

POST-DISASTER RECOVERY PROCESS  
AND LOCATION CHOICES OF BUSINESSES IN CASE OF ADAPAZARI

A THESIS SUBMITTED TO  
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES OF  
MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR  
THE DEGREE OF DOCTOR OF PHILOSOPHY  
IN  
CITY AND REGIONAL PLANNING

NOVEMBER 2012

Approval of the thesis:

**POST-DISASTER RECOVERY PROCESS  
AND LOCATION CHOICES OF BUSINESSES IN CASE OF ADAPAZARI**

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## **ABSTRACT**

### **POST-DISASTER RECOVERY PROCESS AND LOCATION CHOICES OF BUSINESSES IN CASE OF ADAPAZARI**

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October 2012, 370 pages

Turkey has been less responsive to changes in global policies of risk reduction and resilience compared to developed countries. Turkish administrations usually concentrate on allocating resources for the compensation of survivors and recovery procedures. The post-disaster implementations focus on households and usually compel them to leave their current accommodation and move elsewhere. Whereas business enterprises mostly maintain their location and property in the disaster hit areas. Due to lack of appropriate policy and tools, businesses often remain in their facilities or make their own location choices as a part of their recovery strategy.

Since physical damage in facilities is not the only determinant of business disruption, it is required to define the factors that lead to disparities in recovery among businesses. In this regard, this study explores the factors that affect recovery process of businesses in the city of Adapazari heavily damaged in the 1999 Earthquake. The main argument of the study is that urban spatial structure of Adapazari is fragmented due to the implemented recovery policies which isolated business recovery from household recovery.

In the absence of a coherent policy in monitoring the business recovery processes, it is highly relevant to understand the strategy and decisions of the business enterprises in their own efforts of recovery. This should allow planners to assess whether such independent recovery decisions could be compatible with some overall urban spatial structure. For the purposes of research an empirical investigation was carried out surveying a sample of business enterprises in Adapazari.

According to the analysis of results of the empirical research, the most notable impact on business recovery positively associated with 'finance, insurance and real estate (FIRE) sector' and negatively correlated with 'trade sector', 'service sector', and with variables expressing states of 'being financially in trouble', and 'taking more damage'. The variables of 'educational level', 'construction sector' and 'extent of damage' are found to contribute significantly to firm mobility. In addition, variables of 'having disaster experience' and 'owner-occupation' are negatively correlated with business relocation. The post-disaster location choices of firms determine the new structure of the city not necessarily in conformity with spatial decisions concerning the residential recovery processes and spatial structure they manifest.

The outcome of the study is that the interventions in the recovery period in the form of strict provision of new resettlement districts in Adapazarı could not contribute to the creation of a safer spatial, environmental, economic and social context due to the inadequacy of policies designed for business recovery.

Keywords: business recovery process, location choices of businesses, urban spatial structure, disaster impacts, Adapazarı

## Öz

### **ADAPAZARI ÖRNEĞİNDE İŞYERLERİNİN AFET SONRASI İYİLEŞME SÜRECİ VE YER SEÇİM KARARLARI**

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Kasım 2012, 370 sayfa

Türkiye, gelişmiş ülkelere kıyasla küresel risk azaltma ve dirençlilik politikalarındaki değişimlere daha az duyarlılık göstermektedir. Türk yönetimleri genellikle kayıpların telafisi ve iyileşme süreçleri için kaynak tahsisi üzerinde yoğunlaşmaktadır. Afet sonrası uygulamalar hanehalkları üzerine odaklanmakta, ve genellikle hanehalklarını mevcut yerlerini bırakarak ve başka bir yere taşınmaya zorlamaktadır. İşyerleri ise çoğunlukla hasarlı alandaki yerleşimlerini ve mülklerini korumaktadır. Uygun politika ve araçların olmaması, işyerlerinin kendi tesislerinde kalmalarına ya da iyileşme stratejilerinin bir parçası olarak yer seçim kararları almalarına yol açmaktadır.

İş kesintisinin tek belirleyicisi yapıda meydana gelen fiziksel hasar olmadığından, işyerleri arasında iyileşme düzeylerinde farklılıklara yol açan faktörlerin tanımlanması gereklidir. Bu bağlamda, çalışma 1999 Depreminde ağır hasar alan Adapazarı şehrindeki işyerlerinin iyileşme sürecini etkileyen faktörleri araştırmaktadır. Araştırmanın temel savı, işyeri iyileşmesini hanehalkı iyileşmesinden ayıran iyileştirme politikalarının Adapazarı kentinin mekansal yapısını parçalamış olduğudur.

İşyeri iyileşme süreçlerinin izlenmesinde tutarlı bir politikanın yoksunluğunda, işyerlerinin iyileşme süreçlerindeki stratejileri ve kararlarını anlamak büyük önem taşımaktadır. Bu tür bağımsız iyileşme kararlarının genel kentsel mekansal yapı ile uyumlu olup olmayacağını plancının değerlendirmesine olanak vermektedir. Araştırma amaçları doğrultusunda Adapazarı'nda işyeri örneklemini üzerinde ampirik bir araştırma yürütülmüştür.

Ampirik çalışmanın sonuçlarına göre, 'finans, sigorta ve gayrimenkul sektöründe çalışma' değişkeninin işyeri iyileşmesini olumlu yönde etkilerken, 'ticaret sektöründe yer alma', 'servis sektöründe yer alma', 'finansal sıkıntı içinde olma' ve 'daha fazla hasar alma' değişkenlerinin iyileşmeyi olumsuz yönde etkilediği bulunmuştur. 'Eğitim düzeyi', 'inşaat sektöründe yer alma' ve 'hasar düzeyi' değişkenlerinin işyeri hareketliliğine katkı koyduğu belirlenmiştir. Ek olarak, 'daha önce afet deneyimi olma' ve 'mülk sahibi olma' değişkenlerinin yerdeğiştirmeyi olumsuz yönde etkilediği bulunmuştur. Hanehalkı iyileşme sürecini ve bunun oluşturduğu mekânsal yapıyı gözeten mekânsal kararlardan bağımsız olarak, işyerlerinin afet sonrası yer seçimleri kentin yeni yapısını belirleyecektir.

Araştırma ile, Adapazarı'nda yeniden yerleşim biçiminde uygulanan iyileşme süreci müdahalelerinin işyeri iyileşme sürecine yönelik tasarlanmış politikaların yetersizliğinden dolayı güvenli bir mekânsal, çevresel, ekonomik ve toplumsal bağlamın yaratılmasına katkı koymadığı sonucuna varılmıştır.

Anahtar kelimeler: işyeri iyileşme süreci, işyeri yer seçim kararları, kentsel mekansal yapılanma, afetlerin etkileri, Adapazarı

*To my parents;*  
*Münevver & Mustafa Orhan*



## ACKNOWLEDGMENTS

I am deeply grateful to my advisor Assoc. Prof. Dr. H. Çağatay Keskinok. He has been a steady influence throughout my Ph.D. career, by orienting and supporting me with promptness and care, and always been patient and encouraging in times of new ideas and difficulties. I admire his ability to balance research interests and personal pursuits. Above all, he made me feel a friend, which I appreciate from my heart. Besides, I am sincerely and heartily grateful to my co-supervisor, Prof. Dr. Murat Balamir, for the support and guidance he showed me throughout my dissertation writing. I thank him for his guidance, encouragement and support during the development of this work.

I am indebted to my committee members: Prof. Dr. Melih Ersoy , Assoc. Prof. Dr. Tarık Şengül, Assoc. Pro. Dr. Serap Kayasü and Assoc. Prof. Dr. Kübra Cihangir Çamur. They have provided their insight and suggestions with kindness, which are precious to me.

I would like to express my greatest gratitude to Prof. Dr. Ayda Eraydın, Assoc. Prof. Dr. Anlı Ataöv Demirkan and Assist. Prof. Dr. Emine Yetişkul Şenbil for their continuous advices from initial stages of my study. I would like to thank to my studio coordinators Prof. Dr. Oğuz Işık and Assoc. Prof. Dr. Adnan Barlas for their kindness and tolerance in writing my thesis.

I acknowledge the Scientific and Technological Research Council of Turkey for their financial support for this thesis. I would like to thank the Council for supporting me as a scholar during my PhD Thesis through TUBITAK 2211 Domestic Doctorate Scholarship. Besides, the work on this thesis was supported partially by TUBITAK Research Grant no. 111K577.

I wish to acknowledge the help provided by Prof. Dr. Reha Alpar and his research assistant Eda Karaismailoğlu from Hacettepe University, Department of Biostatistics, who helped me apply the statistical models. I would like to extend my thanks to Dr. Banu Aksel Gürün and my student Merve Selçukoğlu for their technical assistance.

Special thanks go to my office mates and colleagues, Dr. Neslihan Kulözü and Ender Peker. To work with them has been a real pleasure to me, with heaps of fun. They continuously encouraged me throughout this study and showed me a great patience by listening to all my complaints. This study would not have been completed without their contributions. I would also like to thank Başak Zeka. I am very grateful to for her friendship over ten years. I am

truly indebted and thankful to Tuğçe Sönmez and Ela Ataç for their friendship. Without them, this process would not be so colourful. Thank you for sharing these years with me.

I would like to express my eternal gratitude to my parents, Münevver and Mustafa Orhan for their everlasting love and endless patience. Besides I would like to thank to my brother, Ekim Onur Orhan for his motivation and support throughout my dissertation. I have to express my gratefulness to Sukran Asan and Emine Mutlu and their families for their support throughout this thesis.

Finally, I would like to thank to my dear Mert, for walking all the way with me...

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## **LIST OF ABBREVIATIONS**

|          |                                                        |
|----------|--------------------------------------------------------|
| AİGM     | General Directorate of Disaster Affairs                |
| DRI      | Disaster Risk Index                                    |
| EMP      | Environmental Management Plan                          |
| FIRE     | Finance, Insurance and Real Estate                     |
| GDP      | Gross Domestic Product                                 |
| HFA      | Hyogo Framework for Action                             |
| IDNDR    | International Decade for Natural Disaster Reduction    |
| IMP      | İstanbul Metropolitan Planning and Urban Design Center |
| KOSGEB   | Small and Medium Enterprises Development Organization  |
| MRR      | Ministry of Reconstruction and Redevelopment           |
| OID      | Organized Industrial District                          |
| SATSO    | Sakarya Chamber of Commerce and Industry               |
| SMEs     | Small and medium size enterprises                      |
| SPO      | State Planning Organization                            |
| UN       | United Nations                                         |
| UNDP     | United Nations Development Programme                   |
| UN/ISDR  | UN International Strategy for Disaster Reduction       |
| TEM      | Trans European Motorway                                |
| TMI      | Three Mile Island                                      |
| TURKSTAT | Turkish Statistical Institute                          |
| TUSIAD   | Turkish Industry and Business Association              |



## **CHAPTER I**

### **INTRODUCTION**

Last two decades have witnessed a shift in disaster approach. There occurs an increasing emphasis drawing multidimensional effects of disasters on socioeconomic environment. The majority of literature on disaster studies has been evolving from traditional understanding to contemporary approaches. Traditional disaster management approaches focus on the physical impacts of disaster. Thus, the post-disaster period is dedicated to reconstruction of physical environment, particularly household recovery. The ineffectiveness of traditional approaches against the growing risks and expensive recovery solutions necessitates fundamental changes in disaster management system. Contemporary approaches, since the 1990s, supporting diverse impacts on disasters argue that communities and built environment are affected both in physical terms and social, economic, political, and spatial aspects (Bolin and Stanford, 1998; Prater and Lindell, 2000; Tierney, et al., 2001; Quarantelli, 2003; Godschalk, 2003; Wisner, 2004; Bankoff, 2004; Oliver-Smith, 2004; Balamir, 2007a; Smith and Petley, 2009). This understanding leads to a shift in disaster approach whose goal is not only restricted with evaluation and prevention of physical impacts but also enlarged to determine the multidimensional effects of disasters on different groups and urban areas.

The contemporary approach in disaster studies refers to a perspective that explains the disastrous event and its consequences within a broader sense. Contrary to the traditional view, contemporary approach claims that the phases of disaster management system are interrelated. That is, the phases of disaster management, i.e. mitigation, emergency, and recovery, have an input-output relation. In the contemporary point of view in disaster studies, multi-dimensional impacts of disasters are highlighted. Contemporary approach particularly deals with secondary impacts of disasters in addition to primary or physical effects. Scholars who put effort explaining the disaster impacts in social, physical and economic terms also make emphasis on the spatial dimension of disasters, which show differentiations according to contextual settings in the studies (Stallings, 1991; Beck, 1992; Blaike, et al, 1994; Bolin, 1998; Tierney, et al, 2001). In addition to differentiations in contextual setting, contemporary approaches acknowledge that impacts of disasters could show differentiations over the components of urban areas and communities.

That is, contemporary disaster studies make emphasis on a variety of disaster impacts to understand the changing patterns of effects on different urban components.

In the light of the contemporary understanding, it is accepted that disasters affect communities and urban components differently, so that their response to and recovery from disaster impacts vary from each other. Studies on community recovery reveal that “all communities eventually recover”, but what differentiates is the process of recovering in terms of speed and quality (Olshansky, 2005; 2).

Recovery phase is commonly regarded as the ability to return to pre-disaster situation. The aim of the policies applied after disaster is to restore the socio-economic level and physical environment of a community to pre-disaster conditions. Recovery from natural disasters is a long process taking a decade or more (Waugh and Smith, 2006; 211). In this process, it is fair to claim that communities may never be the same again. This does not mean the effects of disasters will only lead to negative consequences, but disasters may also present opportunities to the affected communities to rethink their socio-economic, physical and spatial bases. Recovery could lead to a variety of benefits for communities in achieving sustainable development, mitigation and equity (Berke, et al., 1993; 1). Therefore, actions taken in the recovery period could help to enhance conditions, reduce risks, support hazard mitigation, and enable new forms of development. Thus, policies taken in recovery process are expected to focus on a sustainable and comprehensive understanding to “assure that response and recovery efforts reduce the likelihood of future disasters and to connect disaster recovery efforts with long-term economic development strategies” (Waugh and Smith, 2006; 212).

For an urban built environment, recovery process could reduce vulnerability and support mitigation once the contemporary approaches are accepted. Berke, et al. argue that “with appropriate construction, repair and land-use standards, a rebuilt community can be at lower risk to future disasters, compared to pre-disaster condition” (1993; 1). That is, recovery could provide an opportunity to enhance capability after a disastrous event. However, the steps taken in recovery period may not necessarily serve for mitigation of disaster risks, as suggested in the contemporary view.

Within the contemporary context, it could be expected that recovery process could serve to facilitate development by reducing disaster risks of urban environment. In this regard, the present study primarily deals with the recovery process implications and their long-term impacts on urban spatial structure.

Businesses which are one of the main urban components play a significant role in urban structure. Businesses with their locations, functions and economic roles are the ingredients of urban structure. Location of firms determines the main land-use types as working places, commercial activities and production units. As businesses have concentrated in space, they have built up urban cores. With the elimination of production facilities in forms of industries from the urban center, urban cores are left to the businesses operating in commercial activities. Thus, production facilities become to shape urban fringe. Dispersal and sprawl of urban functions lead to restructure urban space. Hence, location preferences of businesses could contribute to physical growth and development of urban space. Therefore, it is fair to claim that there is an interaction between businesses' location choices and the urban structure.

As disasters hit urban areas, businesses suffer extensively to recover the impacts of disasters. That is, disasters can have a devastating impact on business viability. Firms, as basic elements of economy are vulnerable to disasters, and they suffer major losses from disasters. They display different recovery routes as well as different location preferences after disasters in order to adapt to new situation. Businesses, therefore, tend to restructure the urban space. However, each firm does not make similar location choices against an extreme event. These choices can alter among firms operating in the city. This study aims to put forward the disparities between businesses in terms of recovery process and location preferences, which restructure the urban area, in turn.

According to the contemporary approach, one of the crucial impacts of disasters on urban development and communities is the changing pattern of spatial structure resulted from the reorganization of households and businesses within space. The reorganization of households could be oriented through resettlement policies caused by disruption of physical environment. However, household recovery is not adequate to reflect the community-level impacts, so that other components must be investigated. On the other hand, businesses are affected from disasters and reveal differentiating location choices. In order to explain spatial restructuring and economic discontinuity posed by disasters, it is required to understand how disasters affect the basic economic units of an urban area. One approach to reveal the spatial restructuring and economic impacts of disasters is to evaluate the post-disaster situation of businesses.

The study develops its context in Turkish case. Turkey has experienced natural disasters throughout the history, but none of them have catastrophic consequences as the 1999 Earthquake in terms of fatalities, injuries, property damages and economic losses. The 1999 Earthquake has resulted in multidimensional problems ranging from physical, economic,

political, and environmental to spatial problems in Turkey's most urbanized region. More than a decade has passed over the catastrophe which enables us to investigate the consequences of recovery policies on spatial restructuring of urban areas.

Disaster management system in Turkey is rooted in an approach dealing with the post-disaster regulations. The Act no. 7269 (1959) draws the frame of disaster management schema of Turkey. In line with this Act, disaster policies have been shaped under the dominance of a traditional view. Disaster policies are used to regard the post disaster period and allocate resources in case of any disastrous event. This approach results in economic, social, and spatial problems in Turkish cities. As the thesis accepts the contemporary framework which conceives restructuring as the synthesis of spatial, social and economic components, it assumes that there should be a balance recovery process among households and businesses. However, decision-makers make emphasis on household recovery but not on business recovery in the sense of spatial structuring. Therefore, this study highlights the inadequacy of the disaster management policies in Turkey by focusing on the long-term consequences of recovery implications.

The thesis deals with impacts of disasters on urban spatial structure by considering the business as the units of analysis. In other words, this study will examine the consequences of recovery decisions of businesses and the ways of space structuring. It aims to examine location choices of businesses as a part of their recovery process for case of Adapazarı. In doing so, we develop a conceptual and methodological framework for business recovery and their location choices.

### **1.1. STATEMENT OF THE PROBLEM**

Adapazarı, similar to other small and medium-sized Turkish cities, has developed around a single center. This center of the city is the location of business conglomeration (Figure 1.1). The center was surrounded by dense residential areas. Besides, urban fringe has been invaded by the industrial plants as a result of regional dynamics which decentralize industrial development from İstanbul to its city region. These plants mainly locate along the TEM and E-5 highways, in the southern part of the city. Also, there exist production units within small sized industrial districts which locate in fringes of the city. With respect to the disaster existed in 1999, urban area was damaged, particularly the core. Affected households were resettled through public policies to the north of the city. Despite relocation of population, the resettled area could not be able to draw urban central functions to the resettled districts. Consequently, the damaged urban center has sustained to hold businesses. Firms, hence, has recovered within the affected part of the city which is still functioning as an urban core.

Even though the resettled area was designated as an urban area, the new resettlement areas can only be used for residential purposes. Here, it is fair to state that the reason behind the residential scenery of resettled area is location preferences of businesses in behalf of the downtown. In other words, single centered nature of Adapazarı has been continuing despite the resettlement districts due to the post-disaster location choices of businesses. Therefore, it is worthwhile to ask why businesses prefer to recover within the downtown, and which factors determine the recovery process in making location choices of businesses. In addition, it should be asked how the urban space affected from the recovery of businesses?

Public resources including external and domestic aid were allocated to recover the affected parts of the city. These resources were provided both to reconstruct the existing urban area and to resettle affected community into safer locations. As a result of resettlement policies, firms are expected to be relocated to these new resettlement areas. Approximately 7,000 permanent housing units were constructed for 30,000 residents (Erten, 2004; 91), so that businesses could relocate to the resettlement district to serve the resettled population. However, during this process, businesses preferred to locate within the affected city. Despite the movement of residents from heavily affected area to safer locations, businesses tend to locate within the city. This situation could be explained through the public aid allocated to reconstruct the affected area and repaired the infrastructure. Nonetheless, these reconstruction policies alone could not explain the location choices of businesses preferred to stay within the city. Therefore, it should be asked why the urgent recovery goal of businesses does not lead to relocation to another place. The post-disaster location choices of businesses cause to restructuring of urban space. The damaged area has still continued to be the urban center of Adapazarı, while the resettlement district is lack of central development to meet the need of the resettled population. Therefore, it is also worthwhile to examine the recovery period of businesses to explain their location choices which in turn restructure the urban space.

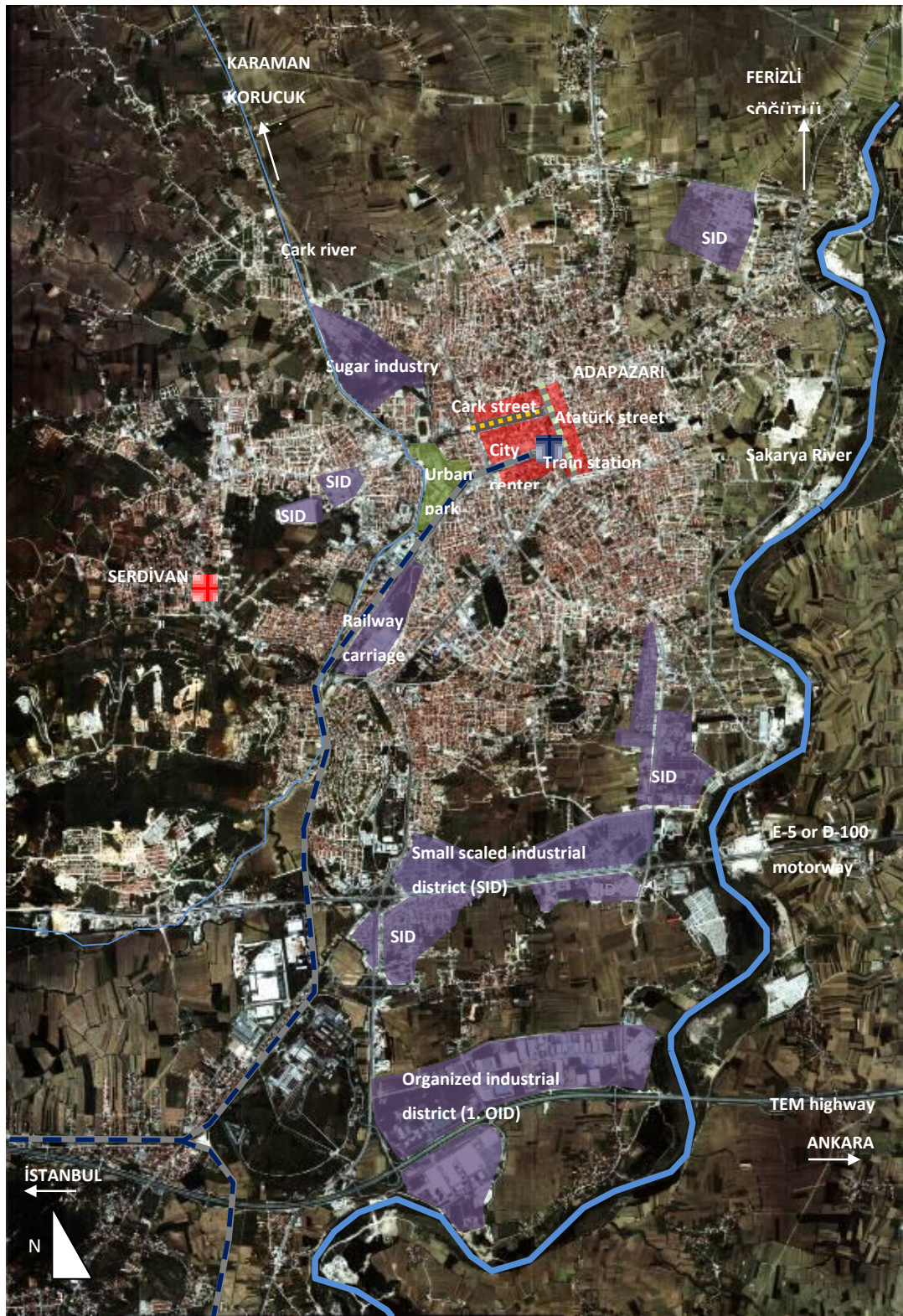


Figure 1.1. Location of industrial districts and center in Adapazarı

Source. İnta-Spaceturk, 2003.



In order to explain the recovery of businesses, post-disaster policies are to be investigated. There has been a substantial amount of documentary on 1999 Earthquake including official reports, statistics, academic researches, and news. These documents display the extent of the disaster in many aspects including mortality, injuries, physical damage, economic costs, mental and social impacts. Official records showing the long-term economic structure after the disaster reveal that there has been an improvement in the affected region's economy, despite the sharp decrease in 1999. According to these records, it could be interpreted that businesses in the affected urban areas has done well and has recovered in the long-run after the disaster. Although the statistics state that the urban economies have recovered, we believe that surveys of firms located in the affected area could reveal the business recovery more accurately. Since data on economic costs and recovery are measured by the physical damage and casualties and disregard the secondary effects, the actual economic impacts could exceed the official estimations. Therefore, economic records themselves are not sufficient to reveal the recovery of businesses. Another aim of the study is to show the contrast between official records and the extent of disaster impacts on businesses.

Similarly, physical damage is not the only determinant of business disruption and recovery. The extent of damage due to a disaster could affect the business recovery and differentiates loss patterns; however, it does not necessarily explain the business recovery disparities among businesses itself. Therefore, it is required to define how businesses were affected from disasters. This study aims to explain business recovery by asking which factors affect recovery process and lead to greater loss for some firms than others. This research seeks to determine the impacts of disasters upon businesses and to investigate the factors to business survival following a disaster. Commonly, suggestions made for reducing disaster losses claim the necessity of retrofitting the buildings where businesses operate. Although strengthening of building is required for protection of lives and property, it is not adequate alone for business recovery. Therefore, by putting the factors that affect business recovery, the current study aims to provide strategies to businesses about reducing the impacts of disasters and recovering them following an event.

In the case of Adapazarı, as businesses settled in the existing urban area, there occurs a contradiction between the initial recovery goals and realized urban structure. Recovery policies aim at reducing urban risks through regional and urban scale implications. At urban level, on the one hand, the goal behind the applied resettlement decisions is to relocate residents to safer districts from the disaster prone urban area. Therefore, it is aimed to create a new urban area on the safer hills. To do that, large amount of public resources were allocated for construction of permanent housings. On the other hand, resources were provided to reconstruct the infrastructure, public services, businesses and industrial facilities

of the damaged area. These investments made for reconstruction of damaged area are the parts of recovery policies. The aim behind the recovery policies in forms of reconstruction practices is to regenerate the existing urban parts. Hence, there occur two-sided implications. While some practices undertaken during recovery process support mitigation, others contrast with mitigation and produce additional risks. That is to say, while decision makers allocate resources to generate a solid physical environment by resettling households to geologically safer locations, reconstruction efforts taking place in the affected area lead to maintain the businesses within the downtown. Thus, isolation between household and business recovery occurs. Location choices of businesses as a result of their recovery process and inadequate policies for their recovery could obstruct disaster risk mitigation as targeted in the initial recovery policies.

There exist resettlement districts such as Karaman, Korucuk, Camili as a part of household recovery process. However, post-disaster policies has not integrated business recovery into household recovery. The disintegration of household and business recovery leads to restructuring of urban space apart from the desired and targeted way of urbanization. Here, it could be argued that ***post-disaster policies separating household recovery from business recovery could result in urban restructuring that vary from the initial goals of the recovery process in the long-term.***

In this manner, it is required to examine the recovery process with respect to the plans and policies applied after the earthquake in long-term period. Our first argument is that if there are controversial policies and practices applied in recovery period as observed in resettlement and reconstruction policies which do not complement each other, mitigation activities aiming to reduce further disaster risks could be hampered.

Addressing to the recovery process, location choices of each urban component will make contribution in structuring of urban space. However, recovery policies that are not designed considering their spatial consequences will structure space in unexpected cases. Therefore, our second argument is policies designed in recovery process ignoring the spatial consequences of implications will reproduce further urban vulnerability and hamper mitigation to reduce future risks.

According to the hypothesis, it could be claimed that policies and plan decisions separating household recovery from business recovery could reproduce the pre-disaster vulnerable characteristic of the urban environment, despite the initial goal of achieving a resilient city. Therefore, our third argument is actions taken in recovery phase disregarding the relation



between urban components, and isolating businesses from household recovery could hamper community recovery and mitigation efforts.

In sum, the purpose of the thesis is to investigate the impacts of business recovery process on the urban spatial restructure. Here, businesses are selected as the object of the thesis since they make location choices to adopt the new conditions. As businesses demand agglomeration, the location choices of businesses depend on several factors including market, input, transport, consumer, land, and etc. Based on these factors, their location preferences will affect the urban structure. In case of a disastrous event which result in business disruption, businesses review their location preferences which could restructure the urban space. Therefore, it is reasonable to focus on businesses to explain the impacts of disasters on urban restructuring.

According to the given problem statement, the thesis is shaped around the following research question: **“How does the urban space restructure after a disaster with respect to location choices of businesses?”**. Considering the main research question, we intend to respond three subsequent questions, which will address the systematic approach of the research, as follows (Figure 1.2);

1. Which underlying factors determine business recovery after a disaster?
2. What factors affect the location choices of businesses after a disaster?
3. How does businesses recovery affect urban spatial structuring?

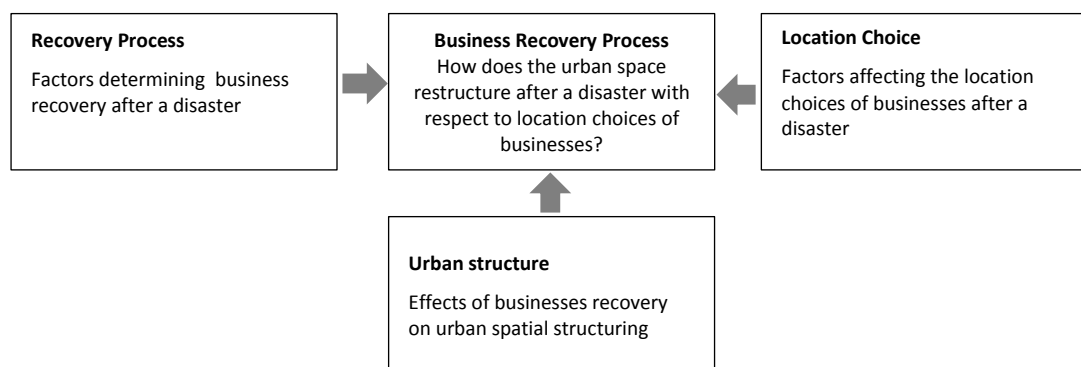


Figure 1.2. Conceptual diagram of the research

The conceptual framework of the study addresses to the main issues related to examination of business recovery process, exploration of location choice factors and identification of

impacts of business recovery on spatial structure. In this context, quasi-experimental research approach constitutes the methodological basis of the study. In order to run the case study on businesses, three-stage stratified sampling method is employed to gather data from Adapazari. Stratifying variables are eligibility, location and business sector. First, businesses are selected upon which provide that they have been in operation since the earthquake. The second stratification is done according to location of businesses. To be eligible, businesses had to be situated in one of the three urbanization models of Adapazari city; downtown, periphery and resettled districts. Third, businesses are selected upon their sectors. Hence, it could be possible to cover all type of businesses, including manufacturing, construction, retail trade, wholesale trade, finance, insurance and real-estate, service, and other which include agriculture, mining, infrastructure and transportation. Data from sample is gathered through application of questionnaire. The survey instruments consist of a series of questions dealing with pre- and post-disaster conditions of businesses. In addition, there are questions to be answered through Lykert Scaling method. The variables used in the research are composed of a set of parameters, departed from literature review as (1) business size, (2) business sector, (3) business age, (4) pre-disaster market condition, (5) occupancy status, (6) market range, (7) education level, (8) previous disaster experience, (9) preparedness level, (10) amount of resources used, (11) physical damage, (12) length of closure, (13) location of customers, and (14) location of employees. In order to find out the factors that affect the business recovery and location choice, data is analysed through logistic regression analysis.

From the perspective of this thesis, the terms 'urban spatial structure' refers to organization of space with respect to the components that give a form, function and social signification to the space. Urban space is structured that "it is not organized randomly, and the social processes at work in it express, in specifying them, the determinisms of each type and of each period of social organization" (Castells, 1977; 115). That is, urban structure could change according to social, economic and political circumstances. Organization of urban space depends on the relations occurring in the space. In other words, social processes appearing in space are affected from the space and condition the space. The iteration between social condition and space finally shapes *socio-spatial processes* (Lefebvre, 1992).

According to the contemporary approach, spatial restructuring after a disaster is a socio-spatial process. The spatial reorganization of an urban area is formed as a result of decisions taken after disaster. These decisions are affected by the socio-spatial processes. Therefore, urban restructuring in post-disaster period is linked with the socio-spatial processes occurred after a disaster. This restructuring could be understood through urban components and their location preferences.

As urban structure relates with the processes of physical growth and development in urban areas, components could explain the change in structure, i.e. restructuring (Chapin, 1968; Castells, 1977). For Castells, components of urban spatial structure could be defined through production, consumption and exchange systems, as illustrated in the Figure 1.3. The type of production is formed by level of technology, basic economic system, and socio-economic stratification. Depending on production type and political environment, exchange elements are formed which cover residential units, transport, prestigious spaces, consumption patterns, decision-making centers, commercial units and business centers. In line with the Castells' formulation of urban structure, it could be concluded that businesses including both commercial and production units, are the basic elements that structure the urban space.

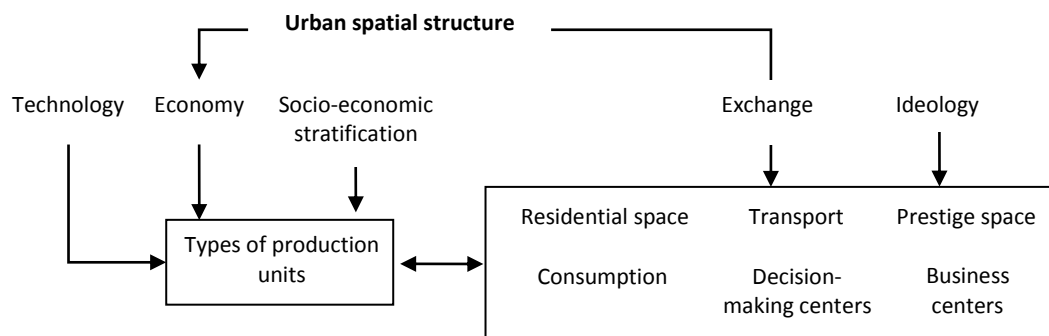


Figure 1.3. Components of urban structure

Source. Adopted from Castells, 1977; 145.

## 1.2. CONTENT

This thesis has been structured around five chapters apart from the *Introduction* and *Conclusion*. *Chapter II* aims to introduce the theoretical framework of disaster studies in order to evaluate post-disaster urban restructuring with respect to business recovery. It is expected from this chapter to constitute a basis for the present study through explaining the disaster management approaches and empirical studies. The chapter consists of three main parts. First part introduces the shift in disaster paradigms which makes a considerable change in the rationale, targets and methods in explaining disasters, so that relevant concepts and steps in the rise of contemporary approach are presented. Second part provides a background understanding on the conflicts of traditional and contemporary

approaches. The conflicts between the paradigms arise from the fundamental assumptions on disaster management phases, and their core interests. Third part presents the empirical studies conducted in the business recovery domain by showing the findings of previous studies.

*Chapter III* introduces the research design of the study including research questions, research propositions, units of analysis, and logic linking data to propositions, and interpretation of data. Research methodology is designed to explain the location choices of businesses by addressing the main research questions, sub-questions and hypothesis. The data collection and data analysis procedures to measure variables and research approach of the study will be described in this chapter.

*Chapter IV* concentrates on the urban development of the Adapazarı city in order to provide information about the urban spatial structure and describe the reasons behind the urban vulnerability. It provides the planning history of the city with respect to the previous earthquake experiences. In doing so, firstly, the chapter examines the stage of development of the city before the 1999 Earthquake. The vulnerability of the city before the catastrophe is evaluated through the political processes and spatial policies. Then, the reflection of the recovery policies on post-disaster urban structure is discussed from a critical point of view. *Chapter V* is devoted to examine the consequences of 1999 Earthquake and the recovery policies applied after the disaster, particularly in Adapazarı. The impacts of the earthquake are evaluated in physical and economic terms. Then, the policy implications for recovery are presented. Using the officially reported data, we assess the post-disaster structure within the Adapazarı city, especially in spatial and economic terms.

Chapter VI includes the analytical procedure of empirical study conducted in Adapazarı. It presents the research findings of the case study that came up from the questionnaires applied to the businesses of Adapazarı. We aim at explaining the factors that make the difference for business recovery and the factors that affect their location choices within recovery process. Firstly, we examine the variables that determine the recovery performances of the businesses, through a set of variables, namely internal factors, response capacity, and extent of damage. Secondly, location choices of businesses as a part of their recovery strategies and the factors that affect their choices are inquired. Thirdly and finally, the relation between business recovery and urban spatial structure is examined.

## **CHAPTER II**

### **THEORETICAL FRAMEWORK**

This chapter aims to draw a theoretical framework for disaster studies and introduce empirical studies conducted in the field of business recovery in order to evaluate post-disaster urban restructuring with respect to business recovery. It is expected to constitute a basis for the present study through these approaches and empirical studies that provide a broad understanding about the location choices of businesses taken in recovery process in case of Adapazari.

Literature review consists of three main parts. First, we review disaster approaches that explain the traditional and contemporary insights on disaster studies. The first part of the literature review is devoted to understand the main concepts about disasters, theoretical approaches and steps in raising the contemporary approach. Thus, first body of literature review will introduce the theoretical background of the study. Second section presents the conflicts between the traditional and contemporary approaches. Three major conflicts will be evaluated which constitute the basic arguments of the thesis. Third section demonstrates previous empirical researches and assumptions about business recovery. This last part of the chapter is developed to determine variables that affect variations in business recovery.

#### **2.1. THEORETICAL FRAMEWORK OF DISASTER STUDIES**

Increasing number of devastating disasters has led scholars to revise the nature and purpose of disaster management. A new conceptual framework on disaster inquiries has created since 1990s. The new approach links the roots of disasters to social and economic systems which are produced as a consequence of human activity. The revolutionary change in disaster paradigm by shifting the priority from post-disaster to pre-disaster process makes a considerable change in the rationale, targets and methods in explaining disasters.

The aim of this chapter is to provide a background information for disaster approaches. Conceptual features of disaster studies are discussed and the relevant theoretical debates are reviewed. First part presents a brief terminological explanation on disasters. Second part introduces the traditional and contemporary paradigms on disasters. Third part makes a

brief introduction about development of contemporary approaches with respect to international disaster policies. In the fourth part, approaches on mitigation which is the core of the contemporary approaches, are summarized. And finally, fifth part discusses the relation between disaster risks and development.

#### **2.1.1. Understanding the concept of disaster as a socio-spatial phenomena**

Addressed to adverse impacts on society, disasters are natural and human-caused events. Disasters are originated by a hazard which refers to natural, technological or human-induced events. Any hazards compounding with risks lead to disasters on human environment causing severe damage. In the line with related literature, this part describes the concepts of hazards, earthquake, disaster, risk and vulnerability.

##### **2.1.1.1. Hazards**

Hazards could be defined as the significant threats to lives and property which are "ubiquitous, posing ever-present threats to livelihoods around the world" (Tobin and Montz, 1997: 197). Hazards may result to harm "by threatening social, economic, and natural capital on a community, region, or country scale" (Pine, 2009: 3). Environmental hazards are categorized into three major groups as natural hazards, technological hazards and context hazards (Smith and Petley, 2009; Pine, 2009). Natural hazards are extreme geophysical and biological events that are consisted of subgroups namely geologic, atmospheric, hydrologic, and biologic hazards such as flood, tsunami, land slide, drought, earthquake, and hurricane. Technological hazards are man-made accidents emerging as transport accidents, industrial failures, unsafe build environment, and hazardous uses. The context hazards are the threats that the human society faced at the global scale such as air pollution, environmental degradation, land pressure, and super hazards. These hazards are illustrated below with regards to human causation, degree of voluntary actions, and intensity in the Figure 2.1.

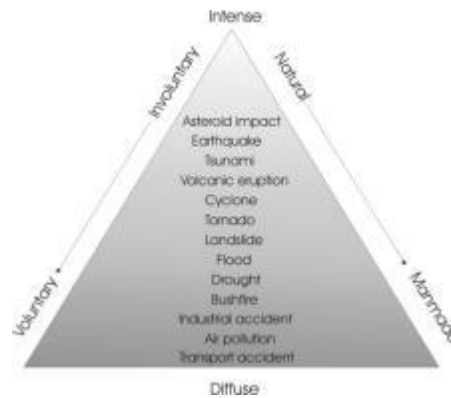


Figure 2.1. Schematic diagram of human causation on and intensity of environmental hazards

Source. Adapted from Smith and Petley, 2009: 11

Technological hazards are the most common type of hazards which are originated man-made events. People are aware of and responsible to the consequences of these hazards. Context hazards are also human-induced events which are less diffuse and voluntarily exist. However, natural hazards are involuntarily and intensely occurred type of hazards. These hazards have both temporal and spatial dimensions. However, prediction of their temporal and spatial dimension has not adequately developed for each hazard type. Therefore, hazards could be also grouped in terms of time-space certainty.

Environmental hazards could be predicted in terms of time and space horizons. However, time-space certainty changes according to type of hazards. Earthquakes are one of the natural hazards whose location in time and space horizon shows uncertainty. Next part gives detailed information on earthquakes which is the core of the case study used in this thesis.

#### 2.1.1.2. Earthquake

Earthquakes are geologically induced natural hazards that occur involuntarily and intensely on Earth. Beatley and Berke note that "earthquakes occur when plates of the earth's crust, floating on a molten substrate, grind past each other, releasing tremendous amounts of energy" (1992; 83). Although the locations of earthquakes have determined by geophysicians, the crush time could not be determined, that is, the time horizon of occurrence is uncertain.

The major hazards produced by quakes are ground shaking, surface faulting, liquefaction, landslides and tsunamis or seismic sea waves (Beatley and Berke, 1992; 83). It is emphasized that, "ground shaking which causes the greatest physical damage, can extent hundreds of miles from the epicenter of an earthquake and can cause structures to collapse"

(Beatley and Berke, 1992; 83). According to Smith and Petley, the destruction level caused by earthquakes depends mostly on the duration of shaking, the distance from the fault, magnitude, local conditions, population density and building quality which cause the differentiated results of disasters (2009).

#### **2.1.1.3. Disaster**

The natural hazards causing loss of life and goods have become 'disasters' for community as a whole. According to the United Nations, disasters are defined as "serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources" (UN/ISDR, 2004: Annex-3). Disasters are the realization of hazards, so that they have tangible consequences on diverse areas (Smith and Petley, 2009; Pine, 2009). These consequences are not existed only in physical aspects, but also in social, economic, political and ecological aspects. Smith and Petley identify disasters as "events, concentrated in time and space, which cause sufficient human deaths and material damage to disrupt the essential functions of communities and to threaten the ability of the communities to cope without external assistance" (2009: 14). The issue concerning local capacity has gain significance in disaster studies. Therefore, definitions of disasters highlight the term of local capacity of the affected area.

Disasters are compound and complex events which appear as a result of interaction between human and nature. The interaction has been increasing and strengthening within the global context. Technological improvements cause an intense relation between human and nature which both helps to cope with adverse impacts and increase vulnerability. Oliver-Smith points that "as the occurrence of the interactions between natural and technological hazards increases, making disasters more complex, both the practical and the theoretical challenges in turn become more complex" (2004: 10). Figure 2.2 illustrates the complex relation between nature and human system.



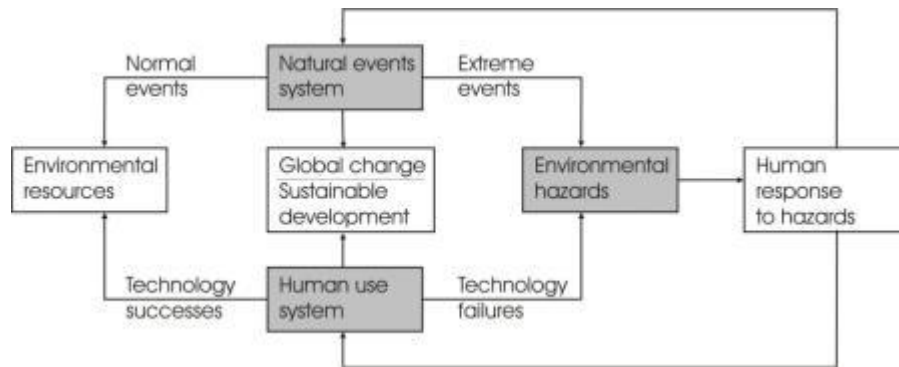


Figure 2.2. Interaction between human system and natural events

Source. Smith and Petley, 2009: 8.

Disasters express the complex relationship between natural and social systems and challenge them materially, socially and ideologically. Human system and nature are interconnected with each other. Apart from the routine proceeding of nature and human system, extreme events and technological failures cause hazards which require human response. Disastrous outcomes of events and system necessitate the development of coping mechanism among society. This mechanism contributes to institutionalization for disaster risks which is the next concept to explain.

#### 2.1.1.4. Risk

Risk in its dictionary meaning refers to a situation associated with exposure to danger. The concept of risk has been used in a broad geography since the Middle Ages. The notion has been developed parallel to the scientific improvements and provided both positive and negative perspectives for decision-makers. Development of the risk concept is illustrated in the Table 2.1.

Table 2.1. Development of risk concept

| Period                | Middle Ages         | 19 <sup>th</sup> and early 20 <sup>th</sup> century | 1945-1980                | Post-1980s                |
|-----------------------|---------------------|-----------------------------------------------------|--------------------------|---------------------------|
| <b>Risk cognition</b> | Danger, uncertainty | Probability                                         | Probability x damage     | Vulnerability x damage    |
| <b>Aim</b>            | Ventures, voyages   | Prediction                                          | Risk-sharing             | Risk management           |
| <b>Rationality</b>    | Dominance of nature | Instrumental rationality                            | Instrumental rationality | Communicative rationality |

Table 2.1. Development of risk concept (cont.)

| Period                    | Middle Ages                      | 19 <sup>th</sup> and early 20 <sup>th</sup> century | 1945-1980                           | Post-1980s                           |
|---------------------------|----------------------------------|-----------------------------------------------------|-------------------------------------|--------------------------------------|
| <b>Context</b>            | City-states                      | Nation-state                                        | Nation-state                        | Globalization                        |
| <b>Government</b>         | Feudality                        | Nationalization                                     | Keynesian<br>Welfare state          | Privatization                        |
| <b>Mode of production</b> | Mercantilism                     | Manufacturing                                       | Fordist production                  | Post-Fordist production              |
| <b>Organization</b>       | Exploitation, Hegemony of guilds | Separation of conception and execution              | Regulation                          | Deregulation                         |
| <b>Type of production</b> | Hand-made production, craftsmen  | Local wealth, Individual production                 | Mass production<br>Standardization  | Flexible, technological innovation   |
| <b>Science</b>            | Theology                         | Positivism                                          | Realism and constructivism          | Critical realism<br>Structurationism |
| <b>Thinking</b>           | Divinity                         | Ordered thinking<br>Newton's physics                | Ordered thinking<br>Social sciences | Critical thinking<br>Chaos theory    |
| <b>Society</b>            | Kinship-base                     | National, territorial-base                          | Welfare society, territorial-base   | Risk society, Network relations      |

According to Taylor –Gooby and Zinn (2006), risk refers to the uncertain conditions of ventures of the early mercantile world and leads to the evolving the notion of insurance. Voyages into uncharted waters aiming exploratory and trading ventures had led to the development of risk concept in the Middle Ages. Pine (2009) notes that the term 'risk' has been used to refer danger, peril, venture, opportunity, and uncertainty in the Middle Ages. Then, during the 18<sup>th</sup> century with the introduction of probability in mathematics (Law of large numbers, Bernouilli, 1713), the concept of risk has turned into a predictable way through the law of chance. The use of risk in mathematics and economics has influenced the investment and market behavior (Taylor-Gooby and Zinn, 2006). With the improvements in probability calculations, modern notion of risk has been developed. The threat of nature on human being and their artifacts has caused a risk cognition among societies. Risk becomes one of the main concerns of human as they have greater wealth to loss since modernization. The modern definition of risk refers to "the damage from the event multiplied by the probability of the event occurring" (Adams, 1995: 8). Development in probability assessments has introduced more scientific approaches in banking, investment, business, enterprise and other financial markets as well as statistics. These results have become significant tools of governments in controlling, assessing, categorizing and judging the

society. During the 1940s, governments have provided risk-sharing mechanisms for lower and middle income groups, which is the basis of welfare states of Europe after the end of Second World War. Institutionalization of risks, therefore, was initiated by the welfare states through employment rights and social security policies. However, the increasing costs of social welfare put a burden on governments' budget which would result in privatization of public services. After the oil crisis of 1970s, neo-liberal economic policies has been introduced and the mode of production has turned to a vertical model, organized in flexible systems and formed post-Fordist production. As the regulation mechanism of states diminished and trans-border relations took part in organization of capital and labor, risks become widespread among society and its institutions. Now, "an increasing flexibility in family and personal life parallels the growing flexibility of employment in a context of rapid technological innovation and ever-intensifying international trade; so uncertainty is brought home at the level of individual life" (Taylor-Gooby and Zinn, 2006: 5). Therefore, *risk society* has shaped where everybody is responsible for the production of risk as well as nobody is (Beck, 1999).

Risk in disaster studies are regarded in a similar context. Smith and Petley emphasize the relation between economic development and hazards both of which associate with the feeling of insecurity (2009). Therefore, the insecurity is a created perception which could be seen as a human-construct. Quarantelli emphasizes that "risk is always socially constructed by humans and has no objective existence" (2003: 211). Since risk is a human-construct, its existence with regard to disasters is not unexpected.

In literature, the difference of the terms uncertainty and risk is emphasized. Okuyama (2004) differentiates the concepts of risk and uncertainty. The former refers to mathematical probabilities to the randomness, where the latter does not include mathematical probabilities in randomness. Therefore, uncertainty is tied up with the issue of time and information, and risk is used for describing the probabilistic occurrence of an event in order to derive the expected utility for decision-makings against disasters. Hence, risk is the term used for pre-disaster conditions. Rather than uncertainty, depending on physical exposure and vulnerability, risk could be well defined. From the simple formulation, risk is the probability of a hazard occurring with a degree of loss (Quarantelli, 2003; Smith and Petley, 2009).

#### **2.1.1.5. Vulnerability**

Vulnerability is the term revealing "the exposure of physical and societal frameworks to violent events" (Albala-Bertrand, 2003: 77). For a broader definition, vulnerability refers to "the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard" (Wisner et al.,

2004:11). According to this definition, vulnerability is “embedded in social relations and processes” (Hilshorst, 2004 in Philips and Fordham, 2010: 4). Meanwhile, vulnerability is a product of social inequalities and patterns of social relations (Hewitt, 1983; Perry, 1998). That is, vulnerability refers to “naturalness of disasters” (McEntire and Crocker, 2010).

Social vulnerability is indicated by social classes, wealth, income, poverty, education level, race and ethnicity, gender, age (children and elderly), disability, health concerns, language and literacy, type of households and families and violence (Philips, et al., 2010). Smith and Petley express the social vulnerability indicators at the household level as family size, number of workers in family, education level, occupation type, income type, productive assets, credit source, support network, house construction, house ownership, facilities and location of house, and access to facilities (2009:17). Contrary to the household scale, it is difficult to determine and measure the vulnerability of a society since it has a more complicated structure than the household vulnerability. In order to predict the human vulnerability of a society, UNDP has developed a Disaster Risk Index (DRI). DRI aims to measure the vulnerability for different hazard types. The Index takes economic, environmental, demographic, health and sanitation, education, development, and development indices as vulnerability indicators. The vulnerability created at urban level causes a complicated structure between human and nature systems. Embedded in social relations and social patterns, vulnerability is produced in the urban areas. Therefore, risks could be directly linked to urbanization as the cities are the most vulnerable artifacts of societies. According to Berke (1998; 76), as urban growth in hazardous areas continues, the devastating potential of disasters escalates.

To sum up, hazards are the natural and man-made events causing damage on human environment. Being seismic environmental hazards, the impacts of earthquakes are investigated in this research. Parallel to the advancements since modernization, the concepts of disaster and risk have developed at contextual level parallel to the improvement in international disaster policy. Based on the international disaster policy, these concepts are used in the later stages of this study. According to this conceptual framework, next section is dedicated to demonstrate the different approaches in explaining the disasters.

### **2.1.2. Different approaches on disaster**

Depending on the conceptualization of hazards, disasters and risks, this part aims to demonstrate the changing perception on nature and disasters upon a periodization. To do so, firstly the development of historical view on nature and disasters will be introduced.

Then, the development of disaster paradigms since modernization will be discussed under two main headings as traditional approaches and contemporary approaches.

Societies have had different disaster perceptions since the ancient times. There has been an improvement in understanding and explaining the nature and disasters. Societies have developed different explanations on nature and disaster according to main context of their era (see Table 2.2).

Table 2.2. Historical view on nature and disasters

| <b>Period</b>              | <b>Ancient Greece and Rome</b>                                       | <b>Medieval period</b>                                            | <b>Enlightenment (16-17<sup>th</sup> century)</b>                         |
|----------------------------|----------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------|
| <b>General approach</b>    | Human and nature together<br>Consistency between nature and humanity | Dominance of nature over humanity<br>Humanity as a part of nature | Dominance of humanity over nature<br>Control and instrumental rationality |
| <b>Disaster approaches</b> | Coping actions, solutions;<br>Part of nature                         | Acts of God; disorder;<br>Nature as evil and fallen               | Scientific explanations<br>Engineering solutions                          |

In the ancient Greece and Rome, humanity and nature were commonly in partnership, so that there was a consistency between nature and society. In the medieval ages, with the hegemony of theological approach, humanity was conceived as a part of nature. Divine rules accepted the dominance of nature over humanity. In that period, it was believed that humanity was under the control of nature, therefore, they could not go further than the doctrine. However, with the Enlightenment, people were able to make calculation and prediction about environment and control the consequences of events. The ideological shift brought an improvement in scientific approaches. Modernization caused changes over societies in economic, scientific, ontological and political aspects. Ontological assumption of modernity sees man as a being that can calculate and control his future. This brings an advantageous position to humanity that now dominates the nature. People perceive the nature as the fund of resources which is used for self-realization of human being. Dominance of humanity over nature leads to a utilitarian perspective which would be the basis of classical economic theories.

From the disaster perspective, in ancient times, people perceived disasters as a part of nature and developed coping actions and solutions against hazards such as sea walls. In

medieval era, natural hazards were regarded as the acts of God causing violence. Prater and Lindell note that “disasters have been referred to as acts of God – events that are impossible to predict, let alone to prevent for many years” (2000: 76). It was believed that the order of society was interrupted by hazards which led to disorder in human world (Oliver-Smith, 2004). The nature was seen as *plastic* which means that it is fragile or vulnerable to the purposes of humankind. Plasticity of human environment makes the system fragile upon a disordered case; therefore it requires reconstruction efforts. However, *elasticity* of human environment provides reproduction opportunity in case of a disordered situation. With the Enlightenment, the conservationist attitudes to disasters have shifted and the natural hazards have been explained in scientific ways. Since the modernization of communities by 16<sup>th</sup> century, people have conceived hazards as natural instead of attributing them some connotations from divinity. The awareness of hazards associated with death, destruction, and losses has drawn societies’ focus and anxiety to naturally-originated events. Progressive engineering solutions enabled humanity to control the consequences of natural hazards. The human domination on Earth’s ecosystem as a part of modernization affects the vulnerability of societies and economies to natural hazards (Messerli et al., 2000 in Smith and Petley, 2009). Accepting that disasters are resulted from the vulnerability created by human actions, hazard mitigation has become possible.

The utilitarian ontological assumption of modernity which makes self-actualization possible provides the dominance of humanity on nature. The concept also became used in economics which perceive humans as ego-centered individuals that aim to increase their own utility. Human, having the right of self-realization, began to use the nature on his interest. The exploitation of nature would create a surplus which has value in the market. Competition in market causes the rationality of short-term gains and institutionalizes the dominance over nature. The short-term rationality of market have resulted in unprecedented levels of material wealth and poverty, environmental degradation, and socially constructed vulnerability (Oliver-Smith, 2004). Similar to capitalist economy practices, command economies have perceived nature is under the domination of human to support self-realization of collective labor. Therefore, the nature in both capitalist and socialist economies was plastic and vulnerable.

Harvey (1996) argues that material practices transform and reproduce the nature by inscribing social relations into space. The socio-spatial processes will demonstrate the transformations and also reflect contradictions occurring between society and environment. Therefore, this bilateral relation between humanity and nature will be expressed through material practices as contradictions which could be best illustrated by disasters (Oliver-Smith, 2004).

Suffering from disasters, communities and decision-makers have developed several perspectives depending on economic, political, cultural and social structures. Since hazards cause changes in normal and routine aspects of everyday life, societies show a broad response spectrum. Therefore, taking disasters as environmental, technological and social phenomena since 1950s, the field of disaster studies is today both theoretically and empirically diverse (Bolin and Stanford, 1998). Researchers from natural and social sciences have developed various definitions and conceptualizations to disasters. The diverse conceptualization shapes disaster paradigms. Depending on the improvements in other fields such as technology and engineering, progressive paradigms have been developed on environmental hazards, affecting social cognition. These paradigms defined in literature show a variety of classification among social scientists. This section of the study examines the perspectives on disasters and their distinct assumptions. We present the two group of explanations for disaster studies, namely traditional and contemporary approaches (Table 2.3)<sup>1</sup>.

Table 2.3. Features of traditional and contemporary approaches

|                                  | Traditional approaches                                                                  |                                 |                                   | Contemporary approach                                          |
|----------------------------------|-----------------------------------------------------------------------------------------|---------------------------------|-----------------------------------|----------------------------------------------------------------|
| <b>Period</b>                    | Pre-1950s                                                                               | 1950-1970                       | 1970-1990                         | Post-1990s                                                     |
| <b>Paradigm</b>                  | Engineering                                                                             | Behavioral                      | Development                       | Political ecology, complexity, critiques of modernity          |
| <b>Key concept</b>               | Structural solutions                                                                    | Human responses                 | Vulnerability                     | Risk, mitigation, sustainability, resilience                   |
| <b>Goals</b>                     | Reduction of physical damage                                                            | Avoidance of hazard-prone areas | Reduction of social vulnerability | Risk reduction<br>Resilient urban growth                       |
| <b>Main concern</b>              | Physical processes of the hazard<br>Emergency management                                |                                 |                                   | Social, economic, political aspects<br>Pre-disaster management |
| <b>Approach to nature</b>        | Utilitarian and conquest of nature<br>Nature is external to society                     |                                 |                                   | Equitable approach in concert with nature                      |
| <b>Assumption on individuals</b> | People have bounded rationality so they have to be instructed about disasters and risks |                                 |                                   | Open systems and complexity                                    |

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1 The framework is adopted from the following studies of Smith and Petley (2009), Philips and Fordham (2010), Oliver-Smith (2004), Bolin and Stanford (1998), Balamir (2007).

Table 2.3. Features of traditional and contemporary approaches (cont.)

|                       | Traditional approaches                                | Contemporary approach                                             |
|-----------------------|-------------------------------------------------------|-------------------------------------------------------------------|
| <b>Means</b>          | Science, technology, and engineering                  | Local knowledge, resources and networks                           |
| <b>Management</b>     | Top-down approach through hierarchies and authorities | Bottom-up and decentralized approach                              |
| <b>Responsibility</b> | Scientists, emergency managers, centralized           | Supranational, sub-national institutions, locality, decentralized |

#### 2.1.2.1. Traditional approaches

Traditional approach has been the most common approach among the researchers until the 1990s. Driven from the literature, traditional approaches could be investigated into three main paradigms, namely engineering, behavioral and development paradigms.

From the *engineering perspective*, hazards have been seen as events need to be protected; so that some structural measures have been undertaken such as dams. The period extends to Middle East over 4,000 years ago to 1950s (Smith and Petley, 2009). The aim of the approach is to designate the physical damage of natural hazards for different magnitudes and frequencies, and to find the protection measures against hazards. The point to criticize the approach is its highly dependent characteristic to engineering solutions, which does not take the non-structural components of society into account in hazard management.

The second paradigm began with the studies of Gilbert White who associated hazards to social perspectives (Smith and Petley, 2009:5). White adopted hazard vulnerability perception "as the product of the joint functioning of a natural events system and the human use system" (Tierney et al, 2001:12). The settlement decisions on hazard-prone land and human behaviors were seen as the determinants of management. The main problems raised vulnerability is caused by the location on disaster prone areas to reach resources such as fertile land, proximity to commercial areas, and attractive surroundings. Disaster occurrence is linked to the location of population adopting land-use, building construction and economic activity on physical vulnerable areas. Therefore, social scientists studying on disaster aid and land planning are involved in the process apart from engineers. The *behavioral paradigm* could also be a turning point for city planners whose concern is to give decisions on land-use via design principles without a particular interest about social structure. Smith and Petley (2009) argue that in this period, the focus was on most developed countries. Researchers that aim to improve short-term warning and better long-



term land planning, addressed their studies to non-structural methods. Depending on the Gilbert White's proposition that concern a comprehensive disaster management by taking into account the human ecology, 'technical fix' method has been used in applied science and technology (Smith and Petley, 2009). In other words, it requires the application of science and technology to control hazards (Bolin and Stanford, 1998). However, these solutions are still composed of engineering methods and land-use management such as construction of dams, implementation of evacuation systems, building codes and construction practices. Furthermore, social scientists put effort on "explaining people's behavior in response to risk and disaster" (Hilhorst, 2004). By the way, it was believed that the solutions produced for the developed countries would eventually affect the developing ones since the follow-up science and technology would solve developing country problems as a part of modernization process. The paradigm is confronted with the critics of having a highly deterministic and materialistic character.

Smith and Petley (2009) define the ***development paradigm*** as an alternative approach to behavioral paradigm which focuses on less industrialized countries rather than industrialized ones. Beginning since the 1970s, the paradigm linked underdevelopment to disasters, and took 'vulnerability' as a key concept (Smith and Petley, 2009). Quarantelli (1989: 247) argues that disasters and their impacts are social rather than being physical phenomena. Existence of this paradigm is reasoned to the unsuccessful initiatives taken in disaster management. Since there has been a slow progress in disaster, particularly in less developed countries, development of a new understanding is required. As the Third World countries have suffered from natural hazards deeply and challenged to recover for a long-time period, the new paradigm concentrated on the historical and socio-economic factors of the situation. Since disasters are no longer accepted as the outcomes of environmental processes, the structural factors associated with poverty and social processes have been highlighted to explain the vulnerability of societies to disasters (Hilhorst, 2004). Smith and Petley argue that "the development view is based on the theory that disasters spring from underdevelopment arising from political dependency and unequal trading arrangements between rich and poor nations" (2009: 7). Further, they claim that the inequality among nations and within societies is deepened as a result of disasters. Stressing the poverty and vulnerability concepts, they discuss that humanitarian aid could only be a temporary solution without bring a solid output to socio-economic problems. Therefore, this paradigm addresses various political and economic factors "which unequally place people at risk to hazardous areas" (Bolin and Stanford, 1998:27).

#### **2.1.2.1.1. Basic assumptions of traditional approaches**

Traditional approaches view nature as the causes of disasters. The approach is called differently in the literature such as dominant view (Philips and Fordham, 2010), conventional approach (Balamir, 2007), traditional view (Tobin and Montz, 1997), and classical approach (Tierney et al., 2001). Commonly, the approach sees the physical world as an externality causing damage on human environment. In other words, the functionalist view on disasters conceives disasters as discrete events. The aim of this thought is to reduce losses caused by disasters. Damage from disasters has been attributed to natural system rather than seeing them as the failure of human system (Tobin and Montz, 1997). There has been a deterministic approach that considers the nature as the source, cause and force of destruction. That is, disasters lead to discontinuity in the routine functioning of societies. This approach assumes that "societies and communities are systems organized around necessary social functions that from time to time disrupted by natural and technological agents" (Tierney et al., 2001: 9). Therefore, little could be done for the consequences of the events.

There occurs a physical impact oriented approach which does not involve the social impacts of disasters. Since disasters are naturally oriented and outgiving to society, there has been little concern of prevention of the effects. Hewitt argues that for traditionalists, disasters have "un"-ness problem; "they are unmanaged, unexpected, unprecedented, uncertain and unscheduled phenomena" (1983: 10).

The main concern of traditional approaches is on physical processes of the hazard. Since it is believed that perfect prediction and decisions are not possible for disasters, people have limited knowledge and insufficient information to deal with disasters. Therefore, according to traditional approaches, individuals have bounded rationality (Philips and Fordham, 2010). The limited knowledge forces people to choose from a bounded set of options for the extreme events. This would be resulted in management of individuals by a top-down, hierarchical model controlled by the technocrats and experts.

Traditional approach accepts that science and technology are the major instruments to cope with natural events. Therefore, this approach depends mostly on engineering solutions which relates to physical environment. Since the main concern of this approach is the physical consequences of disasters, the coping mechanisms provide directly physical solutions by using engineering methods. These methods offer more expensive and single-structure solutions using technology. Therefore, this structure serves for the benefit of capitalist economy and command-control relations between society and experts. Traditional approaches claim that the issue of coping with disasters could not be directly handled by

individuals with bounded rationality and limited means, so that a management mechanism is required which is highly centralized and able to access technological fixes and engineering solutions (Philips and Fordham, 2010).

The main focus of the approach is to manage emergency situations (Balamir, 2007a). This approach is criticized by accepting the cities as an agglomeration of individual buildings, so that disaster risks could be overcome by taking engineering measures. Since cities are complex systems and vulnerable in several terms, building-specific measures could not reduce urban vulnerability as a whole (Balamir, 2009). Also, traditional approach conceives hazards in a cyclical model, depending on the repetition of natural hazards. Taking disasters as uncontrollable events that societies regularly face, this approach focuses on post-disaster emergency management.

### ***Critiques of traditional approaches in disaster studies***

This approach is criticized mainly in three ways. First one is related with the assumption that disasters are the consequences of natural extremes. Contrary, it is accepted that disasters are the consequences of natural environment, built environment and human system. Secondly, the approach is criticized by that disasters have only physical influences. However, they do not only cause physical damage, but also lead to economic, political, social and ecological influences. Third one accused traditional approach by supporting post-disaster emphasis rather than developing mitigation and creating resilience. According to traditional approaches, disaster policies are formed by giving priority to emergency management. Relief operations, health services, resource/aid transfer to priority areas and international aid allocation take parts in that context. However, emergency management activates after a shock, which does not provide a basis for risk reduction, and resulted to loss in resources and damage in human system and built environment.

To conclude, traditional approaches fail by providing limited view of the causes of and solutions to disasters (Philips and Fordham, 2010: 12). By considering the nature of risks, vulnerability and capability of society, a wider understanding has developed in disaster studies which is defined under the contemporary approaches. New theoretical explanations and methodological advancements are connected to contemporary approaches which are described in the next part.

### **2.1.2.2. Contemporary approaches**

Seeing the shortcomings of traditional approaches and recognizing the limitations, a new perception in disaster studies has developed. Major trend of this approach has created with the increasing awareness in social vulnerability in 1970s. Philips and Fordham explain this

trend as "vulnerability is related to major social structural factors such as the lack of access to political power and the uneven distribution of income" (2010: 13). Accepting the vulnerability of human system, disasters have been regarded as social constructions rather than seeing them as discrete events impinge on social systems from outside (Tierney, et al., 2001: 13). The changing conceptualization of disasters concludes to contemporary approaches which assume the disasters as social problems such as development problems instead of objective phenomena.

Despite the general assumption considering the disasters as physical events which demand technological and engineering solutions, contemporary approaches accept that disasters are the consequences of human acts. As Bankoff (2004) argues that disasters are "the actualization of social vulnerability", there occurs the need of a new perspective on the explanation of disasters. Since the disasters are accepted as social phenomena in addition to physical occurrences, a wider understanding is required to explain the complex events. Therefore, a new approach in disaster studies has developed since the 1990s. The contemporary approach meets the requirement of a new conceptual framework, by providing a wider and multidimensional explanation and socially-constructed solutions.

Contemporary approaches or complexity paradigm (Smith and Petley, 2009) or social vulnerability approach (Philips and Fordham, 2010) have reshaped disaster studies beginning from the 1990s. The need to expand the vision of hazards leads to perform a new approach. Looking at the taxonomy of the disaster studies, it is observed that the initiations of The United Nations are commonly taken as a turning point (Balamir, 2007a; 2009; Philips and Fordham, 2010; Smith and Petley, 2009). The UN, as part of a broad policy initiative, has declared 1990s as the International Decade for Natural Disaster Reduction. Particular agenda for the UN decade and related national initiatives is, mentioned by Hewitt, as "to provide geophysical, technical and organizational knowledge that 'we'-the rich nations-supposedly have, to others who apparently lack them" (1995: 320)

The approach is required to fulfill the commitments of previous approaches such as engineering works, land planning, and humanitarian aid (Smith and Petley, 2009). In addition, it is essential to respond the modern environmental threats such as economic and political shocks resulting from devastating events. Therefore, a comprehensive approach that combines both the physical and social sciences is required to explain the hazards (Bolin and Stanford, 1998). From the physical aspects, disasters are conceptualized by physical scientists, but "social scientists have developed definitions and methodology from their disciplinary background to explain disasters such as psychosocial impacts for psychologists, community for sociologists, direct and indirect losses for economists" (Tierney, et al.,

2001:16). Also, an interdisciplinary approach has created among practitioners and researchers to bring solutions for complex, broader and integrated issues handled in disasters. Smith and Petley note that "this approach looks beyond local, short-term loss reduction, based on 'quick-fix' solutions, and attempts to mesh disaster reduction strategies with a realistic development agenda for a rapidly changing world" (2009: 8). The reason to accept contemporary approach as a complexity paradigm is that "the complexity theory is interested with the stability and change in systems that are complex in a sense that they consist of a great many independent agents interacting with each other in many ways" such as the social process and environmental system interacting each other (Hilhorst, 2004: 54).

There occurs a diverse literature on contemporary approach in disaster studies. Contrary to functionalism of traditional approaches, researchers develop alternative approaches which could be grouped as social constructionism, critiques of modernity and industrial society, political economy theories, and political ecology perspective (Tierney, et al., 2001: 16).

***Social constructionism*** has occurred as a reflection to functionalism by supporting a constructionist perspective in the social problems. Proponents of constructionist perspectives argue that what is significant in disaster researches is to understand the social processes (Stallings, 1991, 1995; Kreps and Drabek, 1996; Spector and Kitsuse, 1987; Miller and Holstein, 1993; Sarbin and Kitsuse, 1994). Instead of defining disasters as physical phenomena with adverse consequences, this approach tends to investigate the probable damages and ways to reduce the impacts. Tierney et al. explain the approach of social constructionism as "pointing to the importance of exploring the social activities in which interest groups and different stakeholders engage as they try to place disaster-related problems on the public agenda" (2001: 17). According to constructionism, therefore, the problem is to define disasters as the products of social phenomena and non-routine social problems.

***European social theorists criticizing the modernity and industrial society*** constitutes the second group of approaches against functionalist view of traditional approaches. The well-known researcher of these theorists is Ulrich Beck who explains transformation of industrial society into *risk society* with the shifting of the formerly calculable risks into calculable threats (Beck, 1992). Since the idea of nation-state connoted with controllability, certainty and security diminishes, a fundamental shift in paradigm is needed. However, Beck argues that this shift could not be explained by postmodernity, rather there occurs the need for a second modernity. *Second Enlightenment* is required to generate a common understanding which accepts hazards are socially constructed that makes the society more *reflexive* to unintended consequences (Beck, 1998: 20). Second

modernity requires a new explanation and understanding of society. Giddens define the new society as risk society which refers to "a society where we increasingly live on a high technological frontier which absolutely no one completely understands and which generates a diversity of possible futures" (1998; 25). Therefore, the central themes of the risk society would become "fabricated uncertainty within the civilization associated with risk, danger, side-effects, insurability, individualization, and globalization" (Beck, 1999: 19). Moreover, the central theme of risk society is "in advanced modernity, the social production of wealth is systematically accompanied by the social production of risks" (Zinn, 2008: 20). Within this debate, Luhmann (1993) makes a distinction between risk and danger. The former defines the potential losses as the results of decisions, that is, to do with expectations, where the latter refers to losses originated from environmental system or acts of Gods. This leads to a conclusion that risks are inheritance of modern society which makes the contemporary society riskier.

Looking at the explanations, it can be said that the attitude of Beck is situated both in realist and constructivist perspective (Zinn, 2008). Following Marxist theory, Beck positions between the class analysis and postmodern debate. Opponents of Beck's theory criticize the risk society in terms of culture. According to constructivists (Alexander, 1996; Lupton, 1999; Elliot, 2002; Mythen, 2004 in Zinn, 2008), Beck's perspective rejects the sociocultural background. They claim that risk society is inadequate to reflect sociocultural milieus, lifestyles, different personal needs and wishes for security (Zinn, 2008: 47).

***Conflict-oriented theories*** including critical theory, political economy, and world system theory make contributions to the development of contemporary approach. These theories explain the disasters as a part of political economy. According to Schnaiberg (1980), Tierney (1989), and Bolin and Stanford (1998), disaster vulnerability could be linked to capitalist system where underdeveloped countries are more vulnerable to disasters since world system keeps them marginal and dependent (Tierney, et al., 2001: 19). On the other hand, developed countries are more resistant to disaster risks due to their position in political economic order. Globalization and the dynamics of capitalism lead to the problem of disaster rather than seeing them as objective and external environmental problems (Hewitt, 1983). Bolin and Stanford (1998: 9) exemplify the situation as vulnerability is embedded in daily life of people through the complex political, economic, and social considerations. Such an understanding does not blame environment as the source of disasters, rather considers the politics of land development, short-term profit oriented entrepreneurialism, and decisions of local and central government (Clausen, et al., 1978 and Bolin and Stanford, 1998, Tierney, 1989).

***Political ecological perspective***, similarly, sees the vulnerability as a production of political, economic, social, ideological and cultural processes (Blaike, et al., 1994). These processes put people at risk, and institutions become inadequate to protect people. Disasters are again regarded as a part of global processes rather than being individual impacts. Also, their impacts on marginalize people in terms of income status and of racial, ethnic, gender, disability, and age status are known.

Oliver-Smith defines political ecologic perspective as the relationship between people and their environment is formed by politic and economic forces within the society (2004). The approach assumes that "political economic forces shape the characteristics of society and the relationship between people and their environment" (Oliver-Smith, 2004: 10). According to this approach, power and resources are not equally distributed among people which produces a differentiated access to political power and resources. Particularly, the most vulnerable groups of the society show the characteristics of the least access to the resources. Therefore, ecological vulnerability approach perceives today's communities as an *ecological network* of social system (Peacock, et al., 1997; Bates and Pelanda, 1994). According to Peacock et al., the socio-political ecology perspective puts the disaster into a wider approach that "examines the interaction between social systems and their bio-physical environment, focusing on interactions among social systems themselves" (1997: 21). From the ecological perspective, the society is not regarded as a single, bounded and autonomous social system, rather it is accepted as a part of ecological network interacting social systems. The characteristics of political ecological approach could be summarized as the existence of division of labor and dependency, distribution of power and resources among people, and conflict and competition to access the control over resources. In order to make a research on disasters in the line of ecological vulnerability approach, one must study on social inequality related to age, gender, ethnicity, race, class and other attributes; heterogeneity and complexity; coordination in terms of network interactions; and coordination (Peacock, et al., 1997).

#### **2.1.2.2.1. Basic assumptions of contemporary approaches**

Contemporary approaches view the human systems and built environment as the cause of disasters as well as natural origins of them. Therefore, the aim has shifted to reduce the risks created in built environment and social systems to generate a solid future. This understanding has required analyzing the system as a whole by its political, economic, ecologic and social dimensions to reduce risks and social vulnerability. Recognizing the shortcomings of traditional approaches, the key perception has turned into pre-disaster management rather than post-disaster activities. The key concepts, now, include risk,

mitigation, sustainability and resilience. Since the aim is to create a more resilient human environment to hazards, the assumptions has renewed in a more human-sensitive manner.

The problem of the approach has become "how social, economic and political relations influence, create, worsen, or can potentially reduce hazards in a given geographic location" rather than searching only the physical world (Philips and Fordham, 2010: 15). The question necessitates an open system where individuals act in equitable approach in consistent with nature. Since engineering solutions are not enough to explain the complex structure of social vulnerability, new tools are introduced. These tools include the local knowledge of people, the resources obtained by society and networks that bring different capacities to the disaster management process. Looking from a broader perspective, individuals have become the subjects of disaster studies who are able to make decisions about his/her future without limited by the knowledge instructed by experts or other authorities. Hilhorst (2004: 56) define the ontological assumption of contemporary approach as "people are social actors who do not merely react what happens around them; they have the capacity to process social experience and to respond accordingly". The management system, therefore, has turned to decentralized approach and bottom-up model. Not only technocrats or emergency managers are responsible, but also the system accepts participation of institutions operated in supranational or subnational level and takes into consideration the needs of locality. To conclude, the system of contemporary approach is allowed to gain an open, adaptive and soft system qualifications opposed to closed, fragile and rigid systems of traditional thought.

Consequently, there occurs a variety of theoretical approaches in disaster studies. The diversity of theories constitutes an evolving approach from traditional functionalist and technocratic approach to contemporary socio-politic-ecologic approach within an economic explanation. Due to the limitations of traditional approach, a broader perspective has been constructed with the initiatives of United Nations in disaster studies. Next section deals with the steps advanced by the UN at international level addressing disaster policies. This study accepts the assumptions of contemporary approach and will be run in the line of this approach. That is, contemporary approach forms the basis for the discussions of this thesis study.

### **2.1.3. Development of International Disaster Policy**

The contemporary approaches are supported with the initiatives of United Nations at international level by situating the concepts of 'mitigation' and disaster risk reduction at the core. Due to the inefficiency of post-disaster activities accepted in traditional approaches, a shift in policy level was needed; so, initiatives at global level started with regards to disaster



avoidance and risk reduction. This section aims to explain development process of international disaster policy.

As it is obvious in the academic literature, disaster approaches have evolving through a wider perspective which creates contemporary disaster approach. Parallel to these improvements in academic milieu, the changing disaster policies have been supported by international organizations. Main aim behind the improvement is to reduce disaster risks systematically. Recognizing that disasters have borderless impact area, United Nations takes a global approach to disaster risk reduction, seeking to involve every individual and every community towards the goals of reducing the loss of lives, the socio-economic setbacks and environmental damages caused by natural hazards (web page of UN, 2010).

With the change of policies, new institutions, regulations and concepts are needed to adopt the new objectives. These new attempts to alter the previous understandings date back to UN decisions on International Decade for Natural Disaster Reduction between 1990- 2000. Therefore, a disaster approach parallel to contemporary disaster studies has been developing during the last two decades with deliberations of the UN, as shown in the Table 2.4.

Table 2.4. Recent world experience in chronologic order

Source. Adopted from Balamir, 2010

| Date      | Event                                                                             |
|-----------|-----------------------------------------------------------------------------------|
| 1990-2000 | International Decade for National Disaster Reduction (IDNDR)                      |
| 1994      | Yokohama Conference                                                               |
| 2000      | Declaration of Millennium Development Goals                                       |
| 2000      | Establishment of UN International Strategy for Disaster Reduction (UN/ISDR)       |
| 2005      | Kobe Conference                                                                   |
| 2005-2015 | Hyogo Framework of Action (HFA)                                                   |
| 2007      | Establishment of Global Platform for Disaster Risk Reduction                      |
| 2009      | Incheon Declaration: Campaign on Building Resilient Cities, Addressing Urban Risk |

In this period, Yokohama Conference was held to set new strategies and principles, and in the line of these principles International Strategies for Disaster Reduction Organization was founded in 2000. In 2005, according to decisions of the Kobe Conference, a new activity decade was determined as 'Hyogo Framework for Action'. According to HFA, there occurs a

need to act at global level, hence the Global Platform for disaster risk reduction was established. This platform made meetings with the participation nations and institutions every two years. In 2009, another milestone in international disaster policies has appeared. The Incheon Declaration emphasizes the vulnerability of cities and aiming to make resilient the urban areas. All these international acts help development of the contemporary disaster approach by encouraging the participation of states, institutions and agencies. The core concept of international disaster policies is mitigation with respect to their focus on pre-disaster risk reduction. Next part provides detailed information about mitigation.

#### **2.1.4. The concept of mitigation as a core interest of contemporary view**

Preventive measures in pre-disaster period could be supported by mitigation plans. Mitigation refers to “the pre-impact actions that protect passively against casualties and damage at the time of hazard impact” (Lindell and Perry, 2000 in Lindell and Prater, 2003: 177). Mitigation plans help reducing disaster risks for vulnerable cities. In other words, mitigation plans enable to reach sustainable urban development. Parallel to contemporary disaster approaches and international disaster policies, mitigation approaches have been evolving since 1990s. In this section, firstly traditional hazard mitigation approach will be introduced, and secondly contemporary mitigation approach will be explained by concluding a comparison between them.

##### **2.1.4.1. Traditional hazard mitigation approach**

Disaster specialists are increasingly emphasizing the need for public policies that prevent or lessen loss of life and property, rather than crisis-oriented approaches that take effect only after disaster strikes. Such a trend has gaining importance in recent years by putting hazard mitigation in the core. There occur many explanations during the evolution of the concept. Godschalk argues that “traditional hazard mitigation programs have focused on making physical systems resistant to disaster forces” (2003:137). They are because immediate injury and damage results from their failure. This approach does not go beyond structural measures.

According to Beatley and Berke (1992:84), mitigation options include stronger building codes and construction standards as the most effective approaches for new development. For the authors, seismic codes impose structural design standards to compensate for severe ground-shaking which may cause building collapse and loss of life. Also, they recommend retrofitting of existing structures, site engineering and design, and managing the location and density of development such as prohibiting development in high-risk locations. According to them, there are a number of policy tools that can be used to make land-use changes. For Beatley

and Berke (1992), zoning and other forms of land regulation encourage the landowners to shift development from high-risk locations to safer sites by transferring development rights. They advocate the shifting to new and safer areas without regarding the adverse effects of sprawl. Encouraging the decisions on relocation is preferred for a safer development. Additionally, they point out the challenges within the city by claiming "in many earthquake-prone areas, land is heavily developed, so few opportunities exist to mitigate by regulating or influencing new development. Unfortunately, substantial mitigation and land-use change in these areas may have to wait until after an earthquake occurs and reconstruction efforts begin" (Beatley and Berke, 1992:84). Considering the meaning of 'mitigation', it could not be possible to accept such a proposal. Since mitigation refers to the actions taken before disasters to reduce their adverse affects and losses, the approach could not match with the claims of mitigation. Prevention measures should begin immediately in areas known as high-risk zones without waiting until reconstruction process.

Yet, such an idea occurs mainly due to the understanding that sees the solution only in the structural and engineering measures. This approach disregards the comprehensive policy and planning altogether with its social, economic, environment and physical sides. Therefore, this approach could only remain as a *traditional and early form of the mitigation planning*.

Beatley and Berke note that "because they generally have the authority to regulate land-use and building design practices, local governments can play a crucial role in reducing the vulnerability of people and property before a disastrous quake occur" (1992:85). They argue that local programs integrating seismic considerations into local plans and land-use management could meet the mitigation needs of an urban area. However, there are barriers for local governments such as control over building. The authors claim that "stronger building codes and development controls have little effect in areas that are heavily developed" (Beatley and Berke, 1992:85). In this manner, this approach continues to argue that mitigation efforts could not be applied in developed urban areas. Therefore, it can be concluded that such a mitigation approach ignores the other tools of intervention other than engineering solutions such as retrofitting and implementing building codes. A more comprehensive and long-term approach should be regarded in mitigation for developed areas in a city. One of the most preferable solutions is urban transformation including the redevelopment of areas with existing older structures. This does not require waiting for intervention in risky areas until an earthquake hits. The solution should not be delayed after reconstruction process. Otherwise, resource mobilization is also used for recovery of the damaged areas which does not reduce future risks. Another problematic situation for local

governments seems to the absence of resources, expertise and supportive political climate to implement and follow through with such a local program (Beatley and Berke, 1992:85).

#### **2.1.4.2. Contemporary mitigation approach and the concept of 'resilience'**

The term mitigation internalizes a proactive approach rather than being reactive in nature. In light with the assumption, contemporary mitigation approach refuses to wait until a disaster occur and then to respond. Therefore, contemporary mitigation approaches support to estimate vulnerability of settlements across disasters and to take anticipatory actions in order to lessen risk and exposure (Godschalk, 2003:139).

Godschalk points that "future mitigation programs must focus on teaching the city's social communities and institutions to reduce hazard risks and respond effectively to disasters, because they will be the ones most responsible for building ultimate urban resilience" (2003: 137). Since the approach qualifies the needs of a comprehensive approach rather than only structural measures, it indicates the significance of both physical and social systems. Therefore, a new conceptual framework takes place in disaster planning literature, pointing the *resilience* of urban environment which holds complex relations (Godschalk 2003; Quarantelli, 2003). Godschalk defines resilience as "the ability to accommodate change gracefully and without catastrophic failure" (2003:138). Similarly, Berke and Campanella (2006: 192) define resilience as "the ability to survive future natural disasters with minimum loss of life and property, as well as the ability to create a greater sense of place among residents; a stronger, more diverse economy; and a more economically integrated and diverse population". Based on disaster-proof technology and sociopolitical accession to it, building resistance is an endogenous process for society (Albala-Bertrand, 2003). The technology and sociopolitical structure of society could generate a composition of networked social communities. In addition to networked society, the well designed lifeline systems could produce resilient cities (Godschalk, 2003).

According to Godschalk, resilient city is "a sustainable network of physical systems and human communities" (2003:137). Physical systems refer to the structural and natural environment components of the city including the buildings, roads, infrastructure, communication, energy facilities, waterways, soils, topography, geology, etc., while the human communities refer to the social and institutional components of the city. They include "the formal and informal, stable and ad hoc human associations such as schools, neighborhoods, agencies, organizations, enterprises, task forces, etc." (Godschalk, 2003:137). The primary difference between traditional and contemporary approach comes from the latter component. What is included into mitigation process is the resilient social systems with its vulnerable social groups, institutions and agencies.

### **2.1.5. Relation between development and disaster risks**

Since disasters are regarded as the function of magnitude of hazard agent and vulnerability of urban components, a relation between disasters and urban development is expected. Due to increasing social and economic costs posed by disasters, disasters become one of the main factors that hamper socio-economic development of cities. Therefore, disasters become one of the focal points of development policies. According to the report of UNDP released in 1994, linkages between disaster and development have four dimensions as (1) disasters could hamper development, (2) development could increase disaster risks, (3) development could reduce disaster risk, and (4) disasters could generate development opportunities (UNDP, 1994; 10).

From the point of disaster impacts, disaster could be either a threat or an opportunity for urban development. Disasters, resulting in severe physical damage could destroy the built environment and lead to macroeconomic problems. Stephenson and DuFrane state that "disasters can delay development by; loss of resources, shifting of resources to emergency responses, depressing the investment climate, and affecting the non-formal sector" (2005; 64). Contrary, disaster could be a catalyst for development opportunities. Decisions and practices applied after a disaster could provide a basis for resilient development. Therefore, resources allocated to affected regions could initiate positive externality. It is argued that this type of development could be generated through "creating a social and political atmosphere of acceptance to change, highlighting the general level of underdevelopment that caused the disaster, and focusing international attention and aid on the disaster area" (Stephenson and DuFrane, 2005; 64).

From the point of development, it could either increase or help to reduce disaster risks of urban areas. Malpractices and wrong location choices made within development process could increase disaster risks. The ways of increasing disaster risks through development could be ordered as "building dense urban settlements, developing hazardous sites, degrading of the environment, failures or accidents of technology, and unbalancing pre-existing natural or social systems" (Stephenson and DuFrane, 2005; 64). Controversially, development could reduce disaster risks by "strengthening of urban utility systems, using hazard-resistant building techniques, building of institutions and capacity of local authorities, and building and implementation of agricultural and forestry programs " (Stephenson and DuFrane, 2005; 64).

Disasters could also be linked to development in terms of poverty. Anderson mentions that “poverty increases vulnerability to disasters” (1990; 18). Disasters mostly occur in poor countries and affect mostly poor people of a society. Also, disasters could shorten economic life of development investments, through destroying built environment and interrupting ongoing programs.

Creation of a resilient city and continuity of urban development is therefore dependent on an efficient disaster management approach against to disaster risks of urban areas. Disaster management aims to increase resilience for future risks with pre-disaster and post-disaster efforts, as shown in Figure 2.3.

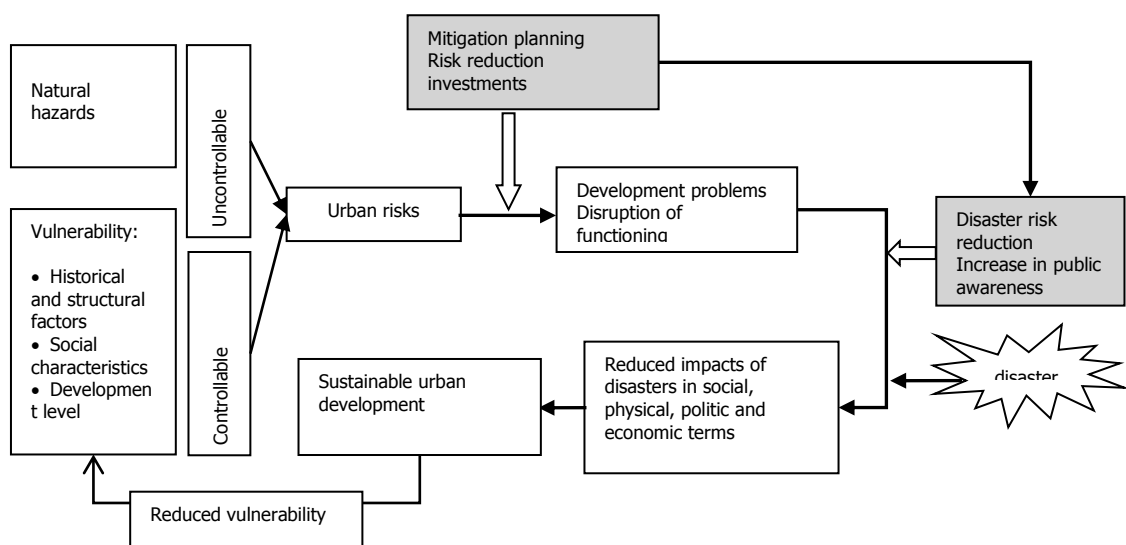


Figure 2.3. Mitigation planning and its possible effects

Source. Adopted from Charveriat, 2000; 42 and Orhan, 2010.

Contemporary mitigation planning approaches aim to create a resilient city with its social, economic, political, physical and spatial aspects. Creation of resilient city necessitates that disasters do not hamper urban development nor contribute to the vulnerability of the urban areas and communities. In order to understand the relation between development and disasters, it is required to define the factors increasing urban vulnerabilities. Next part explains the factors that contribute the construction of urban vulnerability.

### 2.1.5.1. Factors constructing urban vulnerabilities

Vulnerability is a concept of political ecological approach (Oliver-Smith, 2004). The political ecological approach draws the frame of vulnerability in which environment, society, culture, politics, and economy determine the dimensions of disasters. The multidimensionality leads a variety of effects on society which is distributed in the form of risk. Therefore, disaster risks differentiate according to the complicated structure of social, political, economic aspects of vulnerability.

Vulnerability is defined as “the susceptibility or potential for harm to social, infrastructural, economic and ecological systems” (Pine, 2009: 136). Although vulnerability affects the future of society, it is linked to past (Bankoff, 2004; Benson and Clay, 2004). However, past impacts cannot be directly equated with future vulnerability which requires a forward-looking perspective. Meanwhile, vulnerability is “the result of a set of conditions and processes” that influences the future conditions of societies (Pine, 2009). Since vulnerability has been associated with the past, it could be said that historical and structural factors and social characteristics play a role on creation of vulnerability. Bolin and Stanford (1998) illustrate these factors that contribute to vulnerability in the Figure 2.4.

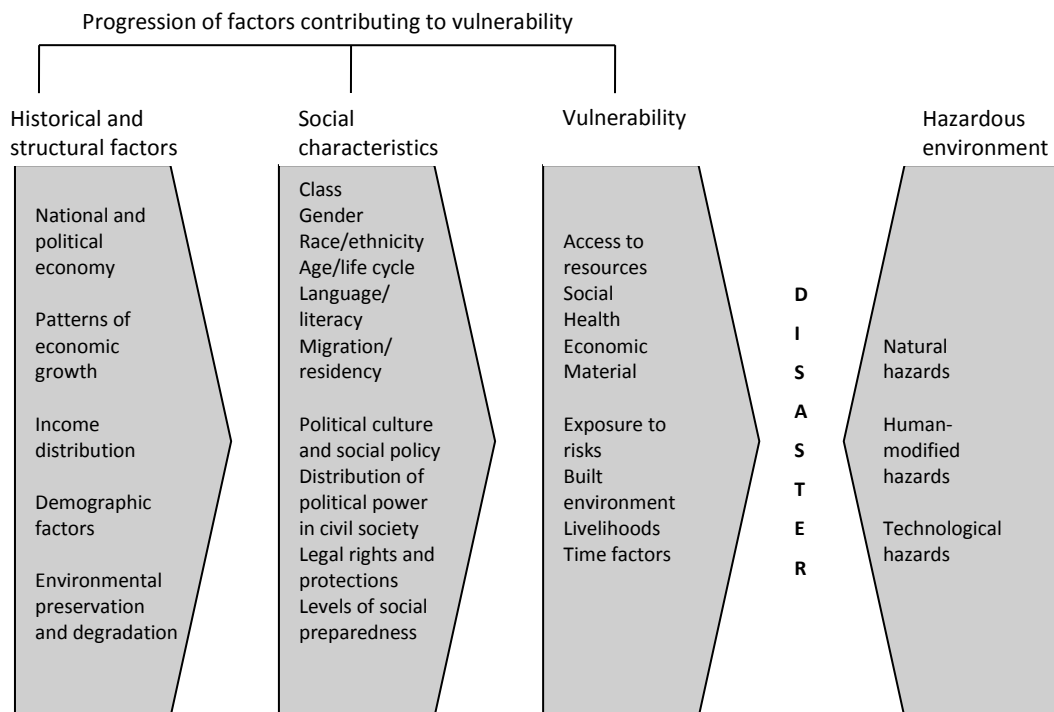


Figure 2.4. Progression of factors contributing to vulnerability

Source. Adapted from Bolin and Stanford, 1998:52.

In the line with the explanations of Bolin and Stanfird (1998), historical and structural factors include the national and political economy, patterns of economic growth, income distribution, demographic factors, and environmental preservation and degradation. Social characteristics comprises the social structure (class, gender, race, ethnicity, age, life cycle, language, literacy, status of migration or residency), political culture and social policy, distribution of political power among civil society, legal rights and protection, and levels of social preparedness. Disasters are the results of the combination of hazards in forms of natural, man-made and technologic with these historical and structural factors and social characteristics. The vulnerability of society affects the distribution of resources and risks among the society. People are vulnerable in accessing the resources such as social and health services, economic gains and materials. In addition to accessibility to resources, their locations and livelihoods become vulnerable. The most vulnerable groups are under the exposure of greater risks.

Vulnerability of societies shows variations among developed and developing countries, according to the relation between development and disaster risks. The variation depends on the population, birth rate, resource scarcity, size of cities, level of technological improvement, safety of environment, and aid dependency (Smith and Petley, 2009). Since vulnerability of developed countries is relatively lower than developing ones, there occur infrequent disasters in developed countries. On the contrary, since the factors result higher vulnerability, there occur frequent disasters in developing countries. Similarly, Bolin and Stanford (1998) make a distinction between social causes of disasters and social effects of disasters with reference to rich and poor countries. Since vulnerability is seemed as a function of people's unequal exposure risk and their unequal access to resources, the asymmetries in resource access and assets differs rich and poor countries. Differentiation among countries is illustrated in the Figure 2.5.



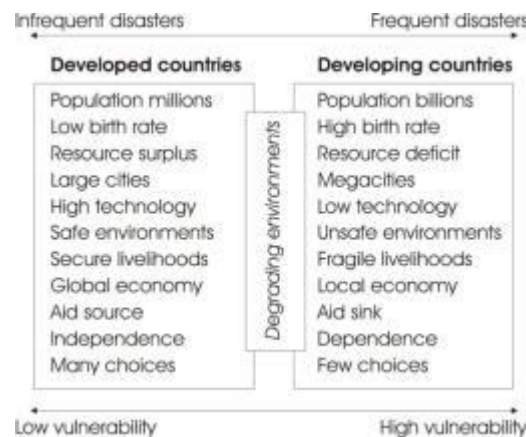


Figure 2.5. The features of developed and developing countries in terms of vulnerability factors

Source. Adapted from Smith and Petley, 2009:18.

The issue of vulnerability has been an interesting inquiry domain for researchers since the 1980s with the increasing awareness of social dimension of disaster impacts. Since then, researchers have developed various explanations and classifications for vulnerability factors. Pine (2009) classifies the recent literature in three main groups identifying vulnerability as a result of physical condition, social condition and both physical and social conditions.

Physical explanation of vulnerability mainly deals with the physical resilience of infrastructure and applies quantitative techniques of engineering sciences (Cutter, 1996). The basic premise is the physical occupation of hazard prone areas through people, economies, and the environment. Social explanation of vulnerability deals with the social resistance (Blaikie, et al., 1994; Wisner, 2004) which occurs a result of coping capacity of people to respond a disaster. Efforts are oriented to strengthen the social fabric, infrastructure and business enterprises' initiatives. In this approach, the problem is not restricted with exposure to hazards; but vulnerability is recognized as a complex issue due to the interdependency of social, economic and natural system. The final approach is an integrated explanation that considers both hazard exposure and social resistance. The aim is to combine the vulnerability of exposure risk with the vulnerability of place and social response. To illustrate, Burton et al. (1978 in Prater and Lindell, 2000) regard the vulnerability of a community as a function of the three components, namely physical environment, human environment and the adjustments developed against hazards. Depending on an integrated understanding for vulnerability studies in the light of political ecologic approach, that this study is shaped accordingly, the factors contributing to the construction of vulnerability are reviewed.

The vulnerability of urban area to natural disasters depends on a complex set of influences. Recent literature emphasizes urban population growth (Bolin and Stanford, 1998; Quarantelli, 2003; Smith and Petley, 2009), inadequacy of institutional arrangements (Bolin and Stanford, 1998; Smith and Petley, 2009), insufficient knowledge, capacity, resources and preparedness (Delica-Willison and Willison, 2004; Smith and Petley, 2009), industrial concentration (Quarantelli, 2003; Balamir, 2007), growth of informal settlements (Coburn, 1995; Bolin and Stanford, 1998; Quarantelli, 2003; Brauch, 2003; Smith and Petley, 2009), and unplanned urbanization (Albala-Bertnard, 1993; Bolin and Stanford, 1998; El-Masri and Tipple, 2002; Delica-Willison and Willison, 2004; Balamir, 2007; Smith and Petley, 2009) as the source of vulnerability.

Within the Hyogo Declaration, United Nations highlight the concept of vulnerability by showing its dimensions as;

“Disaster loss is on the rise with grave consequences for the survival, dignity and livelihood of individuals, particularly the poor, and hard-won development gains. Disaster risk is increasingly of global concern and its impact and actions in one region can have an impact on risks in another, and vice versa. This, compounded by *increasing vulnerabilities related to changing demographic, technological and socio-economic conditions, unplanned urbanization, development within high-risk zones, under-development, environmental degradation, climate variability, climate change, geological hazards, competition for scarce resources, and the impact of epidemics* such as HIV/AIDS, points to a future where disasters could increasingly threaten the world’s economy, and its population and the sustainable development of developing countries. In the past two decades, more than 200 million people have been affected every year by disasters.” (emphasis added) (UN/ISDR, 2005a: 6)

Depending on the internationally accepted criteria in HFA, in this study, vulnerability factors are classified into two main groups, namely socio-economic factors and physical factors, as shown in the Figure 2.6. The classification helps to clarify the major points to be addressed in case study.

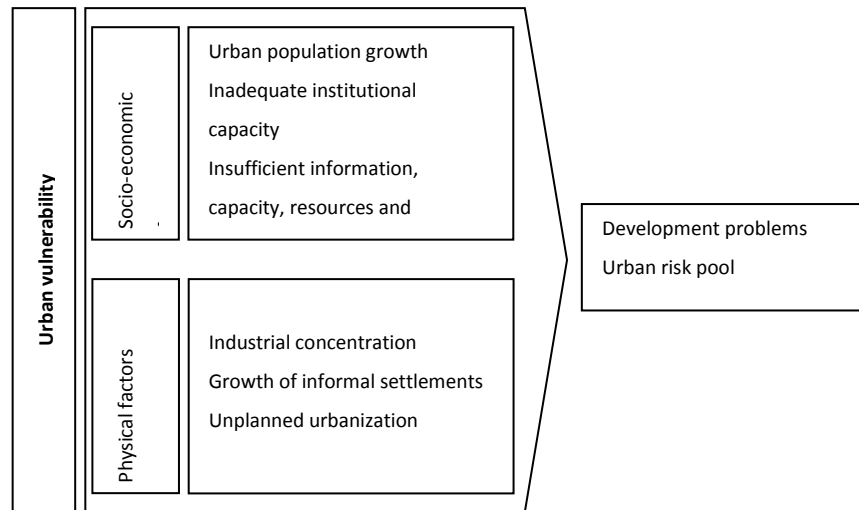


Figure 2.6. Factors producing urban vulnerability

Source. Personal rendering.

Socio-economic and physical factors constitute urban vulnerability. These factors producing and increasing urban vulnerability seem to lead development problems and increase in urban risks. Hence, next section presents the vulnerability factors of urban areas.

#### 2.2.1.1. Socio-economic factors

Socio-economic factors are composed of demographic, political, and cultural factors that affect the human vulnerability at all level. The socio-economic factors are determined as urban population growth, inadequacy of institutional arrangements, insufficient knowledge, capacity and resources, and non-effective preparedness.

**Urban population growth:** A common factor of vulnerability on which researchers are agreed upon is urban population growth. Since the last six decades, world population has an increasing tendency to settle in urban areas (EMI, 2007). This growth takes place mostly in developing countries that already suffer from disasters. Increase in population has pressure on urban vulnerability. According to Smith and Petley (2009), the overall number of people expose to hazard is increasing as about 90% of the growth which is taking place in LDCs. Within the population increase, urban migration plays a significant role in urban growth. The most significant factor in cities' attractiveness is the employment capacity that is why many people migrate from rural areas or relatively small, less developed cities to large urban conglomerations or megacities. Due to the demand of increasing population, pressure to expand housing and commercial space has also accelerated the pace of vulnerability

(Quarantelli, 2003). The dense concentrations of population create more competition for natural resources with unsafe physical settings.

**Inadequate institutional arrangements:** Since the decline of welfare state from 1970s, countries have reduced their commitment to internal welfare. While state regulation has declining, free market ideals take place in countries for almost all issues (Smith and Petley, 2009). Therefore, the lack of effective central government including weak organizational structure and deficit welfare programs is crucial for results of disasters. Besides the loss of commitment of central governments, there is also a limited collaboration between central and local authorities and other institutions. Although “disasters are initially local events” (Quarantelli, 2003), authority and resources are not sufficiently decentralized to meet losses (EMI, 2007). Since local governments do not have comprehensive rules or adequate resources, they could not manage with disaster risks effectively. In addition, disaster risk reduction has not been a priority for governments at any level. Administrators and politicians prefer to consider and invest in disasters after they strike rather than before. Therefore, the authority generally considers emergency management and post-disaster activities. However, apart from government decisions, a combination of stakeholders should involve risk reduction process. As UN/ISDR mentioned in “Guidelines: National Platforms for Disaster Risk Reduction” (2007), the interaction among national actors composing of public sector (governments and statutory bodies); private sector (profit-oriented enterprises); NGOs and other civil society bodies (including individual community leaders); academic and research institutions; and the media should be developed.

**Insufficient knowledge, capacity, resources and preparedness:** Particularly developing countries have less capacity for disaster risk management. In addition to scarcity of financial resources, insufficient knowledge among community makes it difficult in coping with disaster risk. Essential parts of disaster risk management such as early warning system, GIS application, data collection and maintenance do not take a considerable share from budget of governments. Due to lack of decentralization of resources, local authorities remain with little capacity and few mechanisms for implementation of disaster risk reduction (EMI, 2007). Although post-disaster activities are mostly preferred by governments rather than risk reduction activities, authorities again fail to develop an effective emergency management. Being a part of urban mitigation planning, it is significant to determine the areas of action and stock for response, relief, recovery and rehabilitation practices (UN/ISDR, 2005a). Coordination among decision-makers are needed to response early warning system, control communication and transportation networks, organize life-saving activities, arrange trained personnel and allocate medical and technical equipment. Therefore, non-effective preparedness increase the vulnerability of communities.

### **2.2.1.2. Physical factors**

The physical factors affecting the vulnerability are investigated into three groups. Physical factors are related to industrial concentration, growth of informal settlements, and unplanned urbanization.

**Industrial concentration:** The main feature of settlement areas is the capacity that enabling added value to national economy or local population. In other words, much of population concentration depends on the concentration of industry (or services) (Quarantelli, 2003). The production capacity losses resulted from disasters, represent a significant urban risk sector (Balamir, 2007a). In addition to the risk of losing a country's industrial base, this concentration of industry nearby population centers holds another risk. Residents with lower socio-economic status, who face additional risks to their life and health by the mere fact of their poverty, tend to locate around industrial zones and hazardous industrial sites (Quarantelli, 2003).

**Growth of informal settlements:** The expansion of megacities is mainly caused by population growth. The growth leads to the informal housing that are highly vulnerable to disasters (Brauch, 2003; 152). Open land within and around cities is increasingly settled by people without title to it (Coburn, 1995). Many of the most dangerous sites, steep and unstable slopes, river gullies, flood prone areas and environmentally hazardous areas have become rapidly constructed by slums. Inhabitants of those locations contend with every-day risk from malnutrition, inadequate health care, substandard housing, unemployment and illiteracy (EMI, 2005). Compounded by disaster risks, they are often the most vulnerable groups to any natural hazards. Quarantelli (2003) argues that "these informal settlements are considered illegal; therefore, government officials have not included them in urban planning".

**Unplanned urbanization:** Unplanned and rapid growth of cities makes it difficult to provide adequate infrastructure and basic services throughout the expanding areas. Also, capacity of cities becomes unable to plan and to control development, land-use and construction (EMI, 2005). Since "in these expanding areas up to 50- 70 % of the construction is informal", the vulnerability of cities increases (EMI, 2005: 9). El-Masri and Tipple claim that "such 'unsustainable' growth of many human settlements not only endangers the continuity into the future, but also puts the existing built environment at extreme risk and wastes valuable limited resources" (2002: 159). Therefore, uncontrolled urbanization has often fed the growth of slums, reinforced poverty, reduced community resilience, increased disaster risk and diminished cities' ability to deal with disasters. On the other hand, urban planning is the attempt to regulate location preferences, land prices,

demographic trends and other factors driving forces to shape the city (Coburn, 1995). As urban planning concerns to ensure a sanitary, pleasant and safe environment for population, disaster protection should not be separated from planning activities. Urban mitigation planning should be integrated in planning process.

To sum up, socio-economic and physical factors increase vulnerability of cities and yield unprecedented consequences for cities against disasters. In order to sustain development, it is required to reduce disaster risk which is a function of hazard agent and vulnerability degree.

#### **2.1.6. Conclusion**

The mentioned schools of thought on disasters constitute the theoretical background of the disaster studies. Traditional disaster approach focusing on the direct physical impacts of disasters is criticized being inadequate to explain multidimensional effects of disasters. Since the 1990s, contemporary view has constituted through the initiatives of international organizations, institutions, and supranational bodies. Contemporary view explains disasters as socio-spatial phenomena leading multidimensional effects on communities and urban areas. Contemporary view takes disaster risk reduction as a central issue. To deal with the disaster risks, contemporary view supports mitigation activities and fosters risk reduction investments. The aim behind the contemporary view is to create resilient communities across disaster risks.

After reviewing the theories about disasters, the conflicts between traditional and contemporary are introduced to explain the post-disaster recovery process in Adapazarı. The conflicts between two principal approaches could be evaluated in three dimensions. First, according to the contemporary approach, steps taken in any phase of disaster management will affect other phases. Contemporary view assumes that there is a supplementary relation between the phases of disaster management, whereas traditional approach assumes the phases as independent process and neglects the links among these processes. Second, disasters do not only lead to physical impacts, but also create multidimensional consequences. The variety of disaster impacts includes social, economic, political, and spatial aspects. Traditional view disregards these impacts; rather it concentrates on physical impacts and explains the physical vulnerability of systems. Contrary, according to contemporary view, vulnerability of systems could be explained in socio-economic and physical terms. In addition, impacts of disasters could be evaluated in social, economic, politic and spatial terms as well as physical respect. Third, contemporary approach assumes that the urban components could not be thought disjointed; rather they should be regarded

as a whole. Traditional view focuses mainly on households and physical environment and neglects other urban components such as private and public sector entities, socially vulnerable groups, and agents.

These assumptions are derived from the contemporary schools of thought including social constructionism, critiques of modernity and industrial society, conflict-based and political-economy theories and political-ecological perspective. These main dimensions of holistic approach is evaluated and detailed in the section, which enables to adopt the argument of the thesis into contemporary view and helps to analyze the business recovery, as the main topic of the study.

## **2.2. DIMENSIONS OF HOLISTIC APPROACH**

As it is defined in the previous section, contemporary view becomes to dominate disaster policies and there has occurred a shift in disaster paradigms. According to the contemporary understanding, disaster policies aim to create a resilient city. This thesis based upon a contemporary approach assumes that a resilient city could be achieved if mitigation and recovery processes work in cooperation (Tobin, 1999); if recovery process covers multidimensional impacts of disasters, and if policies integrate household recovery into business recovery.

The conflicts between traditional and contemporary approaches constitute the basis of the thesis. This section of the literature review is devoted to provide a background understanding of the conflicts to shed light on the thesis. First part investigates the phases of disaster management and the relation among them according to two mainstreams. Second part deals with the effects of disaster in accordance with the subject of the thesis. Finally, third part explains the requirement of taking urban components as a whole.

### **2.2.1. Interrelations between disaster management phases**

There is a prescribed system of how societies respond to disaster, which is often referred to as the disaster management system (Cutter, 2003; 439). Disaster management is defined as "a multifaceted process aimed at minimizing the social and physical impact of large-scale events" (National Research Council, 2007; 17). Disaster management system proposes a cyclical model that depends on repetition of natural hazards, as illustrated in Figure 2.7. The system is composed of three major phases, namely mitigation, emergency and recovery. Within this context, mitigation could be defined as "any sustained action taken to reduce or

eliminate long-term risk to people and property due to hazards and their effects” (Reddy, 2000; 186). Emergency refers to actions aiming to immediately provide resources and aid to affected people, and recovery refers to returning pre-event conditions through the activities undertaken after a disaster to restore an economy, society and built environment.

With the emergence of contemporary approach, the perception towards disaster management system has been changed. The basis of the change depends on the critics of traditional view. This part concentrates on different perceptions on the disaster management system and the relation between its phases. To do that, this part of the study focuses on the arguments of the traditional and contemporary approaches in terms of resource allocation.

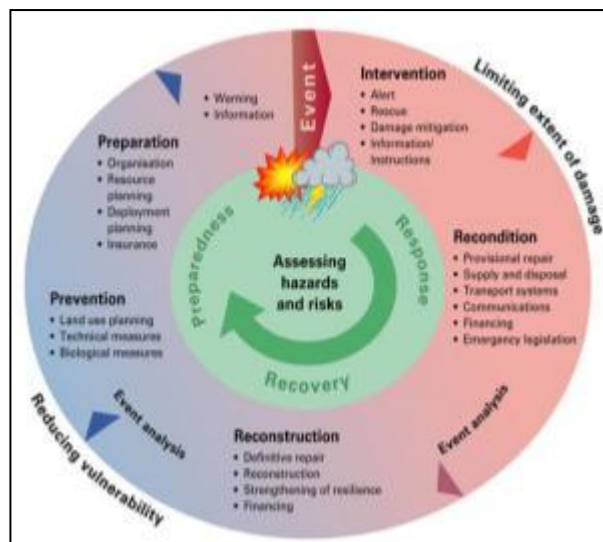


Figure 2.7. Disaster management cycle and phases

Source. PLANAT web page, last achieved in June, 2011.

Traditional disaster approach focuses on the post-disaster period of the model (Balamir, 2007; 27). National policies, where traditional approach is dominant, have been commonly formed by giving priority to post-disaster issues including emergency and recovery. Disaster policies of traditional approach are concerned with emergency management and post-disaster activities. Relief operations, health services, resource/aid transfer to priority areas and international aid allocation take parts in that context. However, as mentioned in the critiques of traditional approach, providing resources and financial opportunities to post-disaster activities do not bring a permanent solution for reducing vulnerability (Balamir, 2007).



Due to inefficiency of conventional methods to create a resilient environment, a shift in policy level was needed; so, at global level a new understanding on disaster management started initiatives with regard to disaster avoidance and risk reduction. Disaster policies have been changed during the last two decades with deliberations of the international organizations. Main aim for this change is to reduce disaster risks systematically. With the change of policies new institutions, regulations and concepts are needed to adopt the new objectives. These new attempts date back to UN decisions on International Decade of Natural Disaster Reduction between 1990- 2000. With the initiation of the Decade, focus has turned to pre-disaster period concentrating on the necessity of mitigation.

This new policy serves for pre-disaster activities including the basic components of risk avoidance, risk reduction and risk sharing. Contrary to preparedness activities, new policy depends on the 'risk' concept aiming at loss reduction after disasters. Pearce (2003) defines the shift in disaster management in terms of core interests and strategies, as illustrated in the Table 2.5.

Table 2.5. Shift in disaster management strategies

Source. Adapted from Pearce (2003) and Rubin and Barbee (1985).

| Traditional approach              | Contemporary approach              |
|-----------------------------------|------------------------------------|
| Hazards                           | Vulnerability                      |
| Loss reduction                    | Risk reduction                     |
| Post-disaster resource allocation | Pre-disaster resource allocation   |
| Discrete relation between phases  | Continuous relation between phases |
| Reactive                          | Proactive                          |
| Single agency                     | Partnerships                       |
| Science driven                    | Multidisciplinary approach         |
| Response management               | Risk management                    |
| Planning for communities          | Planning with communities          |
| Limited coordination              | Communication and information      |
| Conflict among actors             | Pre-defined roles and priorities   |

Effective use of resources is one of the main problems of cities, particularly vulnerable ones faced. Since limited resources are the determinants of urban development, a regulation system is required, especially in vulnerable cities. Therefore, efficient use of resources will be a problem for disaster approaches. This part briefly discusses how to manage this

problem and compares the approaches according to their manner of resource allocation in order to understand their perception towards the relation between phases. The rationale to choose resource allocation in order to explain the difference between the approaches is that only a rational decision-making process as well as planning in disaster management could lead to efficient use of resources.

In a socio-politic environment, where contemporary approach is accepted, it is assumed that pre-disaster policies lead to rationalization of resource allocation and increase efficiency. Thus, resource allocation strategies of traditional approaches are revised with the development of contemporary view. In order to display the difference between traditional and contemporary approaches to disaster management system, in terms of resource allocation efficiency, this section discusses their politic, economic and process management aspects.

#### 2.2.1.1. Resource allocation in traditional approach

From the perspective of traditional approaches, resources are allocated in post-disaster period, particularly in response, rehabilitation and reconstruction phases, as shown in the Figure 2.8. Here, the aim is to reconstruct the affected parts of the damaged areas. Such an aim is an extension of the view that considers the primary and physical impacts of disasters at first.

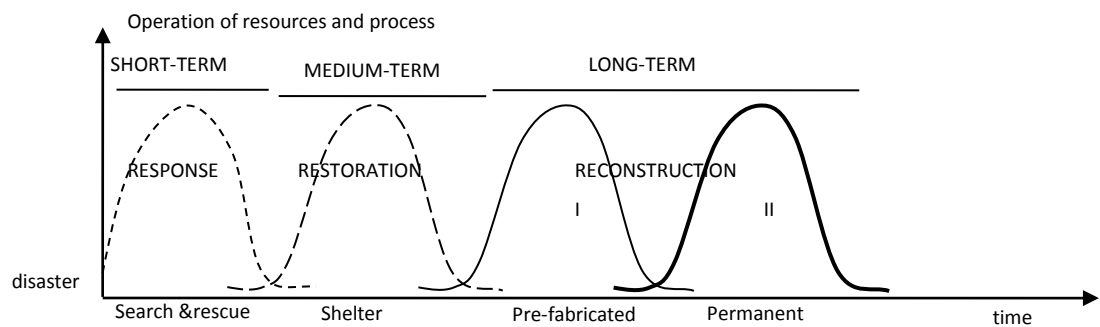


Figure 2.8. Operation of resources and process in traditional approach

Source. Adapted from Vale and Campanella, 2005; 159.

According to traditional approach, resource allocation is initiated with the occurrence of a disaster. Disaster policies are formed by giving priority to recovery actions that include relief

operations, health services, resource and aid transfer to priority areas. Post-disaster period includes both short and long-term implications and decisions. Berke et al state that "traditional approach of aid and recovery programs has been oriented toward short-term relief, with linkage to long-term development, local roles and capacities, and diverse social, economic and cultural conditions" (1993; 2). The period immediately after the shock is called emergency period. Emergency period requires aid for search and rescue activities. The short-term activities are included in the *response phase*. Then, in medium-term, the shelter requirements of affected people are provided. This phase is called *restoration*. In the long-term, *reconstruction* efforts are initiated that comprise basically two following phases (Vale and Campanella, 2005). In the reconstruction-1 period, pre-fabricated housing is supplied with a limited infrastructure. Then, in the reconstruction-2 period, necessity of permanent housing is met. Therefore, increasing amount of resources will be spent and allocated for recovery the impacts of disasters.

According to pioneering work of Haas, et al (1977), it is argued that affected communities have four regular and sequential phases in post-disaster process. These are; (1) taking emergency responses including search and rescue, debris removal, shelter provision, (2) restoration of lifelines, (3) reconstructing capital stock to pre-disaster level, and (4) initiating betterment and development plans. Despite the considerable contributions of the work in to limited recovery literature, following body of studies have criticized the approach of Haas, et al by claiming that the recovery process does not have to be "ordered, knowable and predictable" as defined in the model (Haas, et al, 1977; 261), rather the process could occur in irregular and simultaneous sequences (Rubin, et al, 1985; Rubin and Barbee, 1985; Quarantelli, 1989; Berke, et al., 1993; Bolin, 1993; Olshansky, 2005).

Within the traditional disaster approach, resource allocation shows hegemony in political terms. Allocation is run in a panic environment, with least accountability and depending on the information gathered at that time of emergency. As Rubin and Barbee (1985; 58) note that "post-disaster settings often are characterized by limited coordination, uncertainty, problem complexity, and conflict among key actors", resource allocation process does not include correct predictions and accountability. Since information about the extent and level of damages from a disaster is critical for resource allocation in emergency response period, there is an uncertainty and limited knowledge due to the chaotic nature of aftermath in a disaster (Okuyama, 2004; 12). This uncertainty could lead disturbances in decision-making process. Depending on the information obtained, level of uncertainty changes. Figure 2.9 demonstrates the degree of uncertainty with respect to time.

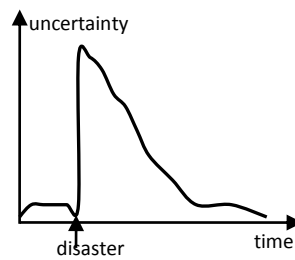


Figure 2.9. Degree of uncertainty in and after a disaster

Source. Okuyama, 2004: 12.

The length of this period depends on the scale of the disaster and extent of the damage. Obtaining information about the damages, level of uncertainty becomes to decrease. Speed of the decline could be affected from some other factors such as the release of timing of recovery plans, the priority of recovery, and the damages to the other regions.

On the other hand, accuracy of the information gathered during emergency period will be susceptible. Therefore, the aid provided in post-disaster according to the gathered information in the emergency environment lead to consumption of the resource that will be used for urban development. Godschalk points that "if we knew exactly when, where, and how disasters would occur in the future, we could engineer our systems to resist them. Since hazard planners must cope with uncertainty, it is necessary to design cities that can cope with effectively with contingencies" (2003; 138).

From the economic aspects of traditional resource acquisition, it could be said that post-disaster oriented allocation increases international aid dependency. The affected authority appoints to an upper level in government hierarchy holding more resources in cases that exceeds its ability to cope with. Hence, post-disaster recovery will be resulted in mobilization of existing financial and physical resources as well as demand for external aid. Since the localities could not afford the required resources for emergency, restoration and reconstruction, foreign borrowings will be increased and localities will have to commit on the amount (Balamir, 2010). On the other hand, unpreparedness for disasters increases the amount of resources that will be used for recovery. At the end, economic development will be delayed due to sudden and high cost borrowings and unjustified expenditures.

To sum up, post-disaster resources are employed in an irregular way in traditional approach. Resources will be allocated to meet the urgent needs of panic environment without predicting possible consequences. Since the authorities do not have any preparedness,

resources acquisition will be done randomly. Also, the authorities stuck in time to intervene the disasters. Resources could not be used for the future opportunities due to lack of preparedness.

#### **2.2.1.2. Resource allocation in contemporary approach**

With the change of disaster paradigms, resource allocation is reviewed and rationalized. The shift in disaster paradigms leads to change resource allocation process in politic, economic and process management aspects. From the side of process management, contrary to traditional approach, contemporary approach supports the continued allocation of resources for disaster mitigation. It is aimed to reduce disaster risks by using resources before disasters in a rational way contrary to the traditional understanding that mobilizes resources in case of emergencies. Hence, it helps to increase preparedness for contingencies and create resilient cities. To do this, contemporary approach supports to make investments for disasters occurring in unpredictable period, as illustrated in the Figure 2.10.

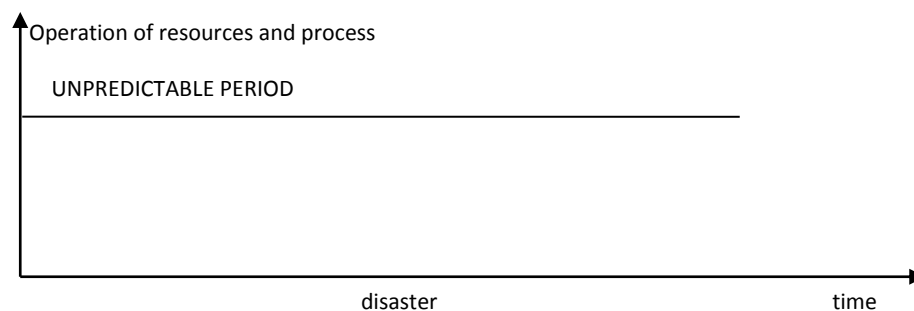


Figure 2.10. Operation of resources and process in contemporary approach

Source. Orhan, 2009; 70.

From the politic perspective, local and central governments determine the existing and potential resources in addition to their responsibilities over them before a disaster struck. The data obtained far from panic environment before a disaster could help to determine the resources that will be used in emergency cases. Therefore, it could be possible to shift from a hegemonic environment to a transparent and accountable position. Also, it provides a participatory milieu for public.

In economic terms, pre-disaster approach could make a borrowing model possible that spread in time. Hence, destruction of the budgetary by a sudden shock will be prevented; so that probable impacts of disasters will be reduced. Besides, this budgetary could be used for development goals. While cities are becoming more resilient, their development goals will not be delayed.

To sum up, under the dominance of contemporary approach, resource allocation for disasters is continued in a slow and regular way. Decision-making mechanism determines the type and amount of resources that will be used in any cases before a disaster. The process management is limited after disaster; instead it spreads over time. Therefore, investing in mitigation before disasters will not be a cost or burden on development goals; rather it will be an instrument that serves for urban development.

According to the shift in politic, economic and process management aspects of resource allocation process, it could be argued that contemporary approach supports continuity of resource allocation. This means that resources allocated to any phase of disaster management system will affect the other phases of the system. Contemporary approach gives priority to resource allocation in pre-disaster period and invests in risk reduction activities. In accordance with its primary investment area, contemporary approach suggests that there is an interrelation between phases of disaster management. It is commonly accepted that mitigation efforts reduce the losses caused by disasters. Similar to the idea, contemporary approach assumes that investments made after a disaster shock in emergency and recovery periods will serve for the reduction of future risks, i.e. mitigation. In other words, contemporary approach accepts that there is an interrelation between phases of disaster management in which output of any phase will be an input for other phases.

Based on the subject of the thesis, the thesis gives particular attention to the relation between mitigation and recovery. The rationale to exclude the emergency phase is that actions taken in emergency phase present short-term solutions so that their effects on recovery could not be clearly observed in the long-term period after a disaster shock. Contrary, implications of mitigation and recovery phases produce permanent practices on cities which affect, in turn, the urban vulnerability or resilience. Therefore, focus on the study is on the relation between recovery and mitigation.

Recovery is "the least understood and researched phase of disaster management system" (Rubin, et al, 1985; Berke, et al, 1993; Olshansky, 2005; Miles and Chang, 2006). Traditional approach seems to allocate resources and take decisions for short-term considerations aiming to return to pre-disaster levels. Hence, it is commonly defined as returning pre-event

conditions. However, this definition is not realistic for the contemporary point of view. Because, with the help of practices applied in recovery period, "a rebuilt community could be at lower risk to future disasters, compared to pre-disaster condition" (Berke, et al, 1993; 1).

According to the contemporary point of view, the aim of recovery is determined as to enhance the capability of community against disasters. Therefore, it is expected from the recovery process is to support the mitigation activities. Stephenson and DuFrane claim that "it is vital to ensure that rehabilitation and reconstruction do not leave the society as vulnerable, or even more vulnerable than before the disaster" (2005; 63). Hence, the interventions made within the recovery process do not have struggles with the goals of mitigation. That is, there should be a consistent relation between the phases of disaster management system.

**Argument:** According to the contemporary view, it is assumed that there is an interrelation between the phases of disaster management system. This interrelation refers to continuous relations among mitigation, emergency and recovery phases which constitute an input-output dependency between these phases. Therefore, we argue that ***steps taken in recovery process without considering its long-term impacts on urban area could hamper mitigation efforts and reproduce urban vulnerability.***

To conclude, the phases of disaster management system have integrated linkages from the contemporary point of view. As Miles and Chang (2006; 440) point out that "decisions made prior to and following an earthquake can significantly affect a community's resilience", there is an accepted idea about the interrelation between these phases to construct a resilient city and community. The *relation between mitigation and emergency* could be extracted as; (1) mitigation could reduce the need for emergency activities, (2) mitigation could enhance the coordination among decision-makers which prevent the occurrence of panic environment, and (3) mitigation could increase the preparedness level of community. The *relation between emergency and recovery* could be defined as; emergency could provide a basis for the initiation of recovery through determination of basic needs of affected community and built environment. The third and last relation occurs *between mitigation and recovery*. This type of relation seems to be the most significant one within the disaster management system because both of the processes have long-term influences and outcomes of the processes have longitudinal impacts on community and environment. In this regard, the relation between two phases requires additional attention.

Recovery is a long term process "in which the community is restored to normalcy" (Reddy, 2000; 185). Impact of recovery could either reduce or increase the vulnerability of affected community. Steps taken in the recovery process will influence the community's resilience against future disasters. The resilience of a community depends on integration of post-disaster recovery efforts into mitigation (Rubin and Barbee, 1985; Reddy, 2000, Berke, et al., 1993). Integration of recovery into mitigation requires strategic decisions made by both local and central governments in addition to public participation. According to the their combined impacts on resilience, the relation between recovery and mitigation could be determined as; (1) recovery could serve for regaining of lost resources including infrastructure, transportation, damage structure, (2) recovery could target high-risk areas, (3) recovery could enhance political commitment on disaster-prone areas, (4) recovery could allocate financial assistance to affected region, (5) recovery could adopt building codes and land-use regulations, (6) recovery could rationalize resource allocation, (7) recovery could enhance monitoring and implementing systems, (8) recovery could increase public participation in decision-making, and (9) recovery could provide adequate infrastructure and affordable housing (Stephenson and DuFrane, 2005; Reddy, 2000).

### **2.2.2. Multidimensional impacts of disasters**

With the development of new understanding, it is accepted that impacts of disasters are not limited with physical damages, but also they cause effects which have longitudinal consequences on societies in several terms. Disasters affect communities and their built environment in physical, social, economic, political and spatial aspects (Nigg and Tierney, 1993; Lindell and Prater, 2003; Miles and Chang, 2006). Tierney, et al., state that "disasters can have adverse consequences for the social and economic wellbeing of an entire affected area, including households, businesses, and communities" (2010: 6). With the shift in disaster paradigms from traditional to contemporary approach, the perception of disaster impacts has changed. Traditional approach mainly deals with the direct impacts of disasters which results physical damages on community and its built environment. Since the assumption of traditional approach has become inadequate to explain the impacts of disasters, contemporary approach enlarges its vision on disaster impacts and investigates multi-dimensional effects of disasters. These effects could be categorized as direct and indirect impacts.

Direct impacts of disasters refer to the physical damage comprising casualties and property damage which are induced by the effect of the disaster agent itself. As direct impacts are inadequate to explain the overall consequences posed by disasters, the importance of indirect impacts has been emphasized. According to Tierney, et al (2001: 6), indirect effects



are caused by “disruptions in flow of goods and services, unemployment, business interruption, and declines in levels of economic activity and productivity”.

Since disasters usually cause negative consequences for community, assessing these impacts become crucial for decision-makers (Lindell and Prater, 2003). This assessment is significant for decision-makers in restructuring the community and urban space. However, assessing disaster impacts and developing policies present complex issues. Disasters may lead indirect and secondary effects in addition to direct impacts. Since it is difficult to assess social, economic, political and spatial impacts caused by physical impacts, sometimes secondary impacts could be ignored. Quarantelli argues that “although indirect and secondary impacts are enormous, recovery process sometimes ignores or downplays the secondary or ripple effects of disasters” (1999; 5).

In this part, the multidimensional effects of disasters are presented in line with the contemporary approach. According to the subject of the thesis, we categorize disaster impacts in three main groups, namely physical impacts, social impacts and economic impacts. This categorization will be used as a basis for evaluating disaster impact in case study.

#### **2.2.2.1. Physical impacts**

Physical damages are accepted as the primary impacts of disasters. Destructing the built environment and causing mortalities and injuries, disaster have been one of major problems of societies. Therefore, since the ancient periods, people have developed some engineering solutions to cope with physical consequences of disasters. Leading visible and tangible results, disasters have been perceived only by their physical effects for a long time. The focus of traditional disaster approach is physical effects resulting from disasters. Until the 1990s, the main issue of disaster studies was physical damages.

The aim of this section is to define the physical effects of disasters and to relate the physical consequences with secondary effects. Physical impacts of disasters cover both casualties and property loss (Lindell and Prater, 2003; Tierney et al., 2001). Casualties include livelihood losses and injuries, where property losses comprise tangible property and infrastructure losses.

##### **2.2.2.1.1. Casualties**

Disasters have a broad range of effects on humanity. The most vulnerable element of the complex urban system is human due to the mortality risks. Particular attention, therefore, has given to mortality risks and several studies have made on livelihood losses. Comparative

studies at national level show that earthquakes have great effects on life losses. The 2007 Global Review of UN/ISDR shows that more than 2,300,000 people killed between 1975-2005 due a disaster, great majority of which resulted from earthquakes (UN/ISDR, 2007a). Lindell and Prater (2003) note that leading to 28 of the 65 greatest disasters of the 20<sup>th</sup> century in terms of deaths, earthquakes resulted 450,000 deaths.

Casualties show variations among countries. According to 2004 Annual Report of UNDP, although the population exposed to earthquakes among developed and developing countries are nearly same, livelihood losses in developing countries are much higher than developed ones. Developing countries have a higher value in livelihood losses compared to developed countries (UNDP, 2004). It is reported that less developed countries witness nearly 3,000 deaths per disaster while developed countries have 500 deaths per disasters (Lindell and Prater, 2003). Also, this variation become increasing since "average annual death toll in developed countries declined by at least 75% between 1960 and 1990, but the same time period saw increases of over 400% in developing countries" (Berke, 1995 in Lindell and Prater, 2003; 177).

Apart from the mortalities, disasters cause injuries, sickness and violence (Charveriat, 2000). Such direct impacts on individuals may cause health problems, loss of job, fall in income, change in family structure such as widows, violence among survivors, homelessness, and poverty.

#### **2.2.2.1.2. Property losses**

Built environment includes "property (land-use in terms of locations of residential units and businesses, building codes, types of construction); critical facilities such as fire stations, hospitals, schools, historical and cultural buildings; infrastructure such as utility lines, water lines, roads and highways; high potential loss facilities such as plants, dams, industrial zones with hazardous materials; response equipments and locations such as emergency operation centers, ambulance and fire districts, early warning systems; and commercial and industrial developments" (Pine, 2009: 35). That is, built environment incorporates residential, commercial and industrial assets as well as cultural and historical heritages, public services and infrastructure.

Disasters have direct physical impacts on built environment. Being the shelter, people mostly suffer from the destruction of their residential units due to a disaster. Therefore, destruction of residential units affects the households at most. Similarly, disasters destruct the commercial units and working places that lead to loss in work days, loss of revenue, loss in productivity, and loss of earnings of individuals. Households are also vulnerable to the loss

of these income-generating assets. In addition, disasters may damage the critical infrastructure that serves for community. Also, disasters may hit the historical and cultural assets which constitute the identity of an urban area or a community. They can cause destruction in physical structure while they can disrupt movement of resources and citizens (Pine, 2009). Physical effects also include loss of animals and crops. Disasters affect cropland, rangeland and woodland. Similar to built environment, natural environment including livestock could be damaged or contaminated due to disasters. However, there occurs little concern on natural environment compared to the built environment.

Consequently, disasters affect residential, commercial, industrial, infrastructure and service sectors (Lindell and Prater, 2003: 177). These sectors are influenced from disaster in two ways. First, disaster causes damage to structure itself. Second, disaster may disrupt the content as a result of collapsing structures. Households are vulnerable against the physical damage caused by the disaster. However, cities or communities affected not only from the direct impacts but also the secondary impacts posed by disasters. Next part deals with the secondary or indirect impacts of disasters as argued in contemporary approach.

#### **2.2.2.2. Social effects**

Social impacts can cause significant problems for the functioning of affected community in long-term. These impacts range from increasing crime rates, divorce rates, psychological and behavioral problems to population redistribution. Social environment is composed of social and cultural capital. Pine (2009: 34) notes that "social environment comprises the level education and their availability to join the workforce, population distribution, population concentrations, degree of poverty, the nature of volunteerism and community engagement, crime rates, educational attainment, availability of health care, vulnerable population groups-children, elderly and disabled". All of these effects could create spatial reflections; but more obviously social impacts of disaster could be observed demographically and psychosocially. Therefore, in this study, social environment will be expressed by its demographic nature in order to express the spatial consequences with respect to choices of population.

##### **2.2.2.2.1. Demographic impacts**

Demographic consequences of and population estimates after disaster are significant in decision-making process in terms of the distribution of funds and aid to local areas, land-use plans, and infrastructure construction such as water supply. Since disasters cause a new population distribution in the affected region, it is essential to observe these changes and to find out the new pattern.

Although several researches (Wright, et al., 1979; Friesema, et al., 1979 in Smith, 1996) claim that disasters have no significant long-term demographic effects, Yezer and Rubin (1987 in Smith and Mccarty, 1996) argue that the impacts of disasters on population depends mainly its frequency and intensity. If the magnitude and frequency of a disaster exceed tolerable levels of community and resources, then there occurs out-migration of both labor and capital. However, this change would not be caused by birth and death rates, since the age distribution was not severely affected from disaster. Rather, the out-migration trend leads to a population decrease in disaster-hit area, and the unaffected regions of the county would attract more population. The geographic redistribution of population causes to socio-economic reorganization among the community and bring some threats and opportunities for the region.

Demographic effects of disasters are mainly caused by the destruction of dwelling units (Lindell and Prater, 2003). Studies on natural, man-made and technological hazards show that some of the occupants whose houses were destroyed from the disaster remained in the same area, yet others moved to different location in the same area or left the area completely (Smith and Mccarty, 1996; Houts, et al., 1988; Perry, et al, 1981; Stallings, 1984). It can be generalized that demographic impact of disasters is caused by physical damage; so that it is one of the secondary impacts of disasters. However, demographic consequences of disasters do not rely upon only physical damage; but also there are other factors that represent the demographic change in social structure. These factors display the characteristics of social environment and background information which have been studied for researches as Smith (1996), Smith and Mccarty (1996), Lindell and Prater (2003), Houts, et al. (1988), Perry, et al. (1981), Stallings (1984).

Perry, et al., (1981) associate the relocation behavior with perception of real threats, existence of relatives, and age. They conclude that perceiving threat as serious lead to relocation; relocated people have a tendency to behave with relatives; and elder people are more likely to have mobility. Stallings (1984) note consistent findings with Perry, et al. in terms of the relation between mobility and existence of relatives. That is, mobility is associated with moving as families, and with families and relatives. Also, Stallings finds that people with higher socioeconomic status, particularly education degree, have a tendency to relocate than low socioeconomic status.

The study of Houts et al. (1988) concludes that main reasons of relocation are perceived danger and protecting children, while main reasons for staying in the area is waiting for an order for evacuation; perceiving the event as an 'Act of God'; having nowhere to go; sawing no danger; unable to leave job; and too sick or disabled. They find a relation between

household size, education level and relocation showing larger households and more educated people are more likely to relocate. Also, their study indicates that life cycle (someone pregnant and under six years of age, age of head of households, and marital status) shows correlation with relocation. Threat perception affects leaving and return dates and distances traveled. Findings of Houts, et al. about the relation between age and relocation are inconsistent with the findings of Perry, et al and Stallings, since Houts et al find that being young associates with relocation. Therefore, characteristics of leavers are associated with being pregnant; having younger children; being married; having a large household; being young; higher church attendance; higher income; higher education and white-collar occupations; and characteristics of stayers are related with longer residence in the area and home ownership.

Smith and McCarty (1996) report the conclusions that people with structural damage in housing are more likely to leave and relocate. Another primary reason for moving is the damage in infrastructure such as loss of electricity, telephone, water, and gas services. Hence, they find that more structural damage leads people to move further. Consistent with previous researchers, Smith and McCarty show that people who move have a tendency to do with friends and relatives. Also, they find that increase in duration of relocation and distance of relocated area cause to less return the initial area. Smith (1996) makes a survey on Hurricane Andrew claiming that the population displacement caused by the disaster lead a variety of residing options. These options included living with relatives, friends, in hotel, in tent or renting or buying another house. The displacement also showed diversity in terms of distance. Some of the displaced residents remained in their territory, some of them moved to a neighboring area, and others completely left the affected city, so that the county lost the pre-hurricane population. Smith (1996) finds that short-term population distribution have affected. However, this survey handled by Smith did not give a clear answer to long-term population changes and permanent moves. It is significant to observe the long-term demographic impacts since large-scale disasters could cause both short- and long-term population movements which leads to a new population distribution in the affected region.

To sum up, it is fair to say that disasters have both short- and long-term demographic impacts in the affected region. The community affected from a disaster has to leave their homes temporarily and permanently which causes a new population distribution in the region. Therefore, it can be concluded that natural disasters force people to leave their residential areas and create a new population distribution which lead to restructuring of urban space.

### **2.2.2.3. Economic effects**

This part aims to determine the vulnerability of an economy to natural disasters. Firstly, relevant definitions will be given to identify the macroeconomic effects of disasters in short and long-term periods. Secondly, the methodologies investigating the macroeconomic consequences of disasters will be represented. Thirdly and finally, the indicators used to measure the economic effects of natural disasters will be extracted from literature survey.

Van der Veen (2004) claims that since the establishment of the UN/ISDR, the risk management process has been supported by economists and the development of civil engineering. Economists are able to compute the costs and benefits of diverse tools. They are interested in the estimation of the consequences on welfare of disasters and in the effects of recovery actions for the economy. Due to the high costs of recovery, disasters prevent developing countries to take part in the world economy. Parallel to the changing perception at international level about risk management, economic effects of large-scale disasters take a significant share. Therefore, relevant concepts and methodologies have developed on cost estimation in order to design instruments on loss reduction.

#### **2.2.2.3.1. Definitions on macroeconomic impacts of disasters**

To start with the relevant concepts in economic terms, it is required to clearly define short and long terms periods, direct and indirect effects. Impacts of disasters could be seen in short-term and long-term periods in economic terms. *Short-term recuperation phase* refers to emergency response and restoration period after disaster. The limitations raised during an emergency are caused by the inadequate financial resources, weakness of institutional arrangements and absence of instruments, information and communication (Skoufias, 2003). There occur information and communication problems due to uncertainty. Also, uncertainty may create further disturbances to decision-making process (Van der Veen, 2004). Since it is difficult to obtain information about damages, demand and supply for restoration become unclear (Okuyama, 2004).

Okuyama claims that “‘uncertainty’ of the information is a key to the analysis of decision making in this phase, since most economic models/analyses assume perfect information and/or empirical probabilities of the future events” (2003:3). Therefore, efficient resource allocation could not be achieved. On the other hand, there occur problems about demand and supply in this period. Since disasters disrupt/decrease some stocks of commodities, there would be an expectation claiming demand remains equal or increases, so that prices should increase, when other things being equal. However, the *ceteris paribus* condition could be achieved in case of disasters, and demand-supply curve could be shifted in unexpected ways. In order to manage the problems of information and economic instability,

Skoufias (2003) proposes construction of social safety nets that will contribute to poverty alleviation and economic development of a country. Therefore, it is argued that public policies considering disasters and economic development are required to develop *ex-ante* mitigation strategies. The reason is that public responses could be run more efficiently if plans are taken place before a shock. Otherwise, public efforts could not be effective in the midst of crisis.

*Long-term recovery period* refers to "the rebuilding process that brings the community back to its pre-disaster economic level" (Dacy and Kunreuther, 1969 in Okuyama, 2004: 7). The recovery period could provide the development opportunity/possibility to community beyond its pre-disaster conditions. There is less concern on long-term reconstruction period since there are other factors that affect the damaged community such as macroeconomic influences. Studies have been oriented towards medium-run (within one year) recovery. Flow models investigate the impacts of disasters in long-run whereas stock model evaluates the damages on stocks. In order to measure the long-term economic impacts of disasters, a diversity of methodological approaches has developed after the initiations of Dacy and Kunreuther using a version of Solow-Swan growth model.

Disasters have both direct and indirect cost impacts. *Direct costs* cover physical damage to capital assets, raw materials, capital, infrastructure and machinery, and loss of land and income, which can be equated with stock losses (Van Der Veen, 2004; Cochrane, 2004). On the other hand, *indirect costs* refer to the damaged goods, services and loss of earnings due to the destruction of marketing infrastructure such as roads and ports. Indirect economic effects are defined as "a result of dislocations suffered by economic sectors not sustaining direct damage. Activities that are either forward-linked or backward-linked could experience interruptions in their operations" (Cochrane, 1997 in Van Der Veen, 2004: 276). Indirect impacts have influences on the flows of goods and services, balance of payments and budgets, economic growth, income distribution, and incidence of poverty (Benson and Clay, 2004). The intensity of the indirect impacts is based on; "(1) the availability of alternative sources of demand and supply, (2) the duration of the disruption, and (3) the possibility to extend production" (Van Der Veen, 2004: 276).

Indirect costs could be categorized as primary and secondary indirect costs. Primary indirect costs refer to business interruption which relate to "human operation of businesses, organizations and institutions" (Rose, 2004; 308). Secondary indirect effects relates with the short and long-term impacts of a disaster, so that the effects determine the performance of the overall economy (Van der Veen, 2004). The indirect or flow costs occur during the

relatively long period of recovery compared to stock or direct costs which occur during the relatively short period.

The indirect costs are necessary for loss estimation of a disaster. Because, stock-based models alone could not produce an accurate calculation. Therefore, in order to calculate the consequences of disruption period, the indirect impacts or flow effects need to be considered.

There occurs a significant increase in global cost of natural disasters (Benson and Clay, 2004). Despite the growing awareness on disaster costs, there is still less cognition on the macroeconomic impacts that could threat development in the long-term. Benson and Clay (2004) define two reasons. First reason is that assessments mostly focus on measuring direct losses due to the necessity to the meet the needs of affected population and to rapidly determine replacement investment. Second reason is on the difficulties of assessing secondary effects. It is hard to evaluate and determine longer-term, cumulative effects of a disaster. Absence of accurate information, on the other hand, poses difficulties to study on the macroeconomic effects of disasters. These factors contribute to the misconceptions to assess hazards as a threat to sustainable development and to lack of appreciation of the economic and social returns to disaster reduction (Benson and Clay, 2004).

#### **2.2.2.3.2. Views on long-term macroeconomic impacts of disasters**

There are two views on long term macro-economic effects of disasters. First view claims that there is little evidence on long-term effects of disaster on urban growth (Albala-Bertrand, 1993; Friesema et al., 1979 in Scanlon, 1988; Okuyama, 2003). This view argues that disasters have no significant effects, which means there are not long-term economic losses due to disasters. On the contrary, second view argues that disasters cause long-term economic effects which have adverse consequences on urban growth (UN/ISDR, 2002; Benson and Clay, 2004; Houts, et al., 1988).

From the former perspective, although disasters cause adverse consequences on society and urban areas, it is claimed that there is little evidence for long-term impacts of disasters with respect to macro-economic researches. Okuyama (2003) claims that although disasters cause critical damages on capital stock and labor, they have limited long-term effects on developed countries. The argument about the negligible effects of disasters on macroeconomy depends on three premises. First one is related about the hypothesis of *impact ratio* which could be calculated as "the amount of damage divided by the amount of community resources" (Lindell and Prater, 2003: 178). According to the hypothesis, it is claimed that if a disaster affects a locality, then the numerator of the impact ratio tends to



be low so that the affected community could afford the impacts of disasters with their local resources in short term, by preventing long-term impacts. Also, if the disaster has a wider impact area which exceeds the ability and resources of affected community, then the state agencies provide recovery resources to the area, thus again preventing long-term impacts (Cross, 2001). The second one is related to the *geographic size* of a country. This view argues that long-term effects of disasters are determined by the geographic size of a country (Benson and Clay, 2004). Very small countries such as islands, suffer from disasters countrywide, which affect the whole economy in short and long-term. Geographically larger countries show two responses in terms of long-term economic effects. Larger countries, on the one hand, suffer from severe natural disasters adversely both in short and long-term periods. On the other hand, larger countries could be challenged by hazardous events without showing economy-wide volatility. That is, disaster impacts may not be reflected in fluctuations in national economic performance such as in Philippines (Benson and Clay, 2004). The third one argues that such an argument could be explained by the *balance between winners and losers* of disasters (Scanlon, 1988). Similarly, Okuyama emphasizes that impacts of disaster are diverse and complex issues which include "not only negative effects from damages or losses, but also positive economic effects from the recovery and reconstruction activities" (2004: 297). To illustrate, disasters could produce positive economic effects by creating new job opportunities during the recovery period (Prince, 1920; Dacy and Kunreuther, 1969 in Scanlon, 1988; Stewart, et al., 2001). Therefore, according to the third explanation, disasters could create both winners and losers (Carstens, 1917 in Scanlon, 1988). Scanlon determines the affected groups as individuals, families, businesses, and community. Individual losers are those who affected from disasters by being injured, paying for health costs, loss of earning power, destruction of working place, and so on. Particularly lower income groups, older persons are the one who loses the pre-disaster conditions. Individual winners are those who will be doing better aftermath a disaster such as emergency workers, lawyers, and so on. Families suffer from uninhabitable conditions of living units, relocation to a distant area, losing of wage-earner of family, reduced incomes. The winners of families could be illustrated as the insurance taken after damage due to a disaster. Similarly businesses might shut down due to damage, and communities might allocate its limited resources to recovery. But also, they can make gains from disasters. Within this approach, who losses and who wins is not random, it depends on the public policy decisions. Public policy efforts from mitigation to recovery determine and affect the consequences of disasters.

According to the latter view, the idea of long-term macroeconomic effects of disasters is accepted. Contrary to the former view, Houts et al. argue that "disasters have both short and long-term economic consequences" (1988:35). The economic impacts could be seen in

terms of capital, labor and productivity (Benson and Clay, 2004). Disasters directly affect physical environment resulted in the destruction human and physical capital stock. Direct economic impacts could be classified as damage in capital asset and resources, decline in GDP, fall in real growth rates. Also, disaster affects economy indirectly by reducing the productivity of undamaged capital and labor due to the disruptions in infrastructure and market. The macroeconomic impacts of disasters cover the decrease in GDP growth, increase in poverty, reduction in average living standards (Skoufias, 2003). Moreover, disasters have influences on longer-term investment plans. Governments may direct resources from planned investments to response and rehabilitation activities (Benson and Clay, 2004). Additionally, funds may be diverted into reconstruction efforts through domestic and external borrowing mechanisms which increase future payments. Furthermore, disaster risks contribute economic instability creating uncertainty and avoidance of potential investors. Besides the macroeconomic effects, disasters have various impacts on well-being ranging from changes in consumption pattern and child nutrition (Skoufias, 2003). Table 2.6<sup>2</sup> summarizes the short and long-term impacts of disasters.

Table 2.6. Short and long-term economic impact indicators of disasters

| Short-term effects                            | Long-term effects                                                                           |
|-----------------------------------------------|---------------------------------------------------------------------------------------------|
| Damage in capital asset and resources         | Decline in productivity of undamaged capital and labor due to disruptions of infrastructure |
| Losses of capital stock and inventories       | Decrease in job opportunities                                                               |
| Decline in GDP                                | Increase in unemployment rate                                                               |
| Fall in real growth rates                     | Decrease in the level of earnings of households                                             |
| Increase in public expenditure such as health | Removal of price subsidies for stable foods                                                 |
|                                               | Increase interest rates on external borrowing                                               |
|                                               | Dampening investment and growth decisions                                                   |
|                                               | Increase in national indebtedness                                                           |
|                                               | Increase in poverty                                                                         |

#### 2.2.2.3.3. Indicators of economic impacts of disasters

Benson and Clay claim that there are five basic factors affecting macroeconomic vulnerability to natural disasters, namely type of natural hazards, overall structure of economy, income level and stage of development, and prevailing socioeconomic conditions (2004: 15). Apart

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<sup>2</sup> Table is obtained from the studies of Benson and Clay (2004); Skoufias (2003); Houts, et al (1988).

from these main determinants, there are other factors mentioned by Benson and Clay, such as socioeconomic development and the level of technical and scientific advancement, disaster risk management capacity and mitigation facilities, and degree of environmental change.

From the *type of natural hazards*, the hypothesis is that hazards types namely hydro-meteorological and geophysical have differentiated impacts on vulnerability of economy (Benson and Clay, 2004: 16). Hydro-meteorological events as cyclones, hurricanes, drought and floods have impacts on agricultural performance, productive capacity and physical infrastructure. Where, earthquakes have direct impact on physical systems and productive capacity more than agricultural production. *Economic structure* is claimed to have a significant role on macroeconomic vulnerability. Intersectoral linkages, role of productive capital, patterns of ownership, and systems of production reflects the economic structure (Benson and Clay, 2004: 17). For the *stage of development*, which is measured by the degree of sectoral, geographic and financial integration, levels of economic specialization, and government revenue-raising capabilities, affect the vulnerability to natural disasters, as shown in the Table 2.7 (Benson and Clay, 2004). Stage of development is related to the proportion of GDP produced in secondary or tertiary sectors. It can be said that an economy at an intermediate stage of development is expected to be sectorally and geographically more integrated so that the multiplier effects widespread to sectors and region. However, general assumption is that the least-developed economies that are more vulnerable to disasters although their absolute losses are relatively smaller due to weak intersectoral relations, self-provisioning, limited multiplier effects. On the other hand, developed economies which are more open show lower vulnerability due to higher investment in risk reduction, improved environment management, lower levels of poverty, insurance against disasters, and decreasing costs of relief and rehabilitation programs.

Table 2.7. Indicators of stage of development

Source. Benson and Clay, 2004.

| Stage of development | Sectoral relations | Dependency | Advance infrastructure | Multiplier effects | Vulnerability | Absolute losses |
|----------------------|--------------------|------------|------------------------|--------------------|---------------|-----------------|
| Least-dev. economies | +                  | +          | +                      | +                  | high          | low             |
| Developing economies |                    |            |                        |                    | high          | moderate        |
| Developed economies  |                    | +          |                        | +                  | low           | low             |

*Socioeconomic conditions* could also affect the vulnerability of economy due to natural disasters. The factors determining the socioeconomic conditions are domestic macroeconomic policies, medium-term economic strategies such as poverty reduction, domestic sectoral policies, policies on disaster response, external policy environment, fluctuations in primary export and import prices, country's or city's significance in specific export markets, and timing and nature of shock (Benson and Clay, 2004: 19).

Consequently, it could be said that disasters are differentiated from other economic events in terms of frequency, extent and predictability. They affect the economy by changing public policy and regulation. Despite, disasters bring economic burdens on countries, especially developing ones, there is no consensus on long-term economic impacts of disasters among researchers. Since long-term economic impacts are observed within recovery process, and since recovery of overall economy is difficult to measure by means of quantitative variables, it is required to make observations at micro-scale. By this way, positive or negative impacts of disasters which create winners and losers could be observed.

According to literature reviewed, disasters have economic impacts ranging from macro level to micro level, causing short and long-term effects. Particularly, hazards pose problems for both short and long-term development of urban areas in developing countries. In this context, this research addresses the question whether the city lost economic units, customers and labor power to less risky locations due to disasters or whether the city continue to hold and attract capital, labor and customer despite the disaster risks.

Reviewing the literature, it can be concluded that hazard agent together with vulnerability factors lead a variety of disaster impacts in urban area which could be reduced through mitigation practices and recovery effort, as illustrated in the Figure 2.11.

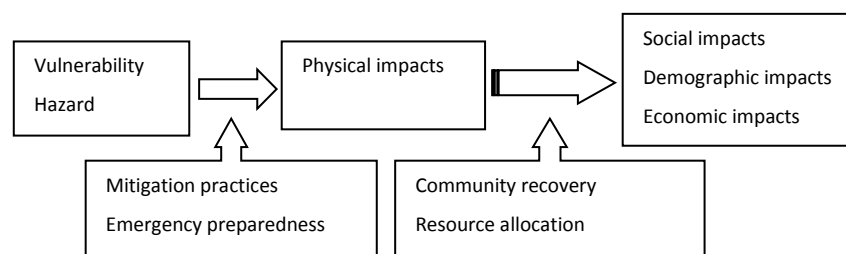


Figure 2.11. Disaster impact model

Source. Redrawn from Lindell and Prater, 2003; 177.

Addressing to contemporary disaster approaches, it is accepted that disasters do not only cause physical damage at urban level; but they lead multi-dimensional impacts. Therefore, it is required to define the domain of impacts. In the literature, the impacts of disasters are categorized as primary and secondary effects. Primary effects refer to the physical impacts of disaster that lead to casualties and property losses. Depending on the physical effects, there appear secondary effects which are also called as indirect effects. Secondary effects linked to the destruction of built environment, and casualties reveal the demographic and psychosocial impacts of disasters. The secondary impacts are associated with the migration, decrease in labor power, loss of productivity and relocation. These impacts trigger political effects, indirect economic effects and spatial effects. Impact domain of disasters is illustrated in the Figure 2.12.

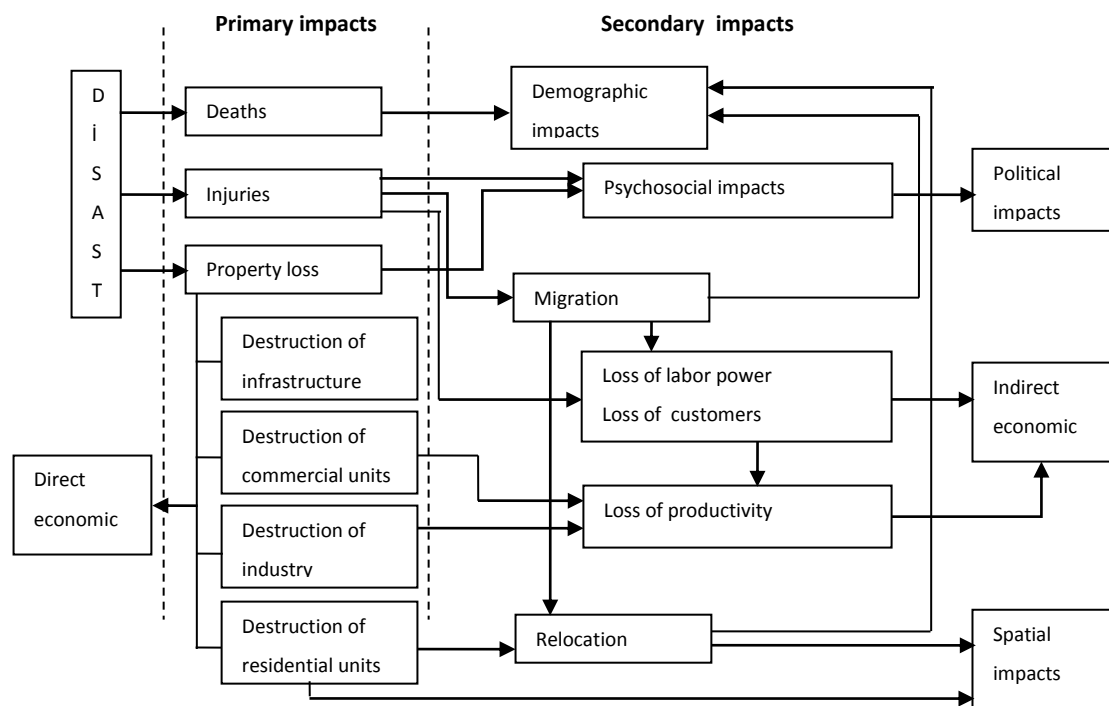


Figure 2.12. Primary and secondary effects of disasters and relation between the impacts

Source. Personal rendering.

To conclude, disasters lead a variety of impacts which affect communities in physical, social, economic, political and spatial aspects. In order to rebuild after disasters, considerable changes take place in cities which adapt themselves to post-disaster situation through

recovery policies. Olshansky notes that “catastrophic disasters can obliterate entire cities or districts, and cities change after disasters” (2005; 13). That is, there occur spatial restructuring depending on the effects of disasters and adaptive strategies of urban components. Spatial restructuring after a disaster holds a significant issue in disaster recovery, however, there has been a limited number of studies focusing on the issue (Tyler, et al, 1992; Arnold, 1993; Schwab, 1998). Since the accountability of impacts reduces from primary to secondary impacts, researchers could not easily find out relationship between disasters and their secondary, therefore spatial impacts.

Since the aim of the study is to explain the spatial restructuring after disasters, the literature review in this part provides a basis to define the spatial effects. As the spatial impacts of disasters are accepted as the consequences of location choices of urban components, it is accepted that there are causal relations between these impacts and spatial restructuring. Therefore, spatial restructuring will be associated with the decisions of the urban components such as households, businesses, public organizations that experienced the primary and secondary impacts of disasters.

**Argument:** According to the contemporary view, it is assumed that disasters will result in multi-dimensional effects rather than single direct effects. Multidimensional impacts refer to a variety of effects caused by direct (physical) impacts of disasters including social, economic, political and spatial impacts. Spatial impacts could be observed in changing spatial structuring of cities. Here, we argue that ***policies designed in recovery period ignoring the spatial consequences of implications will reproduce urban vulnerability and hamper mitigation.***

### **2.2.3. Interdependence of community elements**

After emphasizing the need to understand interrelations between disaster management phases and multi-dimensional effects of disasters, the third conflict between traditional and contemporary approaches could be defined as the integrity of urban components.

Traditional approach, focusing on post-disaster period and dealing with physical impacts of disasters, concentrates on the most vulnerable urban components, households and their basic needs. Traditional approach tends to focus on affected households and individuals and to bring solution to their problems, based on the extent of physical damage. Hence, traditional approach disintegrates the households’ recovery needs and resources from other components. The priority has given priority to household recovery.

According to the contemporary view, since disaster management has a complex structure and covers a number of variables to deal with, it offers a holistic perspective including all vulnerable urban components. Objects of the disaster management system include vulnerable parts of urban environment comprising households, businesses, private sector entities, government agents, institutions and community as a whole.

Recent studies show that recovery addresses a complex and long process to be dealt with. Since disaster impacts are multidimensional, problems of the affected groups become more diverse. Studies on social vulnerability show that socially vulnerable groups including disabled, elder, women, children, poor, ethnic minority tend to suffer disproportionately compared to others in recovery (Bolin and Stanford, 1991; Blaike, et al., 1994; Hewitt, 1997). Other complexity is caused by the context-dependent characteristics of recovery process. That is, since "recovery process is unique for each community" (Olshansky, 2005; 3), it requires to bring "adaptive and site-specific" solutions (Rubin, et al, 1985; 28). Different bodies and representatives of the affected community show different attitudes from each other in recovery process such as households, government agents, institutions, and businesses. Also, each group could show disparities in recovery due to their differentiating attributes and coping capacities, i.e. households (Haas, et al, 1977; Quarantelli, 1999) and businesses (Alesh and Holly, 1988; Durkin, 1984; Tierney and Dahlhamer, 1998; Chang and Falit-Baiamonte, 2003). In the line of growing web of literature on recovery, it could be said that recovery is a complex process in which decisions should be made according to the requirements and problems of the different groups.

Addressing to different adaptive responses of each urban component, recovery process could not proceed at the same speed and same quality among the community units (Tierney, 1997, Nigg, 1995; Chang and Falit-Baiamonte, 2003). However, there is an interconnected relation among these community units. Quarantelli (1999; 4) argue that "while recovery of individuals, households, organizations, businesses, the community and the society are not totally independent of one another, neither is the linkage or correlation necessarily very tight".

However, it is fair to claim that there is a limited number of studies accepting the interconnected structure of recovery process and including urban components as a whole. A large body of literature is devoted to household recovery (Bates, 1982; Bolin, 1982; Drabek and Key, 1984; Bolin and Bolton, 1986; Bolin and Stanford, 1991; Miller and Nigg, 1993; Nigg; 1995). Household recovery could be associated with the variables including having linkages to kin groups, socio-economic status, belonging to an ethnic and racial minority

groups, and living in rural areas. First, households without having linkages to an extended family seem to have more difficulty in recovery than those having kinship linkages (Bolin, 1982; Drabek and Key, 1984, Nigg, 1995). Second, households having a low socioeconomic status tend to suffer more in recovery process than those having higher socioeconomic status (Miller and Nigg, 1993; Bolin and Bolton, 1986). Third, households belonging to a racial or ethnic minority have more difficulties in recovery than others (Bolin and Bolton, 1986; Nigg, 1993). Fourth, households living in rural areas tend to suffer more in recovery process than those living in urban areas (Bolin, 1982). These studies made about household recovery are sufficient to show the differentiations of households in recovery process. However, not only households are vulnerable to disasters, so that household recovery becomes inadequate to represent the community recovery. Focusing on household vulnerability and recovery, there occur two gaps in the traditional approach. Firstly, traditional disaster approach disregards the recovery process of other community elements and concentrates particularly on household vulnerability and recovery. Secondly, since disaster studies, in line with traditional approach, put little interest on other community elements, the differentiations in vulnerability to and capability for disasters of other community elements are not properly investigated. As community is the combination of its elements, it is required to develop a comprehensive understanding that deals with household and other community units together in order to achieve community recovery.

Nigg defines community recovery as “a social process that begins before a disaster occurs and encompasses decision-making concerning emergency response, restoration, and reconstruction activities following the disaster” (1995; 1). According to Rubin (1985), the domain of community recovery is composed of residential units, businesses, public services and facilities, and the community itself. A number of scholars give attention to community recovery and develop models to explain community recovery including individuals, households and businesses. These comprehensive models aim to increase community resilience. These models demonstrate relationships between the components of community including households, businesses, and lifeline networks (Miles and Chang, 2006). Figure 2.13 demonstrates the community recovery developed by Miles and Chang (2006) which takes households, businesses, lifelines, and neighborhoods into account.



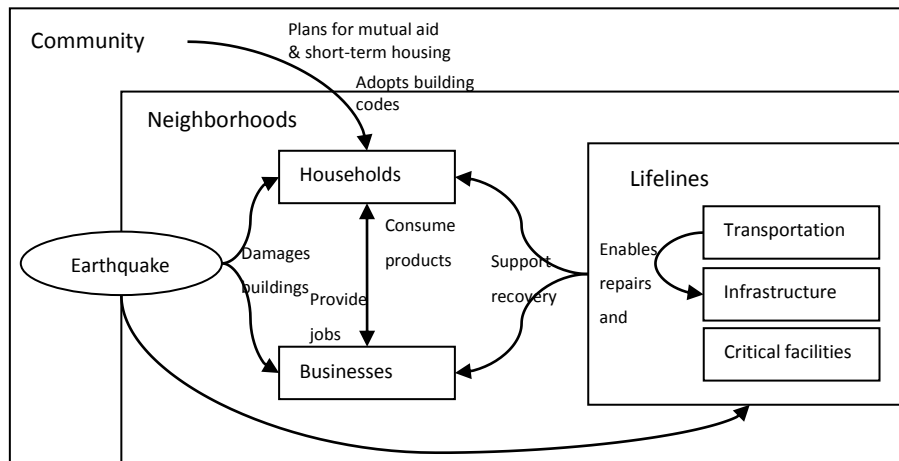


Figure 2.13. Conceptual model of community recovery

Source. Miles and Chang, 2006; 444.

According to the community recovery model, Miles and Chang find that “households influence business recovery through consumption demand” (2006; 449). Firms depending mostly on local employment opportunities and local-based customers will suffer more from the impacts of disasters than those are not based on local consumption and employment trends. In addition, Miles and Chang state that households and businesses are influenced from the conditions of their neighborhoods which determine their recovery in infrastructure and transportation terms (2006; 447).

**Argument:** According to the contemporary view, it is assumed that there should be integrity among urban components. Integrity of urban components means that the elements constituting community which are in relation have substantial influences on each other. Therefore, we argue that ***actions taken in recovery phase disregarding the relation between urban elements and isolating businesses from household recovery will hamper community recovery and reproduce urban vulnerability.***

Accepting the necessity of taking community as a composition of different units including households, individuals, families, private sector entities, public organizations, and institutions, differentiations among their ways of recovery should be considered. This assumption is valid for all components of community, i.e. social groups, businesses, households. To exemplify, Nigg claims that “because social groups differentially experience the recovery process, the overall discussion about the process must include a consideration

of pre-disaster intergroup dynamics and relationships, and their relative political influence” (1999; 6). As community recovery models show, there is integrity between households, businesses and neighborhoods, and policies designed for recovery of any component will affect others. Therefore, it makes sense to focus on businesses and their recovery routes in order to explore the bilateral relation between business and household recovery and explain the urban restructuring through this relation.

#### **2.2.4. Conclusion**

According to the conflicts between traditional and contemporary approaches, this thesis draws the three basic arguments. First, it could be argued that there is an interrelation between the phases of disaster management system. With respect to the resources allocated in any phase, it is expected that the rest of the system will be affected. Decisions and practices applied in any phase will affect subsequent steps. Therefore, if there exists of inconsistency among the goals, decisions and practices of different phases, then there will occur problems to achieve a resilient city. Constituting resilient development depends on consistency among phases of disaster management. Second, it could be claimed that disasters pose multi-dimensional impacts on community and urban environment. Originated from the extent of the physical damage, communities and urban areas suffer from the secondary impacts of disasters. Policies applied in pre- and post-disaster period will reduce the secondary impacts, including social, economic and spatial impacts. Therefore, if policies are designed to overcome the secondary impacts, then it would be possible to achieve a resilient community. On the other hand, in case of ignorance of multi-dimensional impacts of disaster and in case of focusing only on physical effects, then there would be problems in recovery from disasters. Third, it is assumed that there is interdependency among the community elements. Focusing on a single community element does not produce solution for the overall community under disaster risks. Similarly, policies directed to a community unit do not bring community recovery after a disaster. The isolated units are expected to become a problem in vulnerability of communities. Therefore, the community elements which are ignored in the disaster management system are expected to affect the rest of the community resilience. Construction of an aggregate resilience is based on the a holistic approach to community elements.

### **2.3. REVIEW ON BUSINESS RECOVERY STUDIES**

This section introduces the factors that are used to show the business recovery in literature. These factors, obtained from previous researches, are used to shed light on business

vulnerability, disaster-related business interruption, and business location choices. Our approach to investigate the business recovery is to review the findings and results of previous studies. The data obtained from the literature review constitute the basis of the analysis and recovery model of the study. Firstly, factors which are designed as independent variables for previous business recovery studies will be explained. Then, a set of variables will be presented which are used for evaluating long-term business recovery.

With the development of the concept of disaster vulnerability, there has been a recent interest among scholars on the effects of disasters on different vulnerable groups. Majority of researches mainly deals with households and their vulnerability to and recovery from disasters (Rubin, et al, 1985). Community recovery has been explaining with the recovery of households. Other community elements have taken little concerns. With the shift from traditional to contemporary disaster approaches, a body of research has been done for businesses and the impacts of disasters on business firms for fifteen years in the line with the vulnerability concept (Powell and Harding; 2009; 38). These studies have searched the vulnerability of businesses, their preparedness in case of emergencies, and their response to disasters. However, little research has been undertaken for business recovery. A bundle of empirical studies has been carried in developed countries in order to find the factors that affect business recovery (Alesh, et al., 1993; Alesh, et al., 2001; Webb, et al, 2002; Tierney and Webb, 2001; Chang and Falit-Baiamonte; 2002; Webb, et al, 1999; Tierney, 1997; Dahlhamer and Tierney, 1998; Tierney, 1994; Chang, 2000; Chang, 2010; Runyan, 2006). In the light of these studies, a new domain of inquiry has been developing on impacts of disasters on private sector entities. However, it is still a gap in literature about developing countries showing differentiations in business vulnerability and long-term business recovery. In order to show business recovery with a developing country case, this study develops a model which explains the business recovery process. This section of the study, therefore, is devoted to discuss the literature on business recovery dominated by empirical findings of developed country cases in order to test them in Turkish case, as a developing country.

According to literature on business recovery, scholars suggest that disasters affect businesses differently. The variations in the level of recovery among businesses are explained by several factors such as business sector, business size, extent of direct damage on businesses and inventories, dependency to foot traffic, duration of disaster-related closure, access to recovery resources, and level of preparedness. These factors can be categorized as internal factors of businesses, their response capacity to disasters, the extent of damage posed by disasters and spatial factor. Table 2.8 shows the factors used in previous studies for measuring and evaluating business recovery.

Table 2.8. Factors affecting business recovery after a disaster

| Independent variables    |                                           | References                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Internal factors</i>  | Business size                             | Dahlhamer (1998), Dahlhamer and Tierney (1998), Alesch et al. (2000; 2001), Chang and Falit-Baiamonte (2002), Runyan (2006), Tierney and Webb (2001), Zhang, et al. (2009), Tierney (1995), Dahlhamer and Tierney (1998), Tierney (1997), Tierney (1994), Runyan (2006), Dahlhamer and D'Souza (1995), Tierney and Dahlhamer (1997), Webb et al. (2000), Nigg (1995), Powell and Harding (2009), Wasileski, et al. (2011) |
|                          | Business sector                           | Webb et al. (2000), Alesch et al. (2001), Chang and Falit-Baiamonte (2002), Webb et al. (2002), Dahlhamer (1998), Tierney and Webb (2001), Zhang, et al. (2009), Dahlhamer and Tierney (1998), Tierney (1997), Tierney (1994), Dahlhamer and D'Souza (1995), Tierney and Dahlhamer (1997), Nigg (1995), Powell and Harding (2009), Ann Dietch and Corey (2011)                                                            |
|                          | Business age                              | Webb et al. (2002), Tierney (1995), Tierney (1997), Dahlhamer and D'Souza (1995), Tierney and Dahlhamer (1997), Nigg (1995), Waugh and Smith (2006)                                                                                                                                                                                                                                                                       |
|                          | Financial condition prior to the disaster | Alesch et al. (2001), Webb et al. (2000), Waugh and Smith (2006), Webb et al. (2002), Tierney and Webb (2001), Chang and Falit-Baiamonte (2002), Dahlhamer and Tierney (1998), Powell and Harding (2009)                                                                                                                                                                                                                  |
|                          | Occupancy tenure                          | Chang and Falit-Baiamonte (2002), Dahlhamer and Tierney (1998), Tierney (1997), Dahlhamer and D'Souza (1995), Tierney and Dahlhamer (1997), Nigg (1995), Powell and Harding (2009), Wasileski, et al. (2011)                                                                                                                                                                                                              |
|                          | Market range                              | Chang and Falit-Baiamonte (2002), Alesch et al. (2001), Tierney and Webb (2001), Webb et al. (2002), Zhang, et al. (2009), Powell and Harding (2009)                                                                                                                                                                                                                                                                      |
|                          | Education level                           | -                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                          | Education level                           | -                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <i>Response capacity</i> | Previous disaster experience              | Drabek (1994), Webb et al. (2002), Dahlhamer and Tierney (1998), Tierney (1994), Dahlhamer and D'Souza (1995)                                                                                                                                                                                                                                                                                                             |
|                          | Preparedness                              | Webb et al. (2002), Dahlhamer and D'Souza (1995), Chang and Falit-Baiamonte (2002), Tierney (1995), Tierney (1997), Tierney (1994), Dahlhamer and D'Souza (1995), Tierney and Dahlhamer (1997)                                                                                                                                                                                                                            |
|                          | Amount of resources used                  | Webb et al. (2002), Bolin (1989, 1994), Tierney (1995), Dahlhamer and Tierney (1998), Tierney (1997), Tierney (1994), Tierney and Dahlhamer (1997)                                                                                                                                                                                                                                                                        |

Table 2.8. Factors affecting business recovery after a disaster (cont.)

| Independent variables     |                           | References                                                                                                                                                                                                                                                                                       |
|---------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Disaster impacts</i>   | Physical damage           | Webb et al. (2000), Chang and Falit-Baiamonte (2002), Webb et al. (2002), Zhang, et al. (2009), Tierney (1995), Dahlhamer and Tierney (1998), Tierney (1997), Tierney (1994), Webb et al. (1999), Tierney and Dahlhamer (1997), Nigg (1995), Powell and Harding (2009); Wasileski, et al. (2011) |
|                           | Length of time closed     | Alesch et al. (2001), Runyan (2006), Webb et al. (2000), Chang and Falit-Baiamonte (2002), Webb et al. (2002), Tierney (1995), Dahlhamer and Tierney (1998), Tierney (1997), Tierney (1994), Tierney and Dahlhamer (1997), Powell and Harding (2009)                                             |
| <i>Spatial factors</i>    | Location of employees     | Chang and Falit- Baiamonte (2002), Tierney and Webb (2001), Tierney and Dahlhamer (1995), Tierney (1997), Tierney and Dahlhamer (1997), Wasileski, et al. (2011), Ann Dietch and Corey (2011)                                                                                                    |
|                           | Location of customers     | Chang and Falit- Baiamonte (2002), Wasileski, et al. (2011), Ann Dietch and Corey (2011)                                                                                                                                                                                                         |
| Dependent variables       |                           | References                                                                                                                                                                                                                                                                                       |
| <i>Long-term recovery</i> | Number of employees       | Webb et al. (2002), Powell and Harding (2009), Tierney and Webb (2001), Tierney (1995), Tierney and Dahlhamer (1995), Tierney (1997), Tierney (1994), Tierney and Dahlhamer (1997)                                                                                                               |
|                           | Number of customers       |                                                                                                                                                                                                                                                                                                  |
|                           | Business profits          |                                                                                                                                                                                                                                                                                                  |
|                           | Present state of business |                                                                                                                                                                                                                                                                                                  |

### 2.3.1. Recent studies focusing on business recovery

The factors are determined according to the empirical researches on business recovery<sup>3</sup>. The variables, that are used to explain the long-term recovery, are composed of three main groups as internal factors, response capacity, and the extent of damage. Internal factors as the first component comprise (i) business size, (ii) business sector, (iii) business age, (iv) financial condition prior to disaster, (v) occupancy tenure, (vi) market range, and (vii) education level. The second component, response capacity is composed of (i) previous disaster experience, (ii) preparedness activities involved, and (iii) the amount of resources used. The third component, extent of damage includes (i) the length of time closed, and (ii)

3 These studies are Alesh, et al., 1993; Alesh, et al., 2001; Webb, et al, 2002; Tierney and Webb, 2001; Chang and Falit-Baiamonte; 2002; Webb, et al, 2000; Tierney, 1997; Dahlhamer and Tierney, 1998; Tierney, 1994; Chang, 2000; Chang, 2010, Powell and Harding, 2009; Zhang, et al, 2009; Dahlhamer, 1998; Tierney and Webb, 2001; Dahlhamer and D'Souza, 1995; Tierney and Dahlhamer, 1997; Nigg, 1995; Runyan, 2006; Ann Dietch and Corey, 2011; Wasileski, et al., 2011.

physical damage. In addition to this domain, we propose that location of customers and employees may affect the business recovery after disasters. Therefore, we add a fourth component to independent variables regarding spatial aspects. We mean by spatial factors that the location choices of customers and employees have effects on business recovery and their location choices following a disaster.

Additionally, long-term recovery of businesses represents the dependent variables of previous studies in order to evaluate recovery process. The factors used in literature to measure the dependent variable are (i) number of employees, (ii) number of customers, (iii) business profits, and (iv) present state of business.

These empirical studies have contradictory results. It is observed from these studies that there are inconsistencies among their findings. Dietch and Corey explain the case by claiming that "the inconsistencies highlight differences in impacts of different disasters; disasters differ in terms of how widespread the damage was, how long lifelines was disrupted, how many people were displaced, and how long after the natural disaster measurement took place" (2011; 312). That is, these surveys show that each factor tend to affect recovery process differently. This section also aims to reveal inconsistencies of factors among the researches by answering the question of which factors lead some businesses to be resilient across disasters whereas others have difficulty in recovering.

#### **2.3.2.1. Internal factors**

Internal factors incorporate business size, business sector, age, pre-disaster financial condition, occupancy tenure, and market range of a firm.

***Business size.*** A small business can be defined as "a business that is independently owned and operated but is not dominant in its field of operation" (Small Business Administration in Runyan, 2006; 14). Attributes of a small business are associated with their revenue and number of employees that is fewer than 100 workers in common (Runyan, 2006). They have less resources and limited access to capital. Also, they tend to operate in retail and service sector. They have difficulties in market in terms of entry and competition. Runyan indicates that "*downtowns of small and medium-sized cities are typically stored with small businesses*" (2006; 14).

Previous studies in common show that small firms are more vulnerable to disasters than large firms (Tierney and Webb, 2001; Chang and Falit-Baiamonte, 2002; Webb, et al., 2002). Apart from disasters, the vulnerability of small firms could be seen also in daily market competition. Tierney and Webb stated that "on an everyday, non-disaster basis,

smaller firms have more difficulty than their larger counterparts in raising money, competing for labor, and coping with tax burdens and other expenses associated with business operations" (2001; 9). Therefore, due their vulnerable characteristics, small firms show difficulties in face of disasters.

As previously acknowledged, small businesses suffer from more than large business in terms of disaster recovery (Webb, et al., 2002; Alesch, et al., 2000; Zhang, et al, 2009; Dahlhamer and Tierney, 1998; Tierney and Dahlhamer, 1997). Since large firms have more resources and afford hazard insurances, they could allocate these resources in aftermath of disasters. Also, large firms are able to spread risks by employing disaster-resistant facilities and locating in multiple sites. Besides, large businesses have better and diverse business linkages and input-output relations that make recovery easier (Zhang, et al., 2009). Contrary to them, small firms have difficulties in undertaking measures and accessing resources, so that they tend to suffer from disasters compared to their larger counterparts. Additionally, Tierney and Dahlhamer argue that small firms have difficulties in recovery period since "they are disproportionately locate in buildings that have higher probability of collapsing or sustaining severe structural damage" (1995;11). Runyan explains the vulnerability and difficulty they face in recovery as ambiguity to survive, lack of growth orientation, urgency in decision-making (2006; 18).

**Business sector.** Business recovery differs according to business sector. There is some evidence showing the relevance of business sector with economic sector in which the firm operates. Previous studies put forward that construction and manufacturing sector (including furniture, building repair, etc.) recover more rapidly than other sectors (Tierney and Webb, 2001; Webb, et al, 1999; Ann Dietch and Corey, 2011). It is shown that manufacturing and construction firms gain boom in aftermath a disaster, due to increasing need of reconstruction and rebuilding. Zhang, et al. state that "disaster relevant industries such as construction, building materials, and home/office furnishings can experience increasing demand from disaster stricken communities to meet short-term needs for reconstruction of residential, commercial and industrial structures and infrastructure" (2009; 45). On the contrary, trade and service sectors suffer more than construction-related sectors, so that commercial and service sectors have difficulties in disaster recovery (Dahlhamer and Tierney, 1998; Powell and Harding, 2009).

Additionally, previous studies show that retail sector is more vulnerable than wholesale sector to disasters. Chang and Falit-Baiamonte find a strong correlation between the retail sector and recovery (2002; 67). They emphasize that firms in retail sector tend to have difficulty in recovery after disaster than those in wholesale sector. Alesch, et al. explain the

relation through their customer base as the latter has more geographically diverse customers where “retail and service firms have geographically concentrated customer base” (2000; 24).

Many scholars found that firms selling discretionary goods are more vulnerable compared to those selling essential goods and services (Alesch, 2000; Zhnag, 2009). After a disaster event, people tend to buy to survive, so that community in affected region prefers to purchase in order to meet their daily needs rather than luxury expenditures. Alesch, et al. indicate that “suppliers who depend on discretionary income for sales tend to do badly following events that have adverse effects on their residential customer base” (2000; 24). That is, customers’ consumption of luxury goods and services decreases which put firms selling discretionary goods difficulty in recovery period (Zhang, 2009; 44).

Additionally, previous research findings show that firms having large labor pool and relying on less skilled employees are less vulnerable compared to those relying on talented and small amount of workers. As disasters hit labor input of businesses, employee casualties lead to business disruption. Employee injuries and mortalities hamper business activities due to unavailability to work. Disasters might lead to relocation of employees, which in turn cause permanent or temporary population dislocation (Zhang, et al., 2009; 43). Therefore, firms having large amount of employees and requiring less talented workers could recovery easily. Also, flexible form of business organization in terms of working hours and locations could make recovery easier. This flexible form of organization mainly observed in FIRE sector, so that firms operating in FIRE are more likely to recover than those operating in fixed form of labor organization such as manufacturing and construction sectors (Zhnag, 2009).

***Business age.*** Previous studies dealing business recovery found that business age is correlated with recovery process. According to the relation between business age and recovery, there is some evidence that young or new firms have a tendency to hardly recover compared to established firms. Recovery attitudes of businesses related to age is explained by Waugh and Smith as “older business owners tend to take their insurance payments and retire rather than attempt rebuilding their businesses” (2006; 214). It is expected that young firms have difficulties in business recovery (Tierney, 1995). Despite the expectation, Webb, et al. represent that older the firm, less likely to recovery (2002; 54). Although the age factor points more resources to allocate, research of Webb, et al. (2002) show that young firms tend to recover easier than their older counterparts.

***Pre-disaster financial condition.*** Business recovery is associated with the financial condition of firms prior to disasters (Tierney and Webb, 2001; Webb, et al., 2002). However,



previous studies have counterintuitive findings about pre-disaster condition and recovery. It could be argued that financially robust firms do better in disaster recovery. However, previous studies found that firms doing well before a disastrous event tend to recover and report being the same or better after the disaster (Chang and Falit-Baiamonte, 2002; Alesch, et al., 2000; Dahlhamer and Tierney, 1998; Webb, et al, 1999). On the contrary, Webb, et al (2002; 53) find negative relation between financial robustness and recovery. The reason behind the negative correlation may be observed because "they have more to lose in a disaster" (Webb, et al., 2002; 54). That is, financially affluent firms have more to lose in disasters; so they could also be vulnerable.

**Occupancy status.** It is shown in previous researches that occupancy tenure is correlated with disaster recovery. Scholars emphasize that renters of business properties are more vulnerable than owners (Chang and Falit-Baiamonte, 2002; Dahlhamer and Tierney, 1998; Tierney, 1997; Tierney and Dahlhamer, 1997; Nigg, 1995; Powell and Harding, 2009; Wasileski, et al, 2011). Chang and Falit-Baiamonte put the relation between recovery and occupancy tenure as renters have more difficulty in recovery than owners of a business (2002; 68). Since owners of a business property could take measures and obtain loans easier than lessees, ownership on a business could lead an advantages position in business recovery (Dahlhamer and Tierney, 1998; 124).

**Market range.** Scholars introduce that primary market of a business is associated with recovery. This relation could be defined as the firms selling goods and services to local people seem more vulnerable than those having a geographically diverse market. Firms having a wider market scope has tended to recover easily than those serving to local markets (Tierney and Webb, 2001; Chang and Falit-Baiamonte, 2002; Webb, et al., 2002; Zhang, et al., 2009). Businesses depending primarily on local markets suffer from disasters during recovery. Non-local market oriented firms do well following a disaster. Since local customers' demands fluctuate after a disaster, firms depending on local-market could not sufficiently meet these needs and subject to recovery problems. Demographic changes in affected locality can cause a drop in sales of firms serving for the area. As customers relocate out of the area temporary or permanently, firms operating in the area suffer from the change of established customer base (Zhang, et al, 2009). On the other hand, firms depending on regional, national or international markets could continue to provide products or services without influencing from the changing local demands. Meanwhile, firms serving beyond local economies could "disperse their risks because they are not solely dependent on customers and other businesses in the disaster-stricken area" (Webb, et al., 2002; 54). Therefore, it could be observed in the empirical results that retail firms having a local

hinterland are more vulnerable than wholesale firms whose outputs are sold in a regional scope (Chang and Falit-Baiamonte, 2002; 61).

#### **2.3.1.2. Response capacity**

Response capacity includes preparedness level of a firm, the amount of resources allocated after disaster, and previous disaster experience.

***Previous disaster experience.*** The studies examined the relation between previous disaster experience and business recovery show that firms with a disaster experience tend to be less vulnerable than those not having previous experience. It is expected that firms exposed to a disaster previously tend to enhance its ability to deal with further disasters (Tierney and Webb, 2001; Webb, et al., 2002; Dahlhamer and Tierney, 1998). It is because previous disaster experience could to foster preparedness, and provide lessons learned. Firms testing such a disaster could know about the requirements before, during and after a disaster. Therefore, a positive relation is expected between experience and recovery. However, previous studies report that there is not clear evidence providing that recovery is related with previous experience (Tierney and Webb, 2001; Webb, et al., 2002; Webb, et al., 1999). Webb, et al. explain the insignificance of the factor as taking a small number of measures, putting effort on life-safety, depending on site-specific actions regardless lifeline systems, etc (2002; 54).

***Preparedness.*** Preparedness could be defined as “any activity that has the potential to save lives, lessen property damage, and reduce the negative impacts of disaster events, including long-term interruptions of commercial activities” (Dahlhamer and D’Souza, 1995; 3). Thereby, it could be said that preparedness can facilitate the control over the disaster outcomes. However, previous studies show that a substantial amount of businesses are less likely to put priority on disaster preparedness (Tierney and Webb, 2001; 5). The questionnaires applied to several cases after disasters reveal that firms score a low number of preparedness activities mentioned in the checklist. Even, in some cases from 15 percent to half of the businesses had not engaged in any preparedness activities.

Tierney and Webb (2001) suggest that firms engage in preparedness when they found these activities to be easy and to necessitate little investment. Otherwise, firms may not tend to make arrangements for taking measures. “Even in the aftermath of a disaster or high risk perception of business owner does not shift the level of preparedness”, as Tierney and Webb stated (2001; 6).

The findings of previous research on preparedness show that firms taking preparedness measures before a disaster are more likely to recover than those who do not take before. It is expected that firms planning themselves in pre-disaster period tend to recovery easily. Since pre-disaster measures enhance resilience of entities, firms taking preparedness measures could recover easier aftermath a disaster. However, empirical results show that engaging in preparedness does not affect the likelihood of recovery (Tierney and Webb, 2001, 16; Chang and Falit-Baiamonte, 2002, 67; Zhang, et al, 2009, 49; Webb, et al., 1999, 14). They explain the case as taking fewer measures, and focusing on employee's life safety activities and workplace-centered measures that do not provide the continuity of business. On the other hand, firms tend to employ less complicated and expensive measures compared to those which are technically difficult and expensive (Webb, et al., 1999). Therefore, it becomes fair to say that "firms are preparing to respond, rather than to recover, so that preparedness actions do not address the real recovery-related problems they faced" (Webb, et al, 1999; 15).

Also, previous studies address that firms taking mitigation measures before the earthquake tend to take preventive measures also after a disaster. It is shown that firms taking preventive measures before a disaster tend to engage in preparedness also after a disaster (Tierney and Webb, 2001; Tierney, 1997; Powell and Harding, 2009). However, the difference between preventive measures taken pre- and post-event cases is that while pre-event measures mainly concern with life-saving actions, the post-event measures focus on structural actions. Tierney and Dahlhamer state that "the measures undertaken frequently by before the earthquake included having first aid supplies on hand, learning first aid, attending meetings or obtaining preparedness information; after the earthquake, the measures most commonly undertaken were bracing shelves and equipment, talking to employees about preparedness" (1997; 3).

Many scholars indicate that large firms tend to engage in preventive activities compared to small firms. Small firms ignore preparedness due to their resources and ability, whereas larger firms have capacity to allocate time, staff and resource to initiate preparedness activities (Tierney and Webb, 2001; Dahlhamer and D'Souza, 1995; Tierney, 1997, Webb, et al., 1999; Tierney and Dahlhamer, 1997). However, due to the fact that a great deal of businesses is composed of small entities, disaster preparedness remains limited to a minority.

There is some evidence about firms that experienced business interruption before tend to take more preparedness measures than those who do not suffer from business interruption. Suffered from a previous disaster experience, firms may tend to engage in or increase

preparedness measures. That is, it is expected that previous disaster experience has a positive impact on disaster preparedness for future risks (Tierney and Webb, 2001; Tierney, 1997; Webb, et al, 1999). Dahlhamer and D'Souza (1995) find a significant relationship between previous disaster experience and preparedness and claim that firms having previous experience tend to invest in preparedness (1995; 20). However, inconsistent with the findings of Dahlhamer and D'Souza, Webb, et al. (1999) state that previous disaster experience does not lead a significant shift in preparedness level of firms.

According to relation between preparedness and sector, it is shown that firms in finance, insurance and real estate sector are more prepared than firms in retail and service sectors. Scholars found a relation between economic sector of a firm and its level of preparedness (Tierney and Webb, 2001; Dahlhamer and D'Souza, 1995; Tierney, 1997; Webb, et al, 1999). According to their results, preparedness is associated with the business sector. Firms in FIRE sector tend to engage more in preparedness since they regard preparedness is requirement. On the other hand, firms operating in retail and service sectors show fewer tendencies engaging in preparedness activities.

Similarly, in accordance with the relation between occupancy and preparedness level, it is shown that business property owners are more likely to take preparedness measures. In their study, Dahlhamer and D'Souza (1995) and Webb et al (1999) find that business property owners tend to employ preparedness measures than renters. This is because "owners of property may see themselves as having more to lose in the event of disaster" (Dahlhamer and D'Souza, 1995; 19). Also, they could more easily employ measures and allocate resources than renters.

***Amount of resources used.*** Researches focusing on business recovery indicate the relevance of amount of aid used following a disaster. It is generally assumed that firms that have used greater amount of aid resources are more likely to recover than those that have used less.

Firms having inadequate capital to compensate the consequences of disasters seem more vulnerable than those having resources to allocate for recovery. Because, it is expected that use of external resources could facilitate recovery. However, Chang and Falit-Baiamonte (2002) and Webb, et al. (2002) find no statistically significant relation among resources used and business recovery. Even conversely, there is evidence that firms using more external resources after a disaster tend to less likely to recover than those who do not rely on external aid (Tierney and Webb, 2001; Dahlhamer and Tierney, 1998; Webb, et al., 1999; Tierney and Dahlhamer, 1997). Reasons of the contradictory finding are the form of external

aids as loans to be repaid; demands of highly disruptive firms on external aids, and inadequacy of aids to recover losses. Chang and Falit-Baiamonte associate access to resources with business size by arguing that large firms are more likely to access resources in forms of reserves and insurance payments contrary to small firms (2002; 61).

#### **2.3.1.3. Extent of damage**

The extent of damage is composed of the physical damage level and the length of time closed of a firm due to a disaster.

***Physical damage.*** The disruption of business operation leads to recovery problems for firms. Tierney and Webb list the business disruption as “difficulties with receiving and shipping supplies and products, employee absenteeism, and inconveniences for customers wishing to gain access to the business” (2001; 11). Similarly, Dahlhamer and Tierney indicate five factors to explain reasons of extent of damage as physical damage, loss of lifeline systems, disruption of business operations, business interruption, and earthquake intensity (1998; 124). Also, Webb et al. state the disaster-related operational problems as “disruptions in the flow of supplies and in the ability to ship goods, reduced employee productivity caused by transportation problems and by employees’ own disaster-related difficulties at home, and declines in customer traffic and reduced demand for certain kinds of goods and services in the aftermath of a disaster” (Webb, et al, 1999; 10).

It could be argued that disaster loss associates with damage led by disaster. So, the more physically damaged the firm, the more difficult to recover. The extent of damage and disruption will result in poor recovery. Firms experiencing more damage problems tend to have difficulties in recovery. The extent of damage on building and infrastructure is positively correlated with difficulty in recovery (Wasileski, et, 2011; Chang and Falit-Baiamonte, 2002; Webb, et al., 2002). However, there is evidence of a weak relation between the extent of damage and recovery /Chang and Falit-Baiamonte, 2002; Dahlhamer and Tierney, 1998; Tierney, 1997).

Previous studies show that firms suffering more from operational problems are less likely recover than those having fewer operational problems. Depending on extent of damage, there occurs business disruption. The disruption may be caused from loss of lifeline systems, damage to building and its contents, inability of workers to get to business, loss of customers, difficulties getting suppliers or materials, and problems in delivering products (Dahlhamer and Tierney, 1998; 126). Therefore, it is expected that firms experiencing more types of operational problems, are less likely to recover from disasters. The argument is

supported by the study of Tierney and Dahlhamer (1997) as they found a significant relation between operational problems and recovery.

From the point of view on damage on lifeline systems, disasters might lead to physical damage on electricity, water, fuel and communication systems and on transport network. Therefore, businesses that rely mostly on lifeline systems suffer more aftermaths a disaster and stay closed (Zhang, 2009; Tierney and Dahlhamer, 1995; Tierney, 1994; Webb, et al, 1999). As Boarnet's study show, "a business can manage to avoid direct physical damage to its property and yet still experience interruption and losses because of lifeline problems and offsite impacts that affect its operation" (1995 in Tierney, 1997; 92). Tierney argues that "in addition to direct physical impacts and the interruption of the critical utility services, disasters cause business losses by affecting productivity in other ways, for example, by disrupting customer traffic and causing problems for employees" (Tierney, 1997). That is, if customers begin to shop from other firms or lost ability to purchase due to damage, the firm may not able to attract them when it reopens (Tierney and Webb, 2001; Alesch, et al., 2000). Consequently, these kinds of operational problems may result in business disruption which necessitates a wider ecological perception about disaster impacts and recovery.

***Length of time closed.*** As a result of damage and site of the businesses, firms have to be closed in aftermath a disaster (Tierney and Webb, 2001). "Speed of reopening" is the determinant of business recovery. Reopening of a firm is affected from the extent of damage in terms of infrastructure and building, preparedness level, amount of resources used after a disaster, and ability of workers to reach the business (Chang and Falit-Baiamonte, 2002; Tierney, 1995).

Many scholars argue that the longer time the firm closed, the more difficult to recover from disaster. Business closure has negative impacts on disaster recovery since clients may not return after reopening (Webb, et al., 2002; 47). The studies of Chang-Faiamonte (2002), Webb et al., (2002), Runyan (2006), Dahlhamer and Tierney (1998) and Tierney and Webb (2001) verify the hypothesis and find the business closure as a significant factor in business recovery. Runyan explains the relation between opening and business recovery through increase in sales which depends on fewer competitors and increases in population concentration (2006; 21). The 'length of time closed' factor could be explained as "business owners who responded quickly and decisively are able to capture large amounts of the revenues in the months immediately following a disaster" (Runyan, 2006; 21).

#### **2.3.1.4. Spatial factors**

Only a limited number of studies deal with the influence of location on business recovery (Chang and Falit-Baiamonte, 2002; Tierney and Dahlhamer, 1995; Wasileski, et al, 2011; Ann Diecth and Corey, 2011); yet all the empirical studies show that there is significant relation between location and recovery. Spatial factors refer to the location of employees and customers in pre- and post-disaster period.

***Location of employees.*** Employees reside according to location of their jobs. It is assumed that location of employees is affected from the location choice of businesses. Similarly, labor intensive firms make location choices with respect to location of their employees. Therefore, location of employees is a determinant of location choices of businesses. Firms are likely to locate according to their employees. Therefore, it gains significance in recovery to locate adjacent commercial and residential damage (Tierney and Webb, 2001).

***Location of customers.*** Businesses tend to locate nearby their customer base. Particularly those serving to a local customer base prefer to locate around their customers. In case of relocation of customers, firms are assumed to change their address. Firms depending on local customer traffic have to live disadvantages of customer relocation. Chang and Falit-Baiamonte reveal the case by combining economic sector as "retail firms were particularly sensitive to neighborhood problems" (2002; 69). Since retail firms depend on local customers, clients may prefer to shop elsewhere (Durkin, 1984; Chang and Falit-Baiamonte, 2004). Contrary, firms serving to a regional domain are less dependent on the location of customers. In other words, firms having customers outside their locality are more mobile than those with customers with local residency. Hence, customer concentration in a location attracts firms operating in local market.

Researchers employ additional factors related to internal factors and future expectation. To illustrate, gender of business owner (Webb et al., 2002), market stability (Tierney and Webb, 2001; Chang and Falit-Baiamonte, 2003), expectation about future business climate (Webb, et al., 2002; Powell and Harding, 2009), customer loyalty (Alesch, et al., 2000), and ownership status (Alesch et al., 2001; Chang and Falit- Baiamonte, 2002; Tierney, 1995; Dahlhamer and Tierney, 1998; Tierney, 1997; Tierney, 1994; Dahlhamer and D'Souza, 1995; Nigg, 1995; Zhang, et al., 2009) are some of the additional factors used in business recovery literature. For the indicator on gender of the owner of a firm, women in business are less likely to recover than men. Highly competitive markets have more risk than others in daily life. Even in a disastrous meantime, firms in competitive markets become more vulnerable than others. Particularly, it is expected that business in wholesale and retail sectors are more

vulnerable due to the normal crowding and competitiveness of their market. For the indicator on perception on business climate, expectation of business owner is one of the significant factors that determine business recovery. That is, firms, which could see overall economic picture and aware of broader sectoral effects, could orient the recovery process. For the customer loyalty factor, firms having a high customer loyalty could recover more quickly than those having low customer loyalty. However, the reason of exclusion of these factors from the present inquiry is to limit the scope of the research to major determinants that seem more relevant to spatial aspects. Franchise or chain firms have less difficulty in disaster recovery than others since they could reach more resources to cope with the consequences of a disaster. Firms dispersing within a region (multiple branches, stores, etc.) show less vulnerability than those at a single location. Contrary, individual or independent firms have more difficulties in business recovery than franchise firms or part of a chain after a disaster. The list could be last longer, however, the variables which show little influence on business recovery in Adapazarı case are determined according to the responses of pilot study conducted in June 2011.

#### **2.3.1.5. Indicators for long-term recovery**

Since there is not a regular basis in business cycle including new establishments and failed ones, it is difficult to identify how a disaster affects the continuity of business life. Therefore it is required to associate independent variables with dependent variables showing whether a business is recovered after a disaster. Dependent variables are used to evaluate business recovery by asking whether the business has returned or exceed its pre-disaster situation. The evaluation could be made through developing a set of variables. In the line of previous studies, it is observed that business recovery is associated with the number of employees, number of customers, profit levels and present state variables.

Tierney and Webb (2001) found that four of the five survey areas have shown that business firms do same or better than pre-disaster situation. That is, business entities show resilience after disasters. Tierney finds that firms rating worse-off position are mainly suffered from the loss of customers (1997; 94). Also, it is stated in Tierney's study that the more operational problems including inability of employees to get to work, damage to owner's house, few customers, problems in delivery and obtaining materials, and inability to pay employees, the less probability of recover. Here, recovery refers to catching the pre-disaster situation. Therefore, the increase in number of employees, number of customers, profit levels will show whether a business recover after the disaster.



Table 2.9. Summary of previous studies according to data collection and analysis methods and their findings

| Researcher                           | Case area                                            | Data collection                                                                    | Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Data analysis                                                                                     |
|--------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Ann Dietch and Corey (2011)          | 2005 Hurricane Katrina                               | Mail and telephone surveys<br>Convenience sampling<br>N=186 firms                  | <ul style="list-style-type: none"> <li>Firms in manufacturing and construction perform better in recovery than retail and service sectors.</li> <li>Population related problems (loss of customer and labor) have more impacts on recovery than internal factors.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Descriptive statistics<br>Correlation analysis<br>ANOVA technique<br>Multiple regression analysis |
| Wasileski, Rodriguez and Diaz (2011) | 1989 Loma Prieta Earthquake<br>1992 Hurricane Andrew | Mail surveys<br>Questionnaires<br>N=2011 firms from two cases                      | <ul style="list-style-type: none"> <li>Lease-holders are more likely to close than owner-occupied firms</li> <li>Firms in wholesale sectors are more likely to close than others.</li> <li>Small firms are more likely to close than large firms.</li> <li>Firms with electric or phone service outages are likely to close.</li> <li>Firms taking more damage are more likely to close than with light damage.</li> <li>Firms with rented property, in manufacturing sector, in financial trouble or experiencing high damage are more likely to relocate.</li> </ul>                                                                                                                                                                                   | Multivariate logistic regression<br>Descriptive statistics                                        |
| Zhang, Lindell and Prater (2009)     | -                                                    | Literature review                                                                  | <ul style="list-style-type: none"> <li>Firms having large amount of fixed assets and large inventories are less likely to recover than those with small amount of fixed assets and small inventories.</li> <li>Small businesses are less likely to recover than large businesses.</li> <li>Firms with high capital mobility are more likely to recover.</li> <li>Firms having large labor pool and flexible labor organization are more likely to recover.</li> <li>Businesses having high level of dependence upon infrastructure and other businesses are less likely to recover.</li> <li>Firms serving to larger market shares out of the affected region and producing goods and services for reconstruction are more likely to recover.</li> </ul> | -                                                                                                 |
| Powell and Harding (2009)            | 2007 Gisborne earthquake, Gisborne, New Zealand      | Postal questionnaires<br>N= 143 firms<br>Semi-structured interviews<br>N= 14 firms | <ul style="list-style-type: none"> <li>Firms taking preparedness measures before a disaster tend to take measures after the disaster.</li> <li>Firms in retail and wholesale sector are less likely to recover.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Descriptive statistics                                                                            |

Table 2.9. Summary of previous studies according to data collection and analysis methods and their findings (cont.)

| Researcher                             | Case area                                                                                                                              | Data collection                                                                              | Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Data analysis                                                                  |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Runyan (2006)                          | 2005 Hurricane Katrina                                                                                                                 | Qualitative semi-structured interviews<br>N=17 firms from five cases                         | <ul style="list-style-type: none"> <li>• Small businesses suffer more in recovery than large firms.</li> <li>• Small firms are less likely access to resources than their large counterparts.</li> <li>• Firms open soon after disaster tend to recover easier than others.</li> </ul>                                                                                                                                                                                                                                                                                                                                  | Decoding of interviews                                                         |
| Tierney and Webb (2001)                | 1993 Midwest floods<br>1994 Northridge earthquake<br>1989 Loma Prieta earthquake in South Dade and Santa Cruz<br>1992 Hurricane Andrew | Mail surveys<br>Questionnaire<br>N= 5,000 firms from five cases<br>Interviews<br>N=103 firms | <ul style="list-style-type: none"> <li>• Firms put low priority on disaster preparedness.</li> <li>• Preparedness associates with economic sector and size of business.</li> <li>• Small firms have more difficulty in recovery than larger firms.</li> <li>• Pre-disaster financial condition relates with recovery</li> <li>• More business disruption leads to difficulty in recovery.</li> <li>• Firms locating in heavily damaged areas are less likely to recover.</li> <li>• Economic sector associates with business recovery.</li> <li>• Firms depending on non-local markets could recover easily.</li> </ul> | Descriptive statistics                                                         |
| Chang and Falit-Baiamonte (2002)       | 2001 Nisqually earthquake Seattle, US                                                                                                  | In-depth interview<br>Structured questions<br>Random sampling<br>N= 107 firms                | <ul style="list-style-type: none"> <li>• Damage alone is not a significant determinant of business loss.</li> <li>• Preparedness is not statistically significant in recovery.</li> <li>• Firms in retail sector tend to have difficulty in recovery.</li> <li>• Renters are less likely recover than owners.</li> <li>• Small firms have challenges in recovery compared to large firms.</li> </ul>                                                                                                                                                                                                                    | Descriptive statistics<br>Correlation analysis                                 |
| Webb, Tierney and Dahlhamer (2002)     | 1989 Loma Prieta earthquake<br>1992 Hurricane Andrew                                                                                   | Mail survey<br>Questionnaire<br>Comparative study<br>N= 2011 firms from two cases            | <ul style="list-style-type: none"> <li>• Wholesale and retail firms suffer more in recovery.</li> <li>• Market stability and competitiveness lead difficulty in recovery.</li> <li>• Pre-disaster financial condition associates with business recovery.</li> <li>• Older the firm, more difficulty in recovery.</li> <li>• Local-market oriented firms tend to suffer more in recovery.</li> <li>• Longer the firm closed, harder to recover.</li> </ul>                                                                                                                                                               | Regression analysis                                                            |
| Alesch, Holly, Mittler and Nagy (2000) | 13 natural hazards in US including two hurricanes, eight river flood, one earthquake, one tornado, and one wildfire                    | Open-ended interviews<br>N> 100 firms from thirteen cases                                    | <ul style="list-style-type: none"> <li>• Recovery depends on the extent of effects on customers.</li> <li>• Retail firms are less likely to recover than wholesale firms.</li> <li>• Firms selling essential goods recover more quickly than do firms selling discretionary goods.</li> <li>• Smaller, financially weaker firms are less likely to recovery than those who are larger and financially robust.</li> </ul>                                                                                                                                                                                                | Quantitative analysis:<br>• Cluster<br>• Discriminant<br>• Regression analysis |

Table 2.9. Summary of previous studies according to data collection and analysis methods and their findings (cont.)

| Researcher                         | Case area                                                                                                                                                                                                                                 | Data collection                                                                                                                                                                                           | Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Data analysis                                       |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Webb, Tierney and Dahlhamer (1999) | 1993 pre-event survey, Memphis/Shelby County<br>1992 Hurricane Andrew, South Dade County<br>1989 Loma Prieta Earthquake, Santa Cruz County<br>1993 Midwest Floods, Des Moines<br>1994 Northridge Earthquake, Los Angeles and Santa Monica | Mail survey<br>Questionnaire<br>Random stratified sampling in Memphis County, Des Moines and Los Angeles-Santa Monica<br>Entire population in Santa Cruz and South Dade<br>N= 4,947 firms from five cases | <ul style="list-style-type: none"> <li>Firms are more likely to employ life safety measures than business continuity measures.</li> <li>Firms tend to employ less complicated and expensive measures compared to those which are technically difficult and expensive.</li> <li>Small firms are less likely to invest in preparedness activities than their larger counterparts.</li> <li>Owners of business property tend to invest in preparedness measures compared to leasing holders.</li> <li>Firms in FIRE sector tend to more engage in preparedness than others.</li> <li>Firms having more operational problems suffer in recovery period.</li> <li>Firms in construction sector are more likely to recover than others.</li> <li>Financially poor firms in pre-event period are more likely to suffer in recovery.</li> <li>Preparedness is not associated with recovery.</li> <li>More external sources use the firm, less likely to recover.</li> </ul> | Descriptive statistics                              |
| Dahlhamer and Tierney (1998)       | 1994 Northridge earthquake, Los Angeles, USA                                                                                                                                                                                              | Mail survey<br>Stratified random sampling<br>Questionnaire<br>N= 1,100 firms                                                                                                                              | <ul style="list-style-type: none"> <li>Larger firms are more likely to recover than small firms.</li> <li>Large firms are more likely to have prepared for a disaster and financially more robust than smaller firms, so that they have more chance to recover than small ones.</li> <li>The more business disruption problems firms faced, the lower probability to recover.</li> <li>More resources used a firm after disaster, less probable to recover.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Logistic regression analysis techniques             |
| Tierney (1997)                     | 1994 Northridge Earthquake<br>Los Angeles and Santa Monica, USA                                                                                                                                                                           | Telephone and mail survey<br>Questionnaire<br>Stratified sampling by location(shaking intensity), sector and size<br>N= 1,110 firms from two cases                                                        | <ul style="list-style-type: none"> <li>More operational problems, less probable to recover.</li> <li>Older and financially robust businesses tend to apply preparedness measures compared to younger and financially instable firms.</li> <li>Firms operating in manufacturing, service and FIRE sectors tend to engage preparedness measures than others.</li> <li>Young firms tend to apply preparedness measures.</li> <li>Longer businesses remain closed, more likely they are to engage in preparedness.</li> <li>Firms locating in a site damaged severely are less likely to recover.</li> </ul>                                                                                                                                                                                                                                                                                                                                                            | Primarily descriptive data<br>Quantitative analysis |

Table 2.9. Summary of previous studies according to data collection and analysis methods and their findings (cont.)

| Researcher                   | Case area                                                                             | Data collection                                                                                                                       | Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Data analysis                                 |
|------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| Tierney and Dahlhamer (1997) | 1994 Northridge Earthquake, Los Angeles and Santa Monica                              | Mail survey<br>Questionnaire<br>Random stratified sample by size, sector and shaking intensity zones<br>N= 1,110 firms from two cases | <ul style="list-style-type: none"> <li>• Small businesses are more likely to suffer from disaster-related problems than large firms so that small firms are less likely to recover.</li> <li>• Small firms are less likely to prepare for disasters than large firms.</li> <li>• Firms taking mitigation measures before the earthquake tend to take preventive measures also after a disaster.</li> <li>• Firms suffering from severe damage or business interruption are more likely to engage in preparedness.</li> <li>• More operational problems firms faced, less likely to recover.</li> <li>• Firms taking more external resources and aid are less likely to recover.</li> </ul> | Logistic regression analysis                  |
| Nigg (1995)                  | Memphis/Shelby County, Tennessee<br>Earthquake risk study                             | Mail survey<br>Questionnaire<br>Stratified random sampling by size and sector<br>N= 735 firms                                         | <ul style="list-style-type: none"> <li>• Small firms could operate longer than large firms in absence of water supply.</li> <li>• Electricity interruption is critical for all businesses independent of their type and sizes.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ANOVA technique<br>t-tests                    |
| Dahlhamer and D'Souza (1995) | Memphis/Shelby County, Tennessee<br>1993 Midwest Floods, Des Moines/Polk County, Iowa | Mail survey<br>Questionnaire<br>Random stratified samples<br>N= 1,816 firms from two cases                                            | <ul style="list-style-type: none"> <li>• Small firms are less likely to engage in preparedness measures than large firms.</li> <li>• Firms having previous disaster experience tend to more invest in preparedness.</li> <li>• Firms in FIRE sector are more likely to invest in preparedness than those in other sectors.</li> </ul>                                                                                                                                                                                                                                                                                                                                                      | Descriptive statistics<br>Regression analysis |
| Tierney and Dahlhamer (1995) | 1993 survey for a probable earthquake in Memphis/Shelby County, Tennessee, USA        | Mail survey<br>Stratified random sampling by sector and size<br>Questionnaire<br>N= 737 firms                                         | <ul style="list-style-type: none"> <li>• Small businesses tend to locate in buildings that have higher probability of collapsing or sustaining severe damage so that they are less likely to recover than large firms.</li> <li>• Firms depending on the lifeline systems could not tolerate loss of these services and being forced to close.</li> </ul>                                                                                                                                                                                                                                                                                                                                  | Regression analysis                           |

Table 2.9. Summary of previous studies according to data collection and analysis methods and their findings (cont.)

| Researcher     | Case area                                                                                       | Data collection                                                                                                            | Findings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Data analysis                          |
|----------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Tierney (1995) | 1993 Midwest floods, Iowa, USA<br>1994 Northridge earthquake, Los Angeles and Santa Monica, USA | Telephone and mail survey<br>Questionnaire<br>Structured questions<br>Stratified sampling<br>N= 2,125 firms from two cases | <ul style="list-style-type: none"> <li>• Small firms are more likely to remain closed and use small amount of resources than large ones, so that they have difficulty in recovery.</li> <li>• Disruption of lifeline systems, loss of customers and disruption of flow of materials are the factors that significantly affect business recovery.</li> <li>• Disasters have diverse impacts on businesses varying accordingly sector, extent of damage, ret and duration of business interruption.</li> </ul>                                                                                                              | Primary data<br>Descriptive statistics |
| Tierney (1994) | 1993 Midwest Floods, Iowa, USA                                                                  | Mail survey<br>Questionnaire<br>Stratified random sampling by size and sector<br>N= 1,079 firms                            | <ul style="list-style-type: none"> <li>• Large firms are more likely to vulnerable to loss of electricity than small firms.</li> <li>• Firms in manufacturing and construction sectors are more likely to loss electricity, telephone and natural gas services.</li> <li>• Firms in FIRE, manufacturing and construction sectors are more likely to suffer from loss of electricity, whereas firms in retail, wholesale and FIRE sectors suffer from loss of telephone.</li> <li>• Large manufacturing and construction and both large and small service sector firms are more likely to remain closed longer.</li> </ul> | Primary data<br>Descriptive statistics |

### **2.3.3. Conclusion**

Drawing on the previous studies, we develop a model of business recovery process. It is designed to express the dimensions of disaster impacts on businesses and business responses to those impacts. The model comprises three main components as internal factors, response capacity, and the extent of damage (see Figure 2.14). For internal factors, we test the factors of business size, business sector, age of business, pre-disaster financial condition, occupancy tenure, market range, and education level of business owner or manager. Response capacity component includes previous disaster experience, preparedness level, and utilization of resources after disaster. Measures of disaster impact are composed of the extent of damage and length of time closed. In order to test the model, dependent variables are developed as number of employees, number of customers, business profits, and present state of business to assess the long-term recovery of businesses.

Based on the literature review, we conceptualize the model as shown in the figure summarizing the factors that influence business recovery process and location choices. We gather the factors into four main components; (i) internal factors, (ii) response capacity, (iii) disaster impact, and (iv) spatial factors. Business operations may be disrupted by disasters. Disruption of business depends on the direct physical impact. Direct physical impacts and operational problems might force businesses to close down. The length of closure depends on the response capacity of businesses. That is, allocation of the amount of resources allocated after disaster and preparedness level would determine response capacity of a firm. Preparedness level of a business may associate with the education level of an owner or manager. Also, a firm's preparedness level may depend on its previous disaster experience based on the age of the firm. On the other side, the amount of resources allocated after a disaster may depend on the pre-disaster economic condition and occupancy tenure of a firm. Firms allocate resources to overcome the impacts of disaster. According to customer demand, firms begin to operate. Based on their size and sector, firms begin to serve to their market.

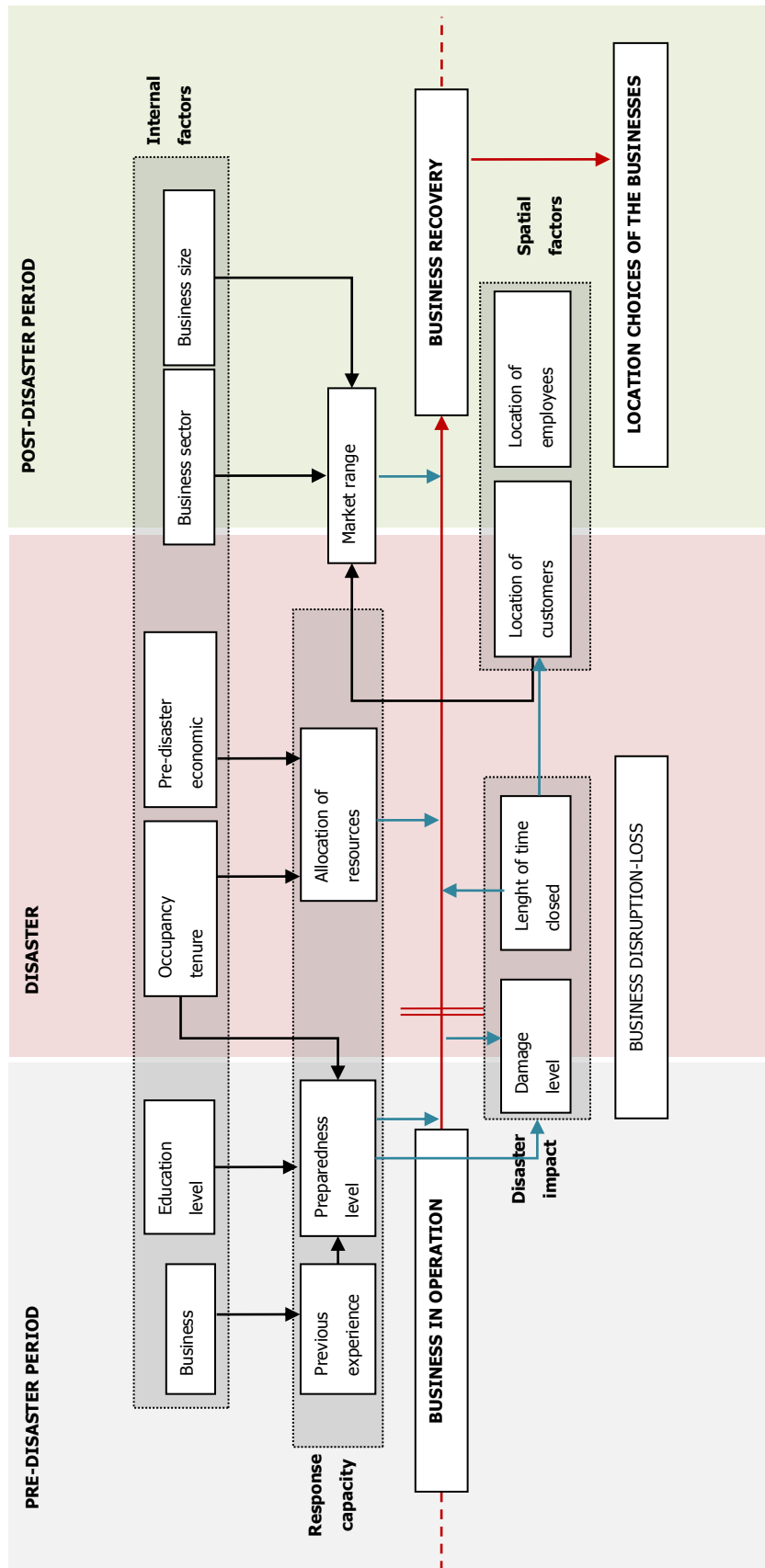


Figure 2.14. Conceptualization of Business Recovery Model

Source. Personal rendering.

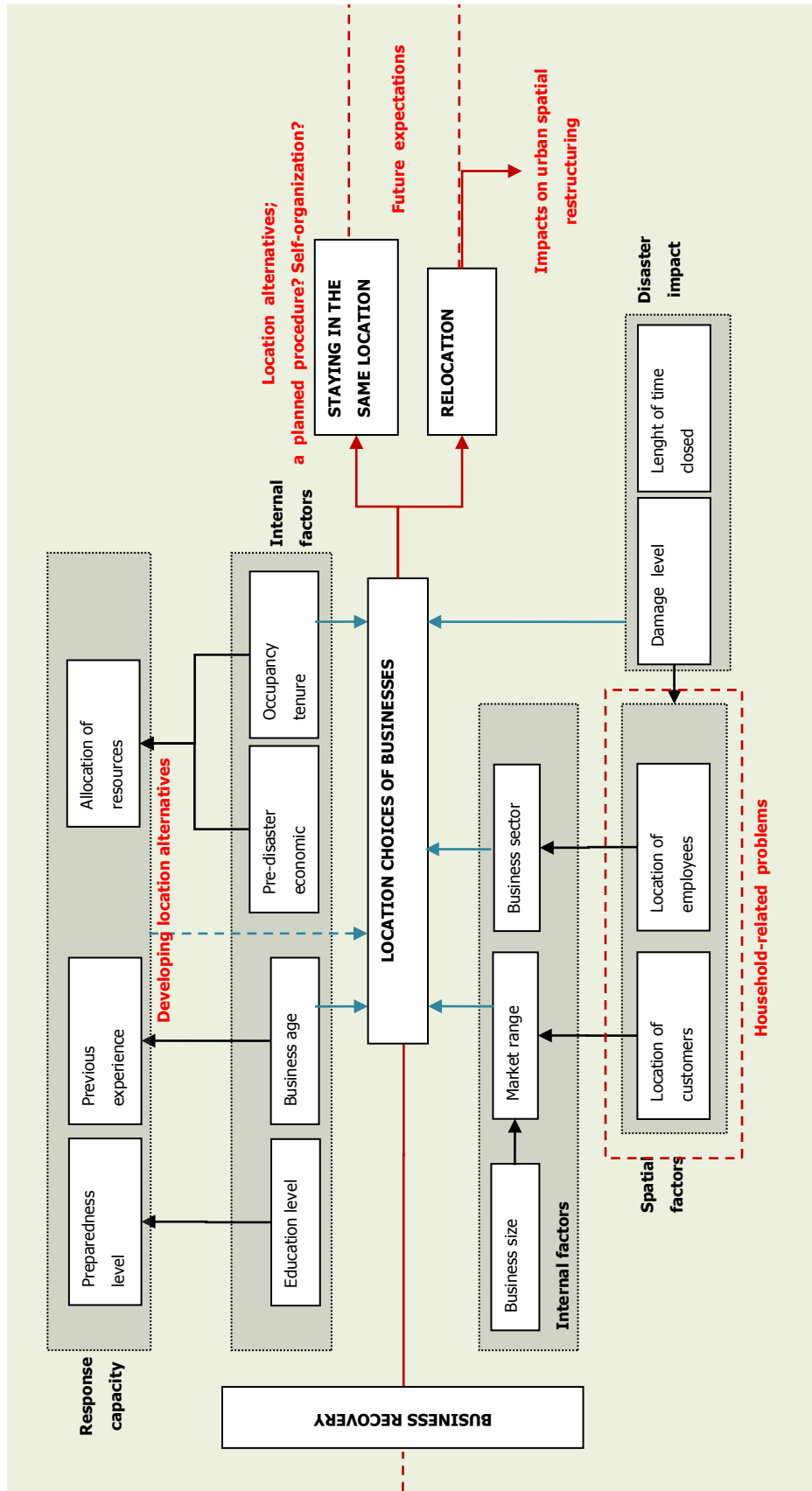


Figure 2.15. Conceptualization of Business Location Choice Model

Source. Personal rendering.



Firms develop some strategies in order to adopt the post-disaster situation. One of these strategies is about their locations (see Figure 2.15). Firms may develop a location alternative as a part of their disaster preparedness. Again, preparedness may relate with business age and education level of the owner or manager. Also, a firm makes a location arrangement according to the amount of resources used which depends on firm's pre-disaster economic condition. In addition, the location choice of a firm may be affected from the occupancy tenure. The disaster may affect the households which take part in business operation as employees and customers. Based on the physical damage that the disaster exposed, households make their new location arrangements. Location decisions of firms may associate with the location of employees depending on their sectors. Similarly, location choice of firms may relate with the location of customers which determine their market range. Along with these factors, businesses produce a location choice. The adaptation strategy may be in favor of staying in the same location or relocation. These location choices of businesses may exist as a result of a planned procedure or may be a self-regulative activity. The location decisions of firms, particularly relocation result in a new spatial reorganization. That is, location choices of business after a disaster will affect the spatial structure.

Depending on the expected relations, we examine the significance of the factors on business recovery and the correlation among them by a case study. Investigating the factors that correlate with business recovery, we define recovery routes and their location choices. Therefore, a micro-analytic study is conducted at urban level to respond the question that how businesses prepare for, damaged by, respond to and recover from a disaster.

#### **2.3.4. BASIC ASSUMPTIONS: BUSINESS TYPOLOGY**

It is required to develop a typology for businesses in order to represent how different types of businesses make a location choice as a part of their recovery process after the earthquake. Typology of businesses is constructed upon the study of Castells, *The Urban Question* (1977). In order to express space with respect to economic system, Castells represent the economic structure on three components, as production element, consumption element and exchange element (Table 2.10). Here, production reveals productive activities of goods and information such as industry and offices; consumption shows the activities related to social, individual and collective appreciation of a product such as housing and public facilities; and exchange represents the spatialization of the transferences between and within production and consumption such as commerce, traffic.

Table 2.10. Relation between production, consumption and exchange elements

Source. Keskinok, 1988, 72.

| Transfer type            | Example                 |
|--------------------------|-------------------------|
| Production- consumption  | Commerce                |
| Consumption- production  | Urban transport         |
| Production- production   | Freight traffic         |
| Consumption- consumption | Housing                 |
| Production- politics     | Business centers        |
| Consumption- politics    | Decision-making centers |

Contrary to neo-classical approach arguing that location of a firm is dominated by profit maximization, Castells supports that location of businesses could be explained through technological and economic links. That is, location choices of firms depend on the position of the firm in the production system (Keskinok, 1988, 70). Therefore, in defining economic space, Castells takes production element as basis and develops a typology of industrial location which depends on technological variable, economic-spatial variable and economic stratification variable. Technological variable differentiates firms at three levels, as companies centered on mass production, centered on technological innovation and centered on one product and subordinated to others. Economic-spatial variable defines three types as entities whose market is spatially determined, companies without spatial limitation, and companies with fixed location due to means of production. Economic stratification variable explain the relative position of the company with respect to other units, as large-scale, medium-sized and small companies.

Based on Castells' typology of industrial location, we reformulate a distinct typology for businesses. The aim is to differentiate firms according to their position in economic system which consists of production, consumption and exchange elements. Therefore, firstly, we make a distinction between firms according to their position in economic system as production units and commercial units. Then, we assume that firms make location choices with respect to their technological level, spatial relations and production material (see Figure 2.16). Technological aspect shows three types of companies as companies centered on mass production, companies centered on innovation, and companies centered on single product and subordinated to other firms. Spatial relation determines economic units' links to space. Spatial aspect differentiates firms as companies with market-dependent, companies with fixed means of production, companies dependent on exchange element, companies creating social value, companies dependent to other firms, and firms independent in space. According to production material, firms are differentiated as firms dependent on natural resources and input-dependent firms.

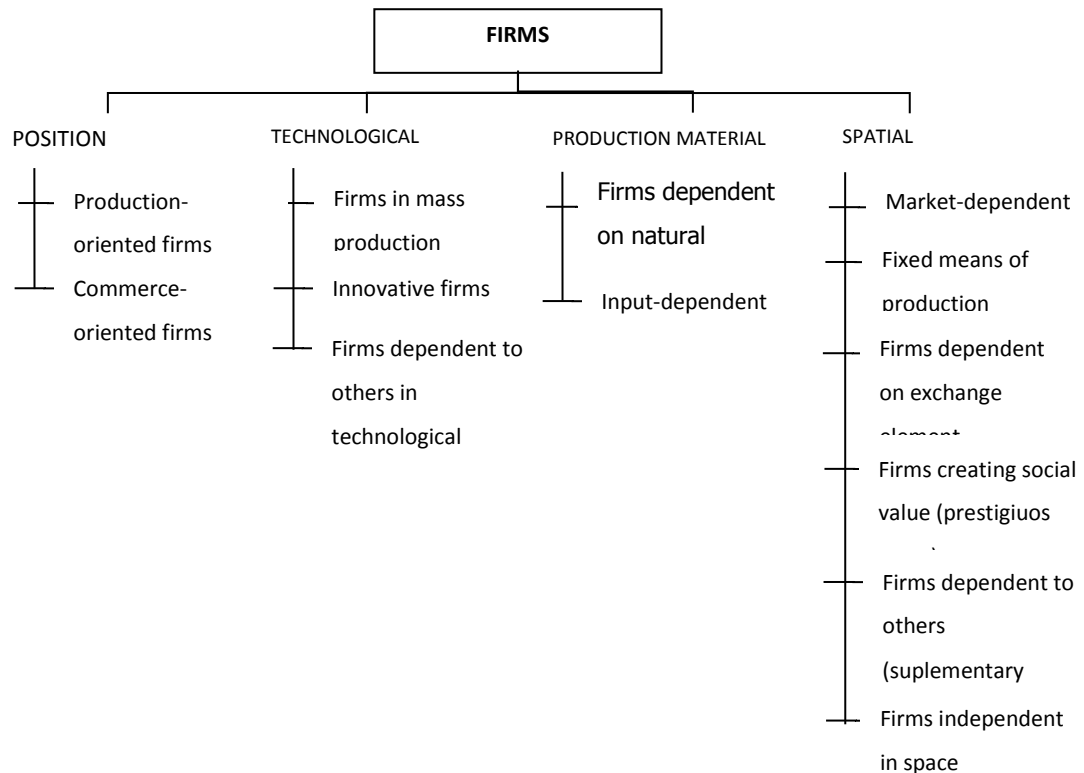


Figure 2.16. Conceptual scheme of business typology with respect to spatial considerations

Source. Personal rendering.

According to given typology, we formulate our hypothesis with respect to business position in economic system and spatial decisions (see Figure 2.17). Firstly, firms in production, dealing with mass production, whatever the production material that the firm depends upon, are highly constraint in space due to its fixed means of production. This type of firms demands a good location on main transport routes, and they have least tendency for relocation. Secondly, firms in production, dependent on natural resources, are constraint in space due to their demand in close location to resource or transport network. Thirdly, production-oriented firms which are dependent to others with input-dependency show a spatial constrained characteristic. This constraint could be related to distance to market, other firms, and exchange element. Fourthly, production-oriented, technologically innovative firms free from the constraints of space. However, they play a role in creation of spatial value, which occurs in the form of social prestige areas.

Fifthly, for the commercial units, having diverse internal factors, firms are constraint in space because they could be dependent on market, demand a good location on transport network and accessibility, and depend on other firms as supplementary units. These reasons lead to

limited mobility and dependence on urban density. Since firms benefit from agglomeration, they tend to relocate where other firms and customers settled.

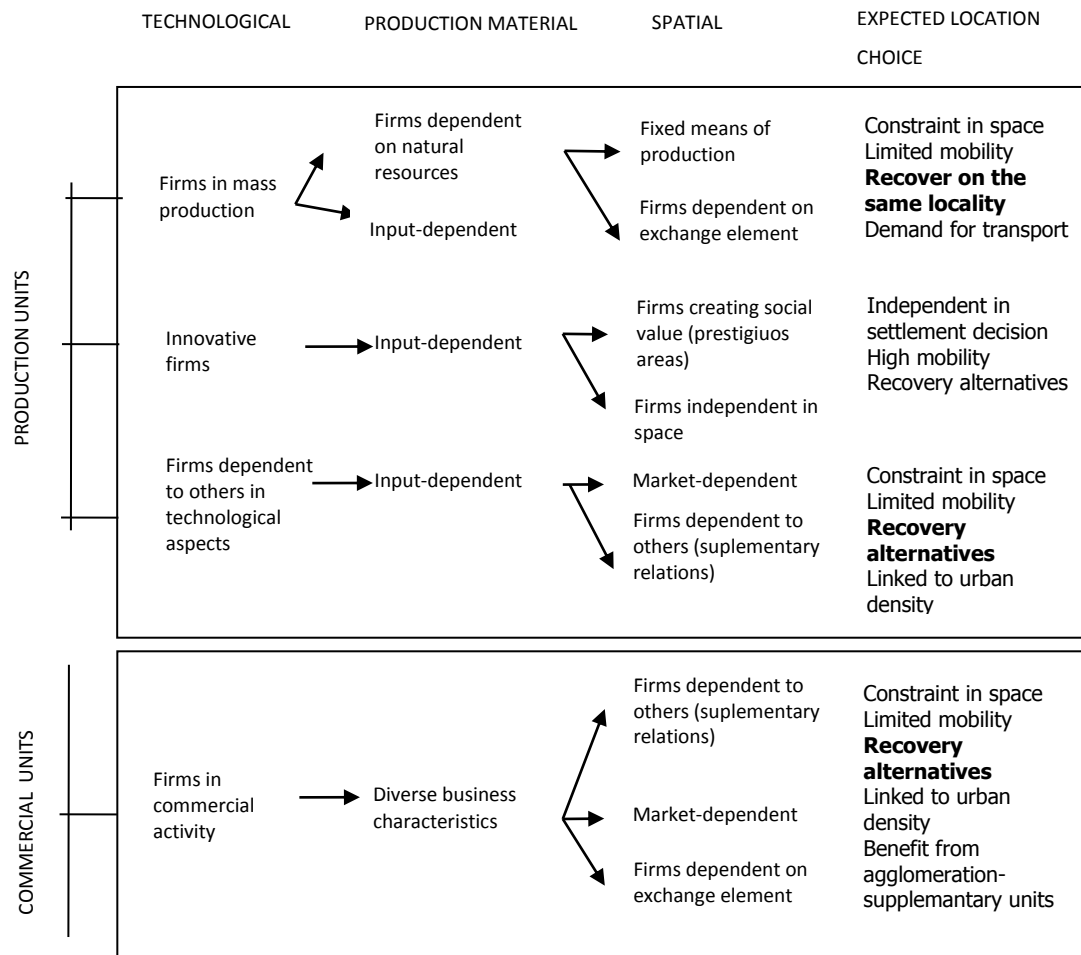


Figure 2.17. Schematic diagram of urban structuring with respect to location choices of businesses

Source. Personal rendering.

Consequently, it could be said that location choices are parts of firm's policies and these decisions are affected by certain factors. These decisions are not only explained by profit maximization, but also expressed through technological, economical and spatial factors. Together with these factors firms make location choices. Post-disaster period is one of the cases that firms have to make location choices in order to recover. If the firm has limited mobility and has no alternative location, it has to stay in the same locality. This case could

be exemplified as industries having fixed means of production. This type industries show low probability to relocation. Also, firms with technological innovation could make individual location decision independent of various constraints, so that they have several options in recovery. On the other hand, firms apart from these two types seem to represent different recovery practices. They are more mobile than firms in mass production, but less than innovative firms. Since they depend on market or other firms, their location choices could be affected from their relations such as industrial and urban developments. Therefore, they could have alternatives for recover in terms of location. Commercial firms, also depend to market, customers, transport, and other firms. Therefore, commercial firms seem to benefit from its location which gives a unique position to firm. However, in case of recovery, commercial firms make individual location choice. These firms are expected to be constraint in space despite the existence of alternatives in recovery in terms of location.

Aiming to understand the urban spatial restructuring, this study focuses on all types of the firms. Therefore, in this study, we concentrate on the businesses that shape urban structure after a disaster with their location choices taken in recovery period as a part of their survival policy. These firms include productive units and firms in commercial activity.

## **CHAPTER III**

### **METHOD OF BUSINESS RECOVERY STUDY**

Countries that could not adopt contemporary approach to their national disaster policies may suffer from the consequences of a disastrous event. Contemporary approach argues that disasters have multi-dimensional effects rather than primary physical impacts; steps taken in disaster preparedness, emergency and recovery phases will affect the whole process; and community recovery could be handled through integration of business recovery to household recovery. However, countries may not meet the requirements of contemporary approach in disaster policies. Turkey, as one of those countries which could not adopt contemporary approach properly in its national disaster perspective, has been challenging the consequences of disasters that hit mostly urban areas.

In order to determine the gap in Turkish disaster policies, the study focuses on the business recovery. The reason of focusing on business recovery process is that priority is given to household recovery in Turkish disaster policies which ignores businesses in the recovery policies. We argue that businesses isolated from the household recovery process and disregarded in spatial policies, make their own location choice which would not be consistent with the initial recovery goals. In line with the argument, the thesis will discuss the consequences of disregarding business recovery from the disaster policies.

To prove the argument, we develop a set of hypotheses which will define the business recovery process, show differentiations among their recovery patterns, and display the influence of recovery on spatial structure. In order to test these hypotheses, the thesis follows a methodological framework that is described in this chapter.

Methodology chapter of the study presents the data gathering and analysis processes. The methodology part includes discussion of how hypothesis are generated and tested, what kind of methods are used, what theories look like and how particular theoretical perspectives can be related to particular research problem. Research methodology is designed to explain the location choices of businesses in the post-disaster period by addressing the main research questions, sub-questions and hypothesis. The data collection and data analysis procedures to measure variables, and research approach of the study is described in this chapter.

The research depends on the research questions, research propositions, units of analysis, and logic linking data to propositions, and interpretation of data (Inam, 2005; 213). The research conducted in this thesis is constructed with respect the research questions. The main research question is formulated as '**How does the urban space restructure after a disaster with respect to location choices of businesses?**'. In order to respond the main research question, we develop three sub-questions about identification of business recovery process and their location choices. Table 3.1 presents the research design of the study.

Table 3.1. Research design

| Research question                                                        | Hypothesis                                                                                                                                                 | Variable                                                                                   | Data gathering                       | Data analysis                                                            |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------------------------------------------|
| Examination of business recovery process                                 |                                                                                                                                                            |                                                                                            |                                      |                                                                          |
| Which underlying factors determine business recovery after a disaster?   | Long-term recovery of a firm is expected to differ according to internal factors, response capacity and the extent of damage.                              | Internal factors,<br>Extent of damage,<br>Response capacity<br>Long-term recovery          | Questionnaire                        | Descriptive statistics<br>Lykert scaling<br>Logistic regression analysis |
| Exploration of location choice factors                                   |                                                                                                                                                            |                                                                                            |                                      |                                                                          |
| What factors affect the location choices of businesses after a disaster? | Location choices of firms after a disaster differ significantly with respect to internal factors, response capacity, extent of damage and spatial factors. | Internal factors,<br>Response capacity<br>Extent of damage,<br>Spatial factors<br>Location | Questionnaire                        | Descriptive statistics<br>Mapping<br>Logistic regression analysis        |
| Identification of impacts of business recovery on spatial structure      |                                                                                                                                                            |                                                                                            |                                      |                                                                          |
| How does businesses recovery affect urban spatial structuring?           | Businesses, ignored in recovery policies, make location choices as a part of their recovery strategy and restructure urban space.                          | Location                                                                                   | Questionnaire<br>In-depth interviews | Descriptive statistics<br>Subjective descriptions                        |

The first question considers the examination of business recovery process. Here, it is asked which underlying factors determine business recovery after a disaster. We argue that long-term recovery of a firm is expected to differ according to internal factors, the extent of damage and response capacity. The second question focuses on exploration of location choice factors. It is asked what factors affect the location choices of businesses after a disaster. We claim that location choices of firms after a disaster differ significantly with respect to internal factors, response capacity, extent of damage and spatial factors. The third question deals with the effects of location choices of businesses on urban spatial structure by querying that how location choice of businesses affects urban spatial structure. We argue that businesses, ignored in recovery policies, make location choices as a part of their recovery strategy and restructure urban space.

This chapter is consisted of three basic sections. First section defines the fundamental research approaches and methods followed in this study. Second section briefly introduces the case study and third section deals with the basic assumptions of this study.

### **3.1. RESEARCH APPROACH**

The research methodology conducted in this study includes a combination of case study, descriptive and explanatory research strategies. *Descriptive research approach*, namely statistical research, refers to "description of data and characteristics about the population or phenomenon being studied" (Babbie, E., 1989;87). Descriptive research serves for introducing the business recovery process by providing an in-depth understanding through interviews. It offers a natural setting between variables without any manipulation on research context (Kahraman, 2008; 89). It presents frequencies, means and averages, and other statistics. Descriptive research does not provide the causal relations behind a situation, rather describes the phenomena as they exist. Descriptive research is used to generate knowledge that identifies the characteristics of recovered firms and relocated firms.

In order to find causal relations between the business recovery and urban restructuring, a complementary research strategy is needed. Therefore, *explanatory research approach* is conducted which provides the opportunity to analyze the causal relations of business recovery routes. This approach enables us "to understand the phenomena by discovering and measuring causal relations among them" (Babbie, E., 1989;87).



### 3.1.1. Variables

In order to verify the hypotheses, an empirical research is conducted in a selected case area. According to the literature reviewed, a set of variables will be defined in order to explain business recovery and disparities among them for the selected case area. These variables gathered from the previous studies are categorized under four headings as internal factors, response capacity, extent of damage, and location. Table 3.2 summarizes the variables used to test the business recovery.

Table 3.2. Factors related to business recovery

| Categories                | Variables                                 |
|---------------------------|-------------------------------------------|
| <i>Internal factors</i>   | Business size                             |
|                           | Business sector                           |
|                           | Business age                              |
|                           | Financial condition prior to the disaster |
|                           | Occupancy tenure                          |
|                           | Market range                              |
|                           | Education level                           |
| <i>Response capacity</i>  | Previous disaster experience              |
|                           | Preparedness level                        |
|                           | Amount of resources used                  |
| <i>Extent of damage</i>   | Physical damage                           |
|                           | Length of time closed                     |
| <i>Spatial factors</i>    | Location of employees                     |
|                           | Location of customers                     |
| <i>Long-term recovery</i> | Number of employees                       |
|                           | Number of customers                       |
|                           | Business profits                          |
|                           | Present state of business                 |

These variables are determined depending on the previous studies focusing business recovery. These variables are used to explain the relation between business recovery and spatial restructuring after a disaster.

Since researches on businesses have taken little consideration within disaster field, the area remains understudied until 1990s. With the 1990s, there has been an increase in the empirical studies focusing on the impacts of disasters on businesses. The case studies mainly conducted in developed countries and evaluate the business recovery in developed

country contexts. Taking these previous empirical studies as a basis, this thesis will discuss the findings of several cases. Thus, this present study aims to apply the findings of previous studies to a developing country context.

After determination of variables, next part introduces the data collection procedures. This study employs a set of data collection methods for the empirical testing. The data gathering covers a variety of techniques to obtain knowledge about all the variables. Interviews, questionnaires, printed and visual materials are used to mark out the differences before and after earthquake and impact of disaster within city.

### **3.1.2. Data collection**

The data collection process in descriptive research consists of primary data such as questionnaires, site visits, interviews, and census data gathering, and secondary data including newspaper accounts, articles and other published documents. Data collection procedure of this study incorporates questionnaires and interviews to be conducted to the owner or manager of firms. By this way, the survey enables us to gather data on business characteristics, recovery attitudes and future perspectives.

*Questionnairng* is defined as "a part of wider quantitatively driven strategy of social survey where representative samples of people can be questioned in order to produce numeric measures of behavior, attitude, and attribute" (Cloke, et al., 2004;127). Questionnaire is a bundle of questions to be asked to a sample of population. Johnston defines the questionnaire as "an instrument of data construction comprising a carefully structured and ordered set of questions designed to obtain the needed information without either ambiguity or bias" (2000; 668). Questionnaire is regarded as the application of scientific method to social sciences. Each respondent answers same questions and the sequences could be shifted to quantitative values.

The questionnaire applied in this study involves two types of questions, namely open-ended questions and closed (restricted) questions. The former gives the opportunity of free responses to the informants, while the latter includes short responses or checking item which easy to interpret and summarize (Kahraman, 2008: 91).

An *interview* could be defined as conversations with people on purpose. Interviewing is a tool for self-expressing which allows qualitative inquiry. According to Cloke, et al., interviewing is defined as "a qualitative technique aimed at teasing out the deeper well-springs of meaning with which attributes, attitudes and behavior are endowed" (2004:148).

The questions of the interview could be prepared in three ways; structured, semi-structured and unstructured formats. Based on the researcher's purpose about giving an insight into experiences of people, the format of the interview could be changed. An interview is a part of intensive research strategy, considering as active and responsive during the conversations. Depending on the time and resource availability and intensity of inquiry, the researcher chooses the methods accordingly (Cloke, et al., 2004).

The present research applied the questionnaire to collect data about business recovery with a permission from ethical commission (see Appendix A for the Ethical Commission Report). Within the questionnaire, both open-ended and closed questions are designed. The closed questions include both checking items and ratings that enable to employ *Likert Scaling method*. Likert Scaling method requires developing items to rate the emphasis of state of business. For the study, three-, four- and five-fold rating scales are developed.

Data collection comprises conducting questionnaires to owner or manager of a firm. The set of questions, as shown in the Table 3.3, are prepared in order to identify the factors that could affect business recovery. The survey instruments consist of a series of questions dealing with pre- and post-disaster conditions of businesses. In addition, there are questions to be answered through Likert Scaling method. The questions address the issues; (1) internal factors, (2) their response capacity, (3) the extent of damage caused by disaster, (4) their dependency on lifeline systems, (5) their recovery strategies, and (6) their location preferences. The questionnaire includes 45 questions (see Appendix C for the original form of the questionnaire).

Table 3.3. Questions of the survey

| Category         | Variable                                  | Question                                                           |
|------------------|-------------------------------------------|--------------------------------------------------------------------|
| Internal factors | Business size                             | How many employees have been working in the business?              |
|                  | Business sector                           | In which sector did the firm operate?                              |
|                  | Business age                              | How long has the firm been operating in the same sector and field? |
|                  | Financial condition prior to the disaster | How was the firm's pre-disaster condition?                         |
|                  | Occupancy tenure                          | What was the firm's occupancy status?                              |
|                  | Market range                              | Where did the customers come from to the firm?                     |
|                  | Education level                           | What is the education status of the owner or manager of the firm?  |

Table 3.3. Questions of the survey (cont.)

| Category           | Variable                      | Question                                                                         |
|--------------------|-------------------------------|----------------------------------------------------------------------------------|
| Response capacity  | Previous disaster experience  | Has the firm experienced any disaster previously?                                |
|                    | Preparedness level            | Has the firm ever taken preventive measures before the disaster?                 |
|                    |                               | If yes, what kind of prevention measures did the firm take before the disaster?  |
|                    | Amount of resources used      | What was your source of finance for damage?                                      |
| Extent of damage   | Physical damage               | How was the firm affected from the disaster?                                     |
|                    |                               | How did you define the disruptiveness of the disaster on your business?          |
|                    |                               | How did the infrastructure outages affect your businesses?                       |
|                    | Length of time closed         | How many days does the firm stay closed after the disaster? Why?                 |
| Spatial factors    | Location of employees         | Where did the majority of your employees reside in?                              |
|                    | Location of customers         | Where did the majority of your customers employees come from?                    |
| Long-term recovery | Number of employees           | The number of employees working in the firm?                                     |
|                    | Number of customers           | The number of customers visiting the firm?                                       |
|                    | Business profits              | Business profits of the firm?                                                    |
|                    | Present state of business     | Present state of your business?                                                  |
| Evaluation         | Location of firm              | What was the firm's address prior to disaster?                                   |
|                    |                               | Did your firm have any location alternative before the disaster?                 |
|                    |                               | What is your current address if the firm has relocated?                          |
|                    | Evaluation on location choice | If the firm has relocated, what was the reason for relocation?                   |
|                    |                               | If the firm stayed in the same location, indicate the reasons of non-relocation. |
|                    |                               | What would your next step be in case of a further disaster?                      |
|                    |                               | Evaluate the impacts of new resettlement district on your job                    |
|                    |                               | Evaluate the impacts of reduced development rights on your job                   |
|                    | Evaluation on recovery        | Indicate the most important problems related to recovery.                        |
|                    |                               | How did you recover your business after the disaster?                            |

Apart from the questionnaire conveyed in the case area, relevant primary data will be obtained from other sources. The set of data used in the thesis will be obtained from the

census data of TurkStat, data from municipality and records of Presidency of Disaster and Emergency Management and Sakarya Chamber of Trade and Industry.

Data from sample is gathered through application of questionnaire. Questionnaire was applied to a random stratified sample within Adapazarı Metropolitan Municipality in the June 2012. 232 questionnaires will be applied in total.

#### 3.1.4. Sampling

Application of questionnaire requires a representation of population, therefore a representative sample of the population is set for the research. The questionnaire is applied to a sample of businesses that suffered from disaster. Sampling will be done on purpose. The present study employs a stratified random sampling method to provide an adequate number of firms from various economic sectors and different urban districts.

The sampling is done according to probability or random sampling which is defined as “each unit in the population has an equal, or at least measurable, chance of being chosen as a potential respondent” (Cloke, et al., 2004: 144). The sampling method, in detail, includes **stratified sampling** which is defined as “the original list of potential interviewee is sampled randomly in a number of stages” (Cloke, et al., 2004: 145). For the inquiry, each firm operating in area has equal chance to be selected at first. Yet, the selection is done in a number of stages. Table 3.4 illustrates the sampling criteria developed for the empirical study.

Table 3.4. Sampling criteria

|          | Criteria 1                      | Criteria 2                | Criteria 3            |
|----------|---------------------------------|---------------------------|-----------------------|
|          | <i>Viability</i>                | <i>Location</i>           | <i>Sector</i>         |
| Sampling | Operating since 1999 to present | Firms in central district | Manufacturing         |
|          |                                 |                           | Construction          |
|          |                                 | Firms in periphery        | Trade                 |
|          |                                 |                           | FIRE                  |
|          |                                 | Firms in resettled area   | Professional services |
|          |                                 |                           | Other                 |

Three-stage stratified sampling method is employed to gather data from Adapazarı. Stratifying variables are eligibility, location and business sector. Firstly, the sample is

stratified by eligibility. The sample group is selected among the firms providing that all the firms have been in business since the earthquake. Therefore, sampling is firstly done according to the operation period. From the operation period respect, all firms provide that they have been in business since 1999 Earthquake until now. In other words, all of the respondent firms have been operating since the occurrence of earthquake up to time of the survey (2011). This means that the selected firms challenged after the disaster and achieved recovery more or less.

Since the study does not cover the firms that have been closed after the disaster, the sampling excludes the firms that were no longer in existence. Unfortunately, firms that have closed, destroyed and relocated to outside of the case area before the inquiry are also excluded from the sampling. This point is also another *limitation* of the study. The study mainly focuses on location choices of businesses which today shape the urban space of Adapazarı. Therefore, firms that could not achieve recovery are excluded from the survey as they do not take part in urban structuring. Also, it is virtually impossible to reach such kind firms that experienced and failed after the earthquake.

Firms providing the length of operation period criteria are selected upon their location and sectors which constitute the second and third stage of stratification. Secondly, the sample group is divided in three locations as firms locating in the central district of the city, firms located in periphery of the city and firms located in resettlement district. The sample of the research is selected among the existing center, resettlement districts and urban periphery, as illustrated in the Figure 3.1. The selection of the sample areas is based on the distinction between the three types of urbanization models emerged in the post-disaster period. Resettlement districts represent detached parts of the city which were developed for the affected inhabitants as a consequence of household recovery process after the disaster. The second model, urban periphery represents the urban sprawl on geologically safer locations. Third model is the continuity of existing center with reduced development rights. In order to show the influence of business recovery on spatial restructuring, the empirical study will be run by using these sample case areas.

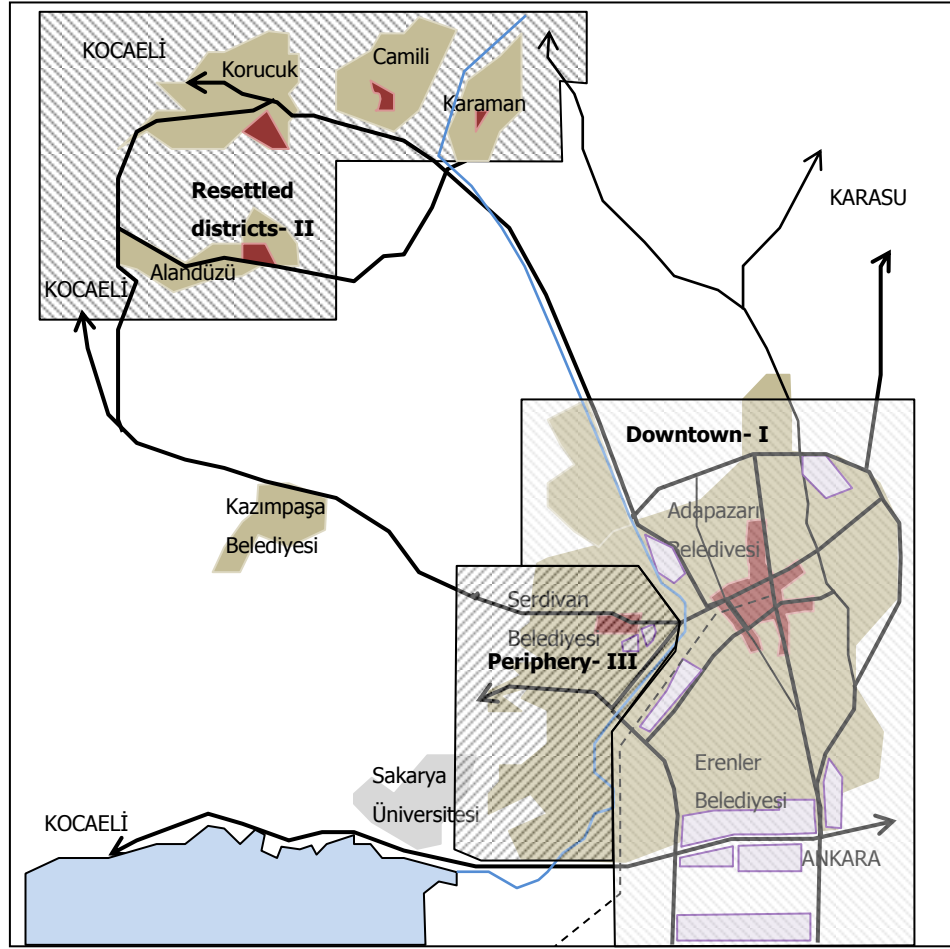


Figure 3.1. Business sample selection sites according to urbanization models

Source. Personal drawing.

Thirdly, the sample groups in these areas have to be representatives of businesses from different sectors. Therefore, each group is supposed to represent the economic sectors as manufacturing, construction, retail and wholesale trade, FIRE (finance, insurance, real estate), professional services except FIRE, and other businesses (agriculture, forestry, fishing, mining, transportation, communication, storage, and public utilities such as health and education).

### 3.1.5. Data analysis

After collecting data, a mixture of qualitative and quantitative analysis methods is employed to examine the business recovery process. The methodology of the thesis study, through which the research study proceeds, is relied on defining variables for business recovery, applying statistical analysis and qualitative research methods.

FOR quantitative techniques, *descriptive statistics* will be used to analyze data. Descriptive statistics is used to "give simple summaries about the sample and simply define what the data show" (Friedman, 1998: 40). Due to the complicated structure of businesses, descriptive statistics is an appropriate tool to analyze large amount of data in a manageable way. The data obtained through Lykert-scaling is also analyzed through descriptive statistics.

For the first and second research questions, data is analyzed through descriptive statistics. A bundle of quantitative analysis is employed in a complementary way to place qualitative results within each category. In order to investigate relations between factors, cross tabulation is used. Then, the compatibility of the null hypothesis in Adapazarı case is tested through Logistic Regression Analysis. SPSS 15 Program is used in conducting the analytical procedure. In addition, in-depth interviews are used to strengthen the hypothesis and support the findings of the analysis. Subjective description is, therefore, used to represent the recovery process.

### **3.1.6. Limitations**

Previous studies applied in the business recovery field mainly select a locality where a disaster strikes. Since the researchers conducted their studies within a research center or with a team, they could provide knowledge about the whole selected locality. Moreover, since most of the studies were conducted through telephone surveys or e-mails to the applicants, it could be possible to reach a majority of businesses within the affected area. Although this data collecting method is beneficiary for researchers in time and financial aspects, the disadvantage of the method is the low return rates. Particularly, this method is difficult to apply in developing countries where the infrastructure is not adequately developed.

However, this present study has limitations on conducting the survey in the case area. The study applies a questionnaire to collect data about the case area. Questionnaire is applied to owners or managers of affected businesses. The method used to gather data from the case area is conducting a face-to-face relation, rather than mail or telephone survey. Although the method is both time and money-consuming, it provides better return rates than mailing or telephone surveys. Therefore, this survey has to be limited to a selected number of firms rather than the entire business population. Unfortunately, the study could not collect an overall database from the case area. Therefore, the results are restricted to the sampling area. However, the findings could be generalized to the selected urban area. Another advantage of the method is that conducting a face-to-face research provides us to get



answers of personal explanations, and real stories experienced after disaster which is not possible for mail and telephone survey.

Since the study gathers data from self-reported information, the accuracy of the data could not be tested. The information collected from the affected area tends to be overstating or understating in order to draw attention about their losses. Some of the respondent firms tend to emphasize higher losses to gain additional assistance, while some tend to reduce the losses in order to attract customers again and reveal that they are in business again. Therefore, another limitation of the study is that the accuracy of the information gathered from the respondents could not be verified.

Alesch, et al., (2000; 2) argue that "longitudinal analysis of recovering organizations is critically important to gaining a full understanding of the recovery process". Due to the fact that there has not been any study on short-term recovery using similar variables, the study could not be designed as a longitudinal analysis. Therefore, it remains a research focusing on the long-term business recovery. The inadequacy of knowledge about post-disaster situation in short-term period presents another limitation of the study.

Another critic for the study could point out the factors which determine business recovery. It is an obvious fact that broader economic trends determine businesses' fate in both short and long-term, and the extent to which firms returned to pre-disaster financial conditions. However, this study aims to shed light on the factors which may have links to disasters, so that this study ignores the economic factors that could affect the business recovery.

### **3.2. CASE STUDY**

The investigation adopts a case study for exploring the consequences of business recovery. Case study method could be defined as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (Yin, 1989 in Reddy, 2000; 187). The case study aims to analyze the nature of business vulnerability and the influence on spatial restructuring. Case study approach is used in order to explain the factors that determine vulnerability, recovery and outcomes of the process. A detailed assessment could provide a considerable understanding for the forms of vulnerability of an urban area and the nature of disaster impacts. By using the case study approach, it is aimed to find out the factors significantly different in business recovery and the impact of the recovery process on urban spatial development. A case study area is

selected to represent spatial impacts posed by recovery policies as a result of isolating businesses from household recovery. The case study is selected purposively; it is a disaster-prone city where the consequences of post-disaster recovery policies could be observed in urban space.

Adapazarı, the center of Sakarya Province, has suffered from natural hazards throughout its history. Figure 3.2 illustrates the location of Adapazarı within Turkey and Sakarya Province. The most common, probable and historically most significant hazards are earthquakes experienced severely in 1923, 1943, 1957, 1967 and finally in 1999 (Altun et al., 1967). The 1999 Earthquake was a devastating catastrophe which led to severe physical, social, economic and spatial consequences. The city continues to locate in seismic-sensitive zone, therefore, the risk of geophysical hazards remains relatively high, particularly in the south of city, where the main part of city, center, and most of the key infrastructure is located.

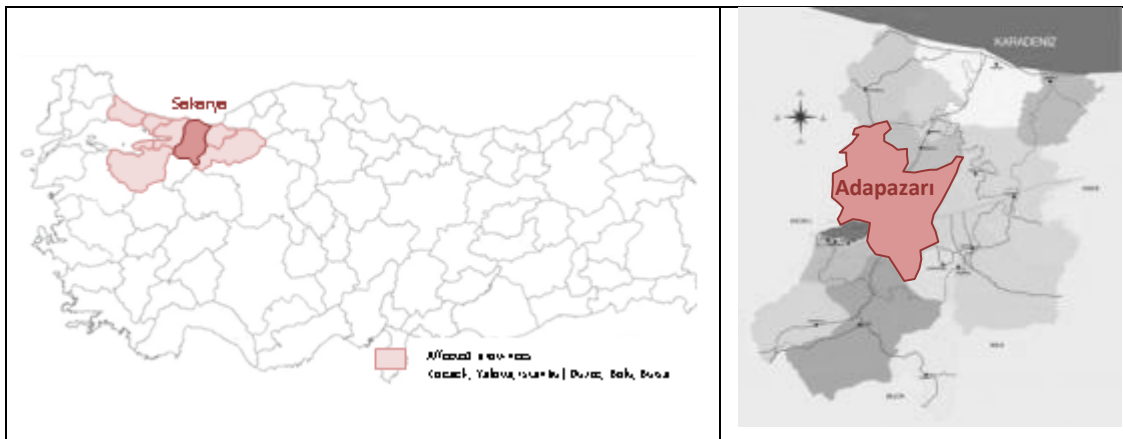


Figure 3.2. Location of Adapazarı within Turkey (left) and Province of Sakarya (right)

Source. Personal drawing.

The study on Adapazarı examines the business recovery process and its impact on the urban spatial structure. Adapazarı offers an interesting case that exemplifies the experience of a seismic shock to show the restructuring of urban area with respect to recovery policies. The city represents the impacts of the shock in social, physical, economic and spatial terms.

The case study is constraint by the very limited resources and time available and, in some respects, by substantial data limitations. For the case study, city visits are made to collect data and conduct interviews with managers or owners of businesses and selected public

officers and administrators who had been affected from the 1999 Earthquake. Interviewees are consulted about the business recovery and their tendencies about location choices. The case study includes a review of the available official documentation, plans, statistics and records, and the recent literature. The database obtained from case study contains the notes, documents, site visits, photographs, maps, outcomes of questionnaires, interviews and archival researches of planning department of municipality. Also, a pilot study was conducted to the case area in June 2011 in order to observe the applicability of the questionnaire to respondents. According to the first responses, the questionnaire was revised.

### **3.2.1. Site Selection Criteria**

In order to examine business recovery process, a case study area is selected. An empirical research on business recovery is carried in a case area which is selected through a number of preference criteria. Firstly, the site selected for case study must be affected from a disaster. Secondly, the consequences of the disaster must be observable in terms of spatial aspects. Thirdly, respondents in the area are able to give information about the situation just before the disaster; therefore, the disaster must create an inerasable memory among the business owners and managers. Fourthly, the extent of disaster must influence almost all urban sectors such as housing, transportation, industry, recreation, commerce, and agricultural facilities. The reason to apply the fourth criteria is to observe the change on private sector entities and within the spatial domain of the city. Fifthly, after the emergence of a disaster, its effects could be observable in long-term period. Finally and sixthly, the disaster must have observable spatial impacts; as such the main concern of the thesis is to put forward the spatial restructuring after a disaster.

Depending on the criteria, the 1999 Marmara Earthquake is selected. The Earthquake creates an inerasable memory among Turkish nation by affecting more than 16 million people directly locating in the region. The Earthquake has reasoned to several losses and damages in almost all sectoral activities with an observable spatial change in cities. The affected region of the Earthquake covers the cities in Marmara Region, namely İzmit, Adapazarı, Yalova, Düzce, Bolu, İstanbul and Bursa. The cities have different reconstruction dynamics changing due to economic facilities and scale. Evaluation of these cities according to site selection criteria is illustrated in the Table 3.5.

Table 3.5. Evaluation of affected cities in terms of selection criteria

| Criteria  | Criteria 1                                                                     | Criteria 2                | Criteria 3          | Criteria 4                    | Criteria 5        | Criteria 6      |
|-----------|--------------------------------------------------------------------------------|---------------------------|---------------------|-------------------------------|-------------------|-----------------|
| City      | Disaster occurrence                                                            | Observable spatial effect | Provide information | Appropriate scale and sectors | Long-term impacts | Spatial impacts |
| Adapazarı | +                                                                              | +                         | +                   | +                             | +                 | +               |
| İzmit     | +                                                                              | --                        | +                   | +                             | --                | +               |
|           | <i>dynamics for recovery compensate the adverse effects of the disaster</i>    |                           |                     |                               |                   |                 |
| Yalova    | +                                                                              | +                         | +                   | --                            | +                 | +               |
|           | <i>small scale urban area with less differentiated and complex facilities</i>  |                           |                     |                               |                   |                 |
| Düzce     | +                                                                              | +                         | +                   | --                            | +                 | +               |
|           | <i>small scale urban area with less differentiated and complex facilities</i>  |                           |                     |                               |                   |                 |
| Bolu      | +                                                                              | +                         | +                   | --                            | +                 | +               |
|           | <i>small scale urban area with less differentiated and complex facilities</i>  |                           |                     |                               |                   |                 |
| İstanbul  | +                                                                              | --                        | +                   | --                            | +                 | +               |
|           | <i>the size and scale of affected districts do not serve on purpose</i>        |                           |                     |                               |                   |                 |
| Bursa     | +                                                                              | -                         | +                   | --                            | +                 | +               |
|           | <i>damages in building stock and the degree of losses in economic activity</i> |                           |                     |                               |                   |                 |

*Bursa* was moderately influenced from the disaster; particularly damages in building stock and a degree of losses in economic activity occur (absence of criteria-2 and 4). *Yalova*, *Düzce* and *Bolu* have small scale urban area with less differentiated and complex facilities compared to other cities (absence of criteria-4). *İstanbul* was not affected totally from the disaster like *Bursa*, only the district *Avcılar* has suffered from the Earthquake. However, the size and scale of *Avcılar* district does not serve on purpose (absence of criteria-2 and 4). The city of *Kocaeli* and *Adapazarı* could respond to the requirements of the pre-determined criteria. The close location of *Kocaeli* to *İstanbul* gives advantageous position to the city to recover from the disaster more rapidly in terms of business environment. Since the industrial facilities are concentrated within the territory of the city, a significant amount of change in patterns of society and economy could be not observed easily on the purpose of the thesis. As there are other factors and dynamics for recovery and for compensate the adverse effects of the disaster, *Kocaeli* is not an appropriate case for the study (absence of criteria-2 and 5).

On the other hand, *Adapazarı* is a disaster-prone city which has suffered from the 1999 Earthquake (*criteria-1*). The 1999 Earthquake was felt in all aspects of the city for a long time. The earthquake damaged the building stock including residential and commercial buildings, and other service facilities. Citizens have become homeless and unemployed due to business disruption. Besides, the infrastructure of the city has been affected. Transportation within the city was interrupted because of the collapse of buildings. Industry

was influenced from the seismic-shock and production had to be stopped. In addition to the building stock, there occurred losses in terms of human resources. The losses comprises life losses, injuries, migration, and hence, reduction in the number of talented worker, literacy rate, employment, and etc. In sum, all sectors of the city were adversely affected from the Earthquake (*criteria-2*). Affected population did not totally migrate to other cities; rather they relocated in new settlement districts. Also, businesses have recovered within the city after the disaster. Therefore, it will be possible to reach the affected business owners or managers to get information about their situation before the Earthquake. Also, previous surveys of the same site shows that people experienced the Earthquake could respond the questions related to pre-disaster period. Therefore, the Earthquake could be said to create an inerasable memory on the directly affected geography (*criteria-3*). Adapazarı is a metropolitan municipality which holds all urban facilities to meet the needs of the population including housing, transport, industry, infrastructure, commerce, and recreation. Therefore, Adapazarı will provide appropriate scale and sectors (*criteria-4*). Since the Earthquake struck the region in 17 August 1999, the time passed after the disaster is enough to evaluate the long-term impacts of the disaster on the urban spatial restructuring. The proposed study will concentrate on long-term periods to show the restructuring of urban space after the disaster. According to the study of Vale and Campanella (2005), from the shock up to two weeks is accepted as emergency period; from the first week to twentieth week restoration phase emerges; from tenth week to two-hundredth week reconstruction and replacement begins; and finally from one-hundredth to five-hundredth week major construction are completed and improved. That is, 100 to 500 weeks are determined as acceptable for the long-term time period (Vale and Campanella, 2005). According to the classification accepted in literature, the long-term period after the Earthquake to observe the major recovery implications could be achieved (*criteria-5*). After the disaster, there have been changes in community and spatial structure due to the collapse of building stock, prohibition of development, new development rights, construction of permanent housing, and recovery of businesses. Since the Earthquake led changes in land-use patterns, it is possible observe the spatial impacts within the city (*criteria-6*). Therefore, the case study in Adapazarı is designed to investigate the effects of developments generated by business environment on urban space.

### **3.3. CONCLUDING HYPOTHESES**

According to literature reviewed and in the line with the given business typology, this section is devoted to construct the components of the question; how the business sector in Adapazarı has experienced the recovery period? In order to answer the question, the

hypotheses of the thesis are developed. The hypotheses that will be tested in the case area are presented below.

### **Hypothesis 1: Examination of recovery factors**

- Long-term recovery of a firm is expected to differ according to internal factors, the extent of damage and response capacity (see Table 3.6).

This hypothesis is formulated with respect to internal factors, response capacity and the extent of damage. Based on the variables including business size, business sector, pre-disaster financial condition, business age, occupancy tenure, market range, education degree, previous disaster experience, preparedness level, amount of resources used, extent of physical damage, and length of time closed, the set of hypothesis is used to show which factors significantly determine firm's long-term recovery.

Table 3.6. Expected relations

|                   | INDICATOR                    | HYPOTHESIS                                                                                                                                                                                                |
|-------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internal factors  | Business size                | H1: Small businesses suffer from more than large business in terms of disaster recovery.                                                                                                                  |
|                   | Business sector              | H2: Construction and manufacturing sector (including furniture, building repair, etc.) recover more rapidly than other sectors.<br>H3: Finance and insurance firms increase their sales after a disaster. |
|                   | Business age                 | H4: Young or new firms have a tendency to hardly recover compared to established firms.                                                                                                                   |
|                   | Pre-disaster condition       | H5: Financially robust firms do better in disaster recovery.                                                                                                                                              |
|                   | Occupancy tenure             | H6: Renters of business properties are more vulnerable than owners.                                                                                                                                       |
|                   | Market range                 | H7: The firms selling goods and services to local people seem more vulnerable than those having a geographically diverse market.                                                                          |
|                   | Education level              | H8: Firms having an owner/manager with better education background are more likely to recover than others.                                                                                                |
| Response capacity | Preparedness level           | H9: Firms taking preparedness measures before a disaster are more likely to recover than those who do not take before.                                                                                    |
|                   | Amount of resources used     | H10: Firms that have used greater amount of aid resources are more likely to recover than those that have used less.                                                                                      |
|                   | Previous disaster experience | H11: Firms, experienced disaster previously, tend to less vulnerable than those not having previous experience.                                                                                           |
| Disaster impact   | Damage                       | H12: The more physically damaged the firm, the more difficult to recover.                                                                                                                                 |
|                   | Length of time closed        | H13: The longer time the firm closed, the more difficult to recover from disaster.                                                                                                                        |

### **Hypothesis 2: Exploration of factors in developing response capacity**

- A well-developed response capacity is related to the internal factors and previous disaster experience (see Table 3.7).

This hypothesis is formulated with respect to internal factors and response capacity. Based on the variables including business size, business sector, pre-disaster financial condition, business age, occupancy tenure, market range, education degree, and previous disaster experience, the set of hypothesis is used to show which factors significantly determine firm's preparedness level.

Table 3.7. Expected relations

|                   | INDICATOR                    | HYPOTHESIS                                                                                                                                                     |
|-------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internal factors  | Business size                | H1: Large firms tend to engage in preventive activities compared to small firms.                                                                               |
|                   | Business sector              | H2: Firms in finance, insurance and real estate sector are more prepared than firms in trade and service sectors.                                              |
|                   | Business age                 | H3: Older firms are expected to invest more in preparedness.                                                                                                   |
|                   | Pre-disaster condition       | H4: Financially robust firms are more likely to invest in preparedness activities than others.                                                                 |
|                   | Occupancy tenure             | H5: Business property owners are more likely to take preparedness measures.                                                                                    |
|                   | Market range                 | H6: The firms selling goods and services to local people are expected to less likely engage in preparedness than those having a geographically diverse market. |
|                   | Education level              | H7: Firms with well-educated owner/manager will show higher interest in preparedness.                                                                          |
| Response capacity | Previous disaster experience | H8: Firms that experienced business interruption before tend to take more preparedness measures than those who do not suffer from business interruption.       |

### **Hypothesis 3: Identification of factors in location choices of businesses**

- Location choice of a firm could be explained by internal factors, response capacity, extent of damage, and spatial factors (see Table 3.8).

This hypothesis is formulated with respect to internal factors, response capacity, the extent of damage and spatial factors. Based on the variables including business size, business sector, pre-disaster financial condition, business age, occupancy tenure, market range, education degree, previous disaster experience, preparedness level, amount of resources used, extent of physical damage, length of time closed, location of employees, and location

of customers, the set of hypothesis is used to show which factors significantly determine firm's location choices in the post-disaster period.

Table 3.8. Expected relations

|                   | INDICATOR                    | HYPOTHESIS                                                                                                                                                    |
|-------------------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Internal factors  | Business size                | H1: Firms with large number of employees are less likely to relocate than small-sized firms.                                                                  |
|                   | Business sector              | H2: Firms in manufacturing and construction sector are less likely to relocate than other operating in other sectors.                                         |
|                   | Business age                 | H3: Older firms are less likely to relocate than their younger counterparts.                                                                                  |
|                   | Pre-disaster condition       | H4: Firms having a robust economic condition are more likely to relocate safer locations than those in financial trouble.                                     |
|                   | Occupancy tenure             | H5: Firms with owner-occupation type are less likely to relocate                                                                                              |
|                   | Market range                 | H6: Firms serving to a wider market area are less likely to move than those serving to local market.                                                          |
|                   | Education level              | H7: Firms having a manager or owner with better education degree are more likely to relocate safer locations than those with less educated manager or owners. |
| Response capacity | Preparedness level           | H8: Firms engaging in more preparedness activities are more likely to relocate.                                                                               |
|                   | Amount of resources used     | H9: Firms allocated more resources after disaster are more likely to relocate.                                                                                |
|                   | Previous disaster experience | H10: Firms having previous disaster experience are more likely to relocate.                                                                                   |
| Disaster impact   | Damage                       | H11: Firms taking more operational problems are expected to relocate than those which suffered fewer problems in order to get rid of those problems.          |
|                   | Length of time closed        | H12: Longer the firms stayed close, more likely to relocate due to their pre-disaster concerns about location.                                                |
| Spatial factors   | Location of employees        | H13: Firms employees change location after disaster are more likely to relocate due to get advantage of spatial proximity.                                    |
|                   | Location of customers        | H14: Firms whose customers change location after disaster are more likely to relocate due to get advantage of spatial proximity.                              |

#### **Hypothesis 4: Interpretation of the post-disaster urban restructuring through the location choices of businesses**

- Businesses, ignored in recovery policies, make location choices as a part of their recovery strategy and restructure urban space (see Table 3.9).

Along with these hypotheses, it is expected that firms that do not prefer to relocate in the safer parts of the city will reproduce the vulnerability of the city as in pre-disaster situation. Here, it is hypothesized that if businesses tend to locate in vulnerable areas despite the



initial recovery goals and the settlement policies developed for households, then the vulnerability of the city will be reproduced.

Table 3.9. Expected relations

| Spatial factor | INDICATOR         | HYPOTHESIS                                                                                                                                     |
|----------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
|                | Location of firms | H1: Location choices of firms and their future considerations particularly in spatial terms are expected to contribute to urban vulnerability. |

## CHAPTER IV

### CONSTRUCTION OF URBAN VULNERABILITIES IN THE CONTEXT OF ADAPAZARI

Turkey has experienced natural disasters throughout history, but none of them has as many catastrophic consequences as the 1999 Earthquakes in terms of fatalities, injuries, property damages and economic losses. These results occur due to the location of seismic shock; the earthquakes emerged in one of the most urbanized regions of Turkey. Figure 4.1 illustrates the epicenter of the seismic shock, namely Golcuk and the affected zone including provinces of Kocaeli, Sakarya, Bolu, Duzce, Yalova, Bursa, and İstanbul.



Figure 4.1. The epicenter of 1999 Kocaeli Earthquake and the affected zone

Source:Wikipedia, last achieved in March 2011.

As tragic as it was, the Earthquake provides an opportunity for us to evaluate the extent of the impacts of disasters on urban structure and its components. To shed light on the disaster effects on businesses, it is essential to examine the stage of urban development before the catastrophe. Therefore, this chapter discusses the urban development within a larger context of the Marmara Region, examining the historical, political and spatial factors which constructed the urban vulnerability. These factors include the dynamics of regional policies, the history of urban development, and the planning decisions on land-use and risk sectors. It firstly introduces the urban development before the Earthquake in three subsequent periods as 1923-1957, 1957-1985, and 1985-1999; later focuses on the period after the Earthquake. Each of the planning periods will provide information about the plans considering spatial development from a critical point of view.

#### **4.1. CONTEXTUAL SETTING OF ADAPAZARI**

This part aims to answer how the urban vulnerability was produced and which factors contributed to the vulnerability of the Adapazarı city. In order to answer the questions, this part explains the urban growth of Adapazarı in different planning periods with respect to the changing socio-economic structure of the country. Therefore, this part gives brief information about the national composition showing social, economic, politic structure as well as the planning scheme. Table 4.1 summarizes the national composition with respect to social, economic, politic and planning aspects.

Turkish economy has differed in four periods since the proclamation of Republic. The 1923 and 1945 period witnessed radical changes including the declaration of new capital city as Ankara; generation of a new polar against to the Ottoman prosperous cities such as İstanbul, İzmir and harbor cities; rural development; foundation of 'Village Institutes'; preparation of industry plans; and construction of railroads (Tekeli, 2008a; Keskinok, 2001). The period had a protective economic policy. The nation-state was ruled by a single party regime, during the period. Having a modernist vision, the aim was to generate a nation by shifting the rationality in economic, political, social and cultural terms. Besides, the reformist ideology of the young Republic had intervened in the spatial development of cities. The dominant urban planning paradigm was to 'design' cities to symbolize the new regime (Uluğ, 2004). Since urban planning is regarded as a modernity project (Tekeli, 2001), urban areas which reflected the vision of the Republic were designed by architects and planners.

Then, between 1945 and 1960, the economy was characterized by liberal economic policies. With the existence of multi-party regime, planned economy was replaced with liberal economy. During the period, industrial growth was promoted. Industrialization led to mechanization of agriculture and raised the need for industrial workers. Since the late 1940s, the growing migration from rural to urban areas was resulted in housing requirement in cities. Because the state could not supply adequate housing provision, migrants produced housing by illegally constructing shanties. Therefore, urban areas had to face the squatter housing problem as a result of migration and inadequate housing provision. On the other hand, governments and private sector benefited from the new urban residents who provided a voting potential for the former and cheap labor force potential for the latter (Kahraman, 2008).

Table 4.1. National composition according to socio-economic development

Source. Keskinok, 2001; Kahraman, 2008; Sengezer and Koc, 2005; Tekeli, 2008b.

| Periods             | 1923-1945                                             | 1945-1960                                                                                                                          | 1960-1980                                                                                                                       | Post 1980s                                                                                           |
|---------------------|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Government model    | Nation-state                                          | Nation-state                                                                                                                       | Decrease in dominance of nation-state                                                                                           | Shrinking of nation-state<br>Rise of local                                                           |
| Economic structure  | Protective economy<br>State-led industrialization     | Liberal economy<br>Industry led growth<br>Intervention on market stability                                                         | Planned economy until 1970s<br>Import substitution<br>Liberal economy after 1970s<br>Collaboration with IMF and World Bank      | Neo-liberal economic policies<br>Privatization                                                       |
| Political structure | Single party regime                                   | Multi party regime                                                                                                                 | Political crisis, weak coalitions                                                                                               | Structuring policies by market forces                                                                |
| Social structure    | Policies to create new bourgeoisie in urban areas     | Social transformation from peasantry to industrial workers<br>Political patronage relations                                        | Widening gap between rich and poor<br>Populist discourses                                                                       | Rise of civil societies<br>Social segregation                                                        |
| Planning scheme     | Design as a planning tool                             | Comprehensive                                                                                                                      | Comprehensive until 1970s<br>Incrementalism after 1970s                                                                         | Strategic planning<br>Participatory planning                                                         |
| Urban structure     | Small and medium scaled towns<br>Railway construction | Growing cities<br>Migration from rural to urban areas<br>Squatter housing problem<br>New construction methods and apartment blocks | Crowding shores<br>Illegal housing concentrations<br>Population growth and crowding agglomerations<br>Raise of apartment blocks | Megacities<br>Infrastructure problems<br>Mass housing policies<br>Transformation of squatter housing |

Since the 1960s, Turkish economy was shifted from a liberal economic perspective to planned economy (Gedikli, 2004; Tekeli, 2008b; Sengezer and Koc, 2005; Keskinok, 2001). The economic shift required a balanced growth of cities and regions which led to the preparation of regional plans. Regional plans, emerged in this period, have a twofold aim. One is to increase economic efficiency, and the other is to reduce regional disparities (Tekeli, 2008b). The regional plans prepared in Turkey since 1963 comprehensively aiming to achieve both of these goals. Tekeli (2008b) argues that these plans were prepared with a long-term perspective and operated in the decision making process at a national level. Twelve planning regions were determined and regional planning projects were suggested (Keskinok, 2001). One of the regional plans covering Adapazarı is the Eastern Marmara Development Project.

The planned economy operated between 1960 and 1970, the main goal of the state was to provide public services. Therefore, the dominant policy aimed to achieve a welfare state model in line with the Keynesian understanding. However, with the end of the welfare state since 1960s, the centrally planned economy began to dissolve. The political trend in the 1970s supported the development of industrialization. The main difference from the previous decade was that urbanization was not seen as the primary task to perform (Tekeli, 2008b). Industrialization was taken as the prerequisite of urbanization; therefore, the aim was to generate a qualified development of urban areas. The dominant militarist regime in the period gave priority to sub-regions, '*yöreler*'. Sengezer and Koc state that this period showed relatively balanced investment distribution from a geographical point of view, accordingly the national industry plans and regional plans (2005).

In the 1980s, a shift in economic model was seen once again towards liberal thought (Tekeli, 2008b; Sengezer and Koc, 2005). The widespread trend of globalization has affected the Turkish economy, and those years would be the age of privatization. Private sector began to dominate investment decisions which had spatial reflections in cities. Sengezer and Koc stress that "the act of 1985 aimed to accelerate and localize the planning process, as the state machinery remained too slow to cope with local dynamics and too large to diagnose local problems" (2005: 175). Comprehensive planning approach was left; instead incremental and afterwards strategic planning approaches have prevailed. The holistic approach of rational comprehensive planning was replaced with piecemeal approach which was advocated to response the needs of private sectors immediately. Post 1980s have also restructured the urban space. Cities become large population concentrations and megacities have begun to hold millions. Due to the increase in population, there occurred a number of problems ranging from infrastructural inadequacy, traffic congestion, pollution, ecologic

degradation, and diminishing physical quality. Also, mass housing implications took place that influenced urban macroform by creating large pieces out boundary of cities.

Consequently, since the foundation of Republic, Turkey has experienced different economic and political models resulting in social and spatial reflections. The dynamic and changing national composition has affected urban structures directly. The modest towns of the country have experienced the revolution in their spatial structures.

Within the socio-politic history of the Republic, Adapazarı has been one of the Anatolian towns whose urban space has structured with not only the changes in national context, but also the disasters. This part presents the urban development of Adapazarı within the context of different periods. In determination of these periods, we benefit from the planning history and disaster experiences of the city as well as changing nature of national context.

To start with the earthquake experiences, the city suffers from the close location to active fault lines. Adapazarı has experienced several earthquakes as listed in the Table 4.2.

Table 4.2. Earthquakes in Adapazarı history

Source. Bayhan, 2010; 19; Aytun, et al.,1967; and Wikipedia web page, 'lists of earthquakes'.

| Date           | Location        | Magnitude    | Mortality    |
|----------------|-----------------|--------------|--------------|
| 1923           | Adapazarı       | Not reported | Not reported |
| 20 June 1943   | Hendek          | Ms: 6.6      | 336 (346)    |
| 26 May 1957    | Bolu-Abant      | Ms: 7.1      | 52 (66)      |
| 22 July 1967   | Adapazarı-Geyve | Ms: 7.2      | 89 (143)     |
| 17 August 1999 | Golcuk          | Mw: 7.4      | 17480        |
| 12 Kasım 1999  | Duzce           | Mw: 7.2      | 763          |

At 20 June 1943, an earthquake hit Adapazarı resulting in 318 life losses. As a result of 1943 Earthquake, 524 buildings were totally collapsed; 227 buildings were heavily, 928 buildings were moderately, and 575 buildings were lightly damaged (Aytun, et al., 1967; 16) within the city.

In 1957, an earthquake has occurred with the epicenter in Bolu-Abant in the severity of 7.1. The physical damage caused by 1957 Earthquake led to 187 heavily damaged and 317 lightly damaged buildings (Aytun, 1967; 16). There would not be any fatalities in Adapazarı.

1967 Earthquake caused to 5837 heavily damaged buildings, 5153 of which were determined to receive aid. It was reported that 81 people lost their life, 111 people were injured lightly and 113 people were injured heavily (Aytun, et al, 1967). Apart from residential and commercial buildings, industrial plants were damaged from the Earthquake. Agricultural equipment and machinery industry lost its 5,000 m2 closed area including manufacturing workshops. Main building of industry was collapsed; and it took three days to collect debris of the industry. The wagon industry stayed closed for 10 days after the earthquake. Also, Adapazarı, Arifiye, Sapanca, Doğançay and Alifuatpaşa railways stations were destructed; and Adapazarı Sugar Industry took structural damage in terms of building and equipment.

In addition to the earthquakes, the urban space of Adapazarı has been structured through planning decisions. Since 1950s, there have been planning studies for Adapazarı. These plans have been prepared at different scales related to earthquakes and needs. The process and scales of plans developed since 1950s are illustrated in the Table 4.3.

Table 4.3. Planning process of Adapazarı

| Disaster   | Earth-<br>quake | Earth-<br>quake  | Earth-<br>quake |                   | Earth-<br>quake |                   |                  |                |                  |             |
|------------|-----------------|------------------|-----------------|-------------------|-----------------|-------------------|------------------|----------------|------------------|-------------|
| Plan scale | 1943            | 1957             | 1967            | 1985              | 1999            | 2000              | 2001             |                | 2006             | 2009        |
| 1/100,000  |                 |                  |                 |                   |                 |                   |                  |                |                  | Master Plan |
| 1/25,000   |                 |                  |                 | Master Plan       |                 | new settlements   |                  |                | Master Plan      |             |
| 1/5,000    |                 | Development Plan |                 | Development Plan  |                 |                   | Development Plan | new settlement | Development Plan |             |
| 1/1,000    |                 | Development Plan |                 | Development Plan  |                 |                   | Development Plan | new settlement |                  |             |
| 1/500      |                 | 1/500            |                 |                   |                 |                   |                  |                |                  |             |
| Site plan  |                 |                  |                 | Revisions on plan |                 | Revisions on plan |                  |                |                  |             |

Taking both planning periods and earthquakes into consideration, it could be observed that milestones of urban development overlap with the years of 1957, 1985 and 1999, as shown

in the Figure 4.2. Therefore, we employ a chronological sequence in introducing planning history of Adapazarı, which takes the intersection of the years of earthquakes and plans into consideration. In this sense, the periods are determined as pre-1957, 1957 to 1985, 1985 to 1999, and post 1999.

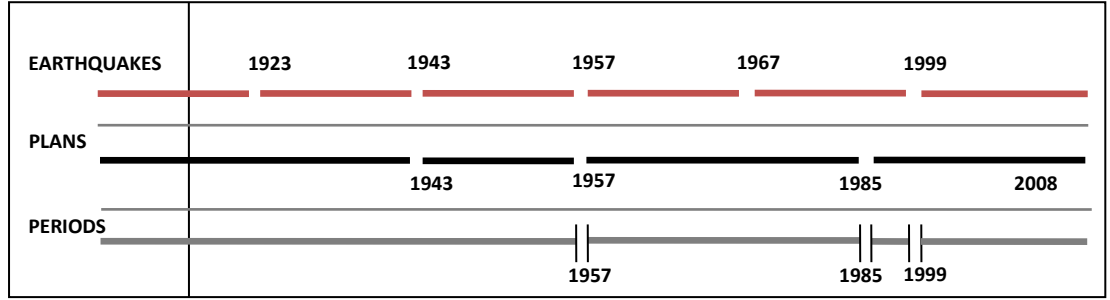


Figure 4.2. Planning periods used in this study

Source. Personal rendering.

The aim of this section is to put forward what makes the city vulnerable and how businesses locate within the urban area. Therefore, this section presents the milestones of urban development process, main principles of plans, plan proposals, and stage of urban development with respect to macroform in a chronologic order.

#### 4.1.1. Pre-disaster planning periods of urban growth in Adapazarı

This part of the study analyzes the urban development in Adapazarı taking the planning history and disaster experiences of the city into account. Information provided in this part will be a brief evaluation of the construction of urban vulnerability until the 1999 Earthquake within three major periods. The first period starts with the proclamation of Republic and goes until 1957. After 1950s, the migration from rural to urban areas throughout the country had reshaped the urban space leading to acceleration of urban risks. In this respect, the second period starts with 1957 and goes on until 1985. The years 1980s witnessed liberal policies which had crucial impacts on the urbanization. Hence, the third period covers the years between 1985 and 1999. This period shows the stage of development that the Earthquake hit.



#### **4.1.1.1. Core: 1923-1957 Period**

Adapazarı, which was a village during the Ottomans times, would become a district of Kocaeli province at the end of 19<sup>th</sup> century. The district was settled by nomadic Turkish invaders that shaped the neighborhoods of the city. Since small sized production and commerce was the primary economic activity, the neighborhoods were called by the economic functions of these invaders such as mat makers, shoe makers, and so forth. With the construction of railway in 1899, the population of the district has increased and the central functions expanded around the station. Then, in the midst of 19<sup>th</sup> century, immigrants from Balkans were inhabited; and as a result of population exchange policy after the Independence War, people from Bulgaria, Greece, Yugoslavia and Romania were settled in the area.

Adapazarı has developed around the historic center during its history, as shown in the Figure 4.3. Located near the Sapanca Lake, the city has been settled on agricultural plain, Akova. Since there are not any significant topographic limitations for growth, the city has developed over the plain with respect to the increase in population.



Figure 4.3. Location of Adapazarı and surroundings, 1922

Source.Sakarya Metropolitan Municipality, 2008; 387.

Population of the city was counted as 22,559 inhabitants in the first general population census (Governor of Sakarya, 2004; 501). Being a county, the population of Adapazarı was greater than the center of Kocaeli province, namely İzmit, during the early periods of

Republic. According to the 1935 General Census, the population of Adapazarı was 24,839 whereas the population of İzmit was 18,693. A rapid population increase was observed in 1940 census as the population of Adapazarı was 25,793 and that of İzmit was 29,120 (Governor of Sakarya, 2004; 501).

According to the point of view of the young Republic, cities were needed to be planned in order to regulate both spatial and social structure. The new Republican government supported the vision of modernity and aimed to prove the success of the new regime through modern socio-cultural and physical environment (Tunç, 2003; Türkoğlu Önge, 2007). Therefore, Adapazarı's planning history goes back to early 1930s. Initially, Prof. Hermann Jansen was decided to be hired to prepare urban plans. However, negotiations with the planner of the capital city remained inconclusive. Then, Van der Berg started to prepare development plans in 1939. Nevertheless, Van der Berg's plan was rejected due to the disagreements on the route of railway. Despite the unsuccessful plan initiatives, the city reached its limits until 1950s, as demonstrated in Figure 4.4.

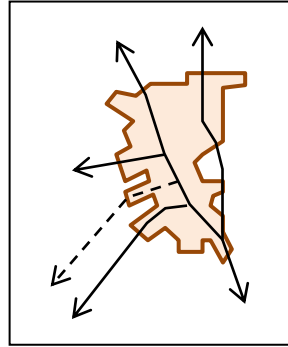
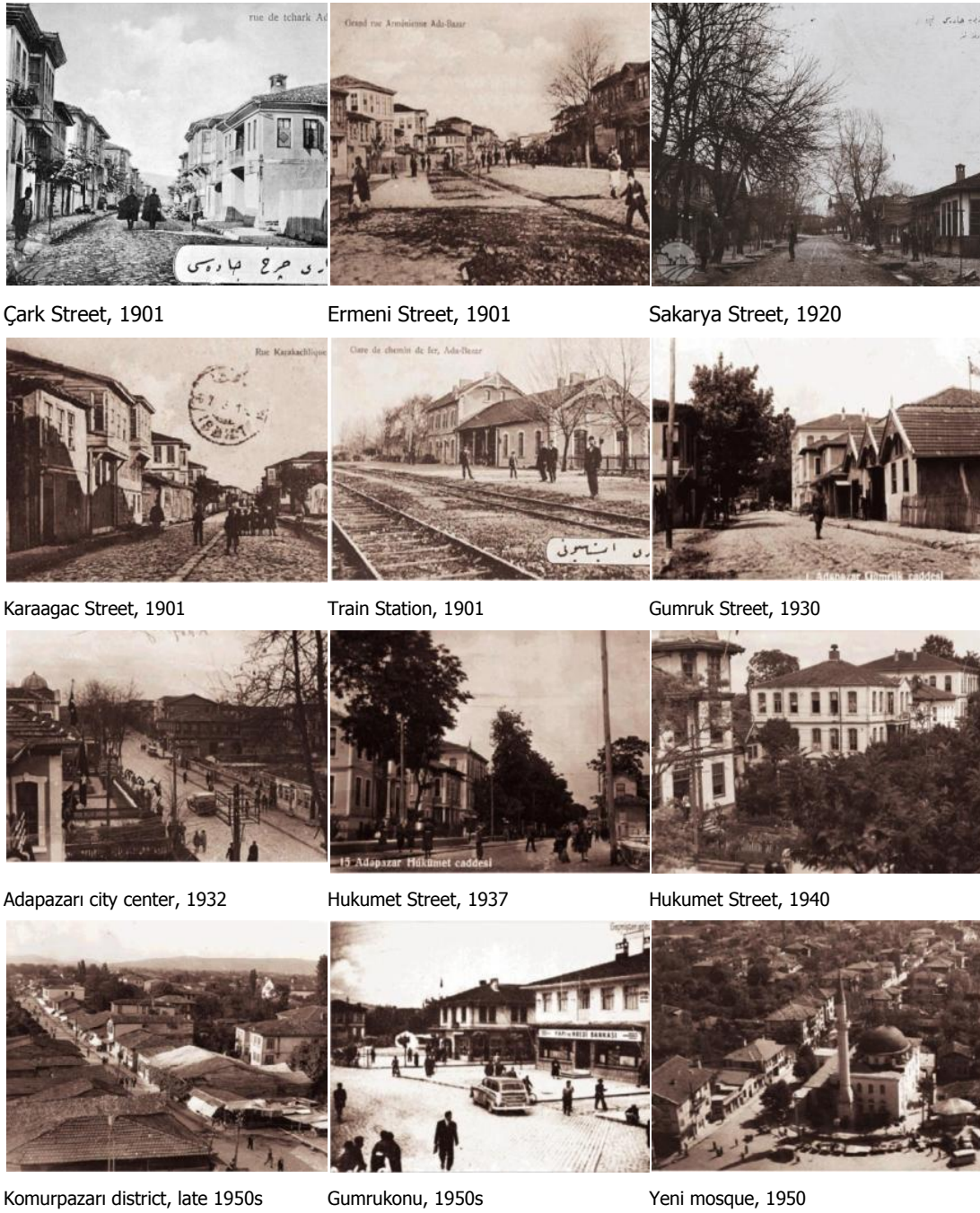


Figure 4.4. Adapazarı urban macroform analysis before 1950s

Source. Personal rendering.

During the period, Adapazarı developed around its center over the plain area. Besides, there emerged settlements in the slope areas such as Hızırtepe, Maltepe and Serdivan. The city was mostly shaped by 2 or 3-storey buildings constructed with traditional methods, as shown in the Figure 4.5. The center gained administrative units in addition to commercial activities. However, the city showed a mercantile and agricultural center identity until the industrial investments.



After the 1943 Earthquake, Ferit Örs prepared the 1/1000 scaled plans of Adapazarı under the consultancy of Prof. Oelsner (Bayhan, 2010; 51). The planning study did not target a

long-term development; rather it held a short-term approach for spatial development. Therefore, the planned area covered 400 ha area, and the estimated population of the city was 45,000 inhabitants. Örs' plan regulated the spatial development of Adapazarı until the enactment of the 1957 plan.

During the period until 1957 plan, state-led investments were made in the city, as summarized in the Figure 4.6. On November 22, 1944, Adapazarı Agricultural Equipment and Machinery Factory under the Institution of Agricultural Equipment was founded in Adapazari. Then, Adapazarı wagon factory was established on October 25, 1951. Additionally, in 1953 Adapazarı Sugar Industry was established. Initial industrial developments appeared along the İstanbul-Eskisehir railway route. Then, with the construction of İstanbul-Ankara highway, industries tended to relocate along the highway. These improvements encouraged settlements around these industries which would determine the directions of urban development. First, the wagon factory initiated the expansion to the southern part of the city. Afterwards, the growth was directed to the west where the sugar industry located. The center sustained its function and form until 1950s. Also, in the institutional aspect, during this period, Sakarya gained the status of province with the center being Adapazarı according to the article numbered 419 on June 22, 1954.

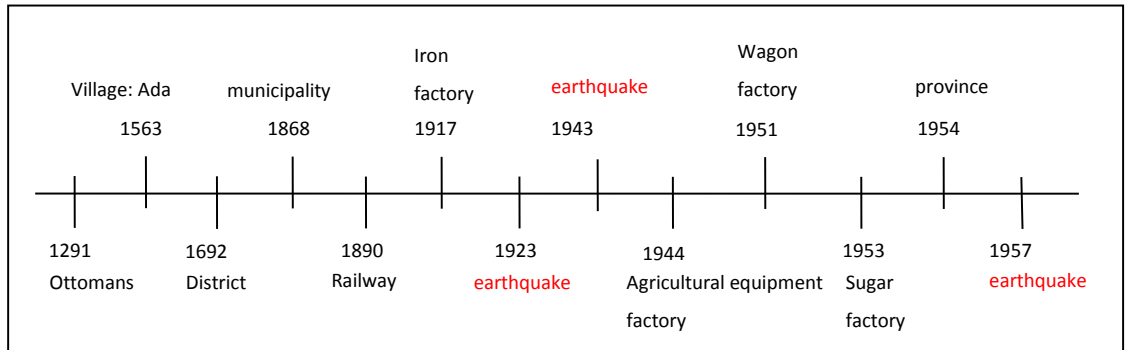


Figure 4.6. Milestones in urban development process of Adapazarı until 1957

Source. Personal rendering.

#### 4.1.1.2. Concentration: 1957-1985 period

The period covering 1957-1985 begins with the 1957 Bolu-Abant Earthquake. After the disaster, a planning study has been initiated for Adapazarı. Thus, in 1957 Mehmet Topaloğlu and his team prepared an urban development plan for Adapazarı. During this period, in 1963

Eastern Marmara Development Plan, whose decisions directly affect Adapazari's economic function and urban growth, was developed. Within the planning period of 1957 Plan, Adapazari faced with another earthquake in 1967. Then, in 1985, a master plan was developed for Adapazari, which indicates the end of the planning period. The process is summarized in the Figure 4.7.

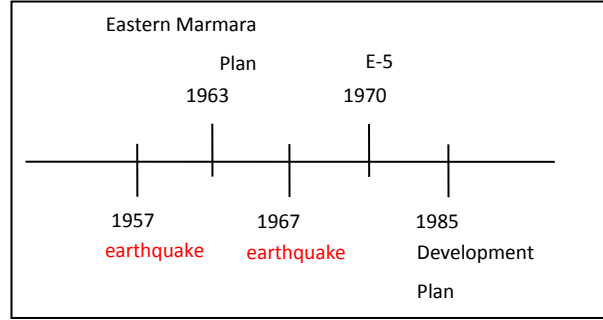


Figure 4.7. Milestones in urban development process of Adapazari between 1957-1985

Source. Personal rendering.

Since Örs' plan was limited in size and scope, there occurred the need of preparation of a general plan of Adapazari. 1957 plan of Adapazari was developed as a result of a competition prepared by Bank of Provinces. MelahatTopaloğlu, Mehmet Ali Topaloğlu and Bulent Berksan, who won the national Architectural Design Competition, were the authors of the 1957 Plan (Arkitera web page, 2011). The plan was structured for the following 20 years around an estimated population of 250,000 inhabitants that accompanies with the actual population of 1975. The plan aimed at regulating the urban growth with respect to continuous investments and hazardous geological structure (Figure 4.8).

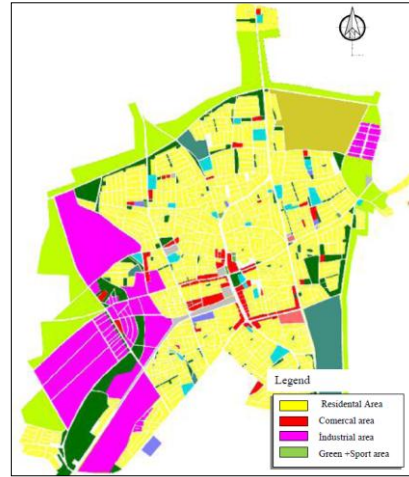


Figure 4.8. Adapazari 1957 Development Plan

Source. Bayhan, 2010; 52.

Parallel to the preparation of the plan, the urban development commission released a report indicating that the natural and geological structure of the city was not suitable for development. It is noted in the report that "*Adapazari is located in the North Anatolia Fault zone, and on a river basin... As is the case for the rest of the area in the zone, there was severe earthquake destruction in the river basin of Adapazari in previous years... During the latest serious earthquake on June 20, 1943, almost the entire city was destroyed. The most affected regions were on the northern part of the city. Location of the city is very dangerous in terms of earthquake since it is located on a river basin where the level of groundwater is very high... The old hills and slopes on the south (Erenler hill) and on the southwest (around the wagon factory) of the city are less hazardous in terms of earthquakes.*" (Gedikli, 2004, 84; Bayhan, 2010, 51). Based on these evaluations, the report made recommendations about urban growth. Firstly, it was recommended that development should be oriented where groundwater level was low. And secondly, it was suggested that sewage system of the city should be constructed at a very deep level despite the cost.

Along with this report, 1957 plan highlighted a building code system envisaging the number of floors, buildings heights, building types, constructions styles, plot widths, and depths of buildings. The maximum number of floors was determined as three. The depth of the buildings was set as 9.50 m from streets. The plan also allowed for attached buildings. Furthermore, the plan determined the growth direction. It was recommended that urban growth should be directed towards western part of the city where groundwater level was low.



In his 1957 planning proposal for Adapazarı, Topaloğlu planned Atatürk Boulevard as the main axis of the city holding commercial, administrative and recreational facilities. This axis was designed to connect the railway station to new facilities that would be developed in the central area. According to plan decisions, city center continued to grow around its historical location and along the designed axis such as Atatürk Boulevard and Karaagac Street. The Figure 4.9 shows the image of city in 1960s.



A view from northwest to southeast, 1959



City center from east to west, 1960s



Karaagac Street, 1960



City center from east to west, 1963

Figure 4.9. Adapazarı center in 1960s

Source. Sakarya Metropolitan Municipality, 2008; 16-34.

The city had developed with respect to the 1957 plan until 1970s. The Figure 4.10 illustrates limits of the city in 1970. Considering the limited technical knowledge about seismic risks, the 1957 plan made significant contributions to disaster planning. Since the plan took seismicity of the site into consideration, it proposed limited development rights. Besides, the plan provided a coding system to regulate the development over the plain. Also, it made consistent population estimation for the year 1975. In order to meet the demands of population increase, at the end of the planning period, there occurred the necessity of a new plan.

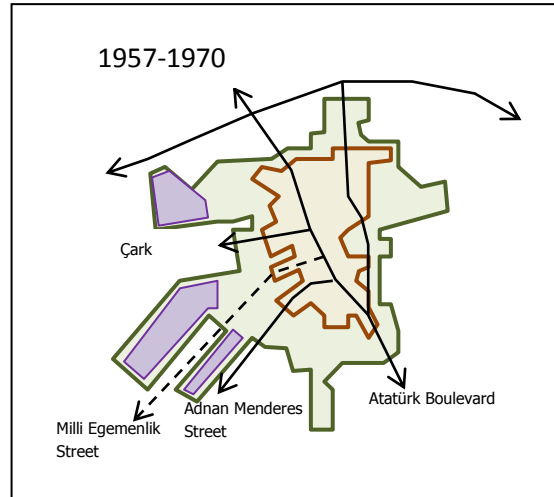


Figure 4.10. Adapazarı urban macroform analysis between 1957-1970

Source. Personal rendering.

Meanwhile, in the 1960s, Turkey experienced a planned economy period. As a result of regional strategy, roles of the cities were described as a part of a bigger frame. Adapazarı was considered within a regional planning study which determined the sectoral structure, interregional relations, population distribution, settlement hierarchy, and central functions of cities within the region. The regional planning study including Adapazarı was the Eastern Marmara Development Project.

Eastern Marmara, defined in the plan as “the most developed region of a less developed country”, is a sub-region of Marmara including İstanbul, Kocaeli, Sakarya, and Bursa provinces. However, the plan mostly dealt with İstanbul, Kocaeli and Sakarya which had interconnected problems in terms of physical structure, infrastructure and urbanization.

The plan, called as Eastern Marmara Development Project, was designed to alter the economic functioning of İstanbul from manufacturing city into a commercial and consumption center (Gedikli, 2004). Therefore, the idea of decentralization of industry from İstanbul was taken into agenda. The direction of the decentralization was decided as the eastern part of the city, up to Adapazarı. Eastern Marmara Regional Plan, holding by Ministry of Reconstruction and Resettlement during 1958-1960, was completed in 1963. The Plan supported the idea of industrial decentralization through Eastern corridor. Also, the Plan proposed the rapid urbanization of İstanbul and the development of Eastern Marmara. On the one hand, the continuous trend in both urbanization and industrialization was



emphasized in the Plan, and on the other hand, it restricted the spontaneous existence of industry.

Main goals of the plan are determined as; (i) integrating the region into national development, (ii) benefiting from the existing limited capital and development tendency of the country, (iii) encouraging urbanization, (iv) implementing interregional equity principle by considering the maximum development principle throughout the country and differentiated functionality of regions approach, and (v) supporting the welfare state through provision of investments (MRR, 1963; 7). The main issue raised in this plan is *decentralization of industry* from İstanbul to eastern corridor and *determining central functions* of the cities of Eastern Marmara. Accepting that agriculture has been losing its relative significance in Eastern Marmara, it is aimed to give a differentiated and hierarchical role to cities within the region. Therefore, analyses were undertaken in the plan to illustrate the present condition and trends. Table 4.4 and 4.5 summarize the population distribution among region and the employment distribution according to sectors.

Table 4.4. Population distribution among region

Source. Ministry of Reconstruction and Resettlement, 1963; 4.

| <b>Total pop.</b>        | <b>1927</b> | <b>1935</b> | <b>1940</b> | <b>1945</b> | <b>1950</b> | <b>1955</b> | <b>1960</b> |
|--------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>İstanbul</b>          | 794000      | 874000      | 926000      | 1005000     | 1138000     | 1475000     | 1854000     |
| <b>Kocaeli+Adapazarı</b> | 700000      | 776000      | 832000      | 897000      | 1009000     | 1132000     | 1338000     |
| <b>Urban pop.</b>        |             |             |             |             |             |             |             |
| <b>İstanbul</b>          | 691000      | 761000      | 806000      | 879000      | 1003000     | 1321000     | 1675000     |
| <b>Kocaeli+Adapazarı</b> | 167000      | 204000      | 223000      | 246000      | 288000      | 375000      | 486000      |

Table 4.5. Distribution of employment according to sectors in the year 1955 (%)

Source. Ministry of Reconstruction and Resettlement, 1963; 5.

|                        | <b>Agriculture</b> | <b>Industry</b> | <b>Services</b> |
|------------------------|--------------------|-----------------|-----------------|
| <b>Eastern Marmara</b> | 42,4               | 17,1            | 40,3            |
| <b>Turkey</b>          | 82,2               | 6,3             | 11,5            |

In addition to the population and employment figures, the plan expressed the territorial land-use of region in 1960, as shown below (Figure 4.11).



Figure 4.11. Territorial land use, 1960

Source. MRR, 1963; 100.

With respect to data about geological concerns, the plan reports that "*Adapazarı lies on the least suitable locations in terms of soil. The city locates on the fault zone and has high groundwater level. These features lead difficulties with regards to infrastructure and make high density and high-rise settlement difficult through the construction techniques of the country. The most suitable areas in terms of soil conditions are Serdivan in west, Erenler hill in south, and areas lie towards new Ankara way.*" (MRR, 1963; 144)



Figure 4.12. Geologic map of the region

Source. MRR, 1963; 104.

After determination of the present conditions of the region in terms of population, employment, land use pattern and natural structure, the plan recommended a new distribution of employment among cities and sector. According to the Table 4.6 and 4.7, it is fair to state that the plan expects a substantial development within the region. The plan was

structured around a population estimation of 1,350,000 inhabitants for Kocaeli and Sakarya for the year 1980 when the general census results figured out 513,000 inhabitants. Similarly, the plan expects an increase in nonagricultural employment concentrating in industry, construction and commerce.

Table 4.6. Estimated population

Source. MRR, 1963; 55

| Total pop.             | 1960    | 1970    | 1980    |
|------------------------|---------|---------|---------|
| <b>İstanbul</b>        | 1930000 | 3750000 | 5850000 |
| <b>Kocaeli+Sakarya</b> | 640000  | 920000  | 1350000 |

Table 4.7. Estimated employment distribution among sectors

Source. MRR, 1963; 55

|                   | İstanbul |         |         | Kocaeli+Sakarya |        |        |
|-------------------|----------|---------|---------|-----------------|--------|--------|
|                   | 1960     | 1970    | 1980    | 1960            | 1970   | 1980   |
| Agriculture       | 93600    | 113200  | 122400  | 222000          | 276300 | 331700 |
| Mining            | 3200     | 6000    | 11100   | 600             | 1000   | 1400   |
| ManufacturingInd. | 177000   | 297400  | 481000  | 26100           | 48900  | 69700  |
| Construction      | 40100    | 239100  | 438100  | 10300           | 18200  | 26200  |
| Energy            | 3900     | 9200    | 19800   | 300             | 600    | 900    |
| Commerce          | 90700    | 117200  | 222300  | 9200            | 13000  | 29200  |
| wholesale         | 13600    | 19400   | 43100   | 1300            | 2000   | 5600   |
| retail            | 60500    | 69900   | 106600  | 7200            | 9500   | 17700  |
| business          | 16600    | 27900   | 72600   | 700             | 1000   | 5900   |
| Transport, comm.  | 54000    | 94000   | 178000  | 6500            | 13900  | 26700  |
| Services          | 136500   | 175400  | 334800  | 13500           | 12400  | 21800  |
| Non-defined       | 150000   | 456000  | 742000  | 30200           | 59600  | 101800 |
| TOTAL             | 749000   | 1507500 | 2549600 | 318700          | 443900 | 609500 |

Therefore, according to the plan, it is aimed to give an international center identity to İstanbul. Besides, the plan proposes central functions to İzmit as a port city which plays a crucial role countrywide whereas Adapazarı remaining as a regional center to serve for local needs. Since the plan is conscious of the natural limitations, it limits the development of both İzmit and Adapazarı. The Figure 4.13 shows the proposed hierarchy between settlements within the region.



Figure 4.13. Regional structure proposal of Eastern Marmara Plan, 1963

Source. MRR, 1963; 136.

With respect to the demographic structure, the plan proposes that; *"It is assumed that Adapazarı which has a population over 80.000, would reach an estimated population of 380,000 inhabitants in 1980. However, high density urbanization of the population should not be expected due to the soil conditions. Therefore, the size of the new development area will be 1500-2000 hectares considering the density as 150-200 persons per hectare. The industrial area parallel to the development will cover 20,000 employment within 300 hectares."* (1963; 145)

Proposed industrial development for Adapazarı includes transport vehicles industry, agricultural industry such as food and forestry, and manufacturing (production) industry such as agricultural machinery, transport vehicles, etc. (MRR, 1963; 157).

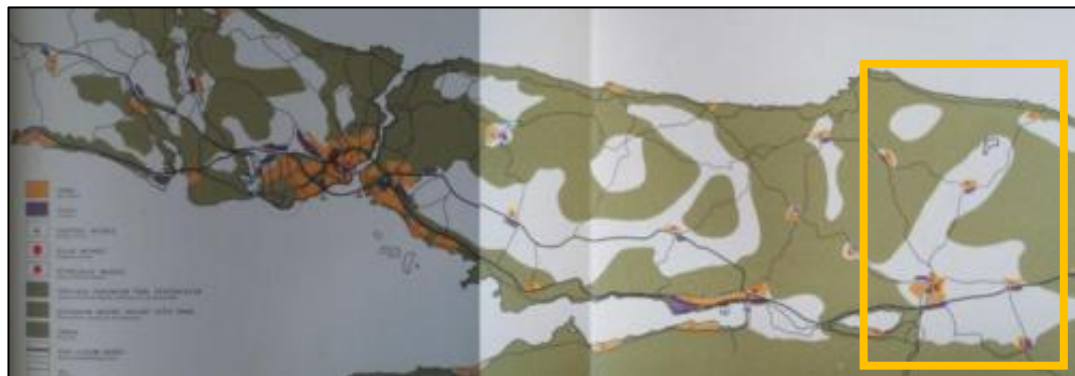


Figure 4.14. Development proposal for the region

Source. MRR, 1963; 144.

The plan reported the settlement proposals as *"the main part of the settlement which covers 1500-2000 hectares will dwell in west and south (from Serdivan to new Ankara way). Development in east is critical for protection of orchards lying through Sakarya River as well as soil conditions. The most suitable area for industry is the south part of the new Ankara way. Besides, the construction of the industrial areas locating in the west will be completed conditioning that the area separates the residential area from the center."* (MRR, 1963; 145)

To conclude, although the plan considered the seismic risks posing threat to whole region, it promoted industrial development in Eastern Marmara cities, which would be resulted in migration, urbanization and increasing urban vulnerability. Particularly, this plan proposed industrial development for Adapazarı around the new Ankara way locating in the south part of city which was known as a location on fault line. Despite the agricultural characteristic of Adapazarı, the city was supported as a regional center that could attract further industrial investments. What is critical in Adapazarı's planning history is the decision of decentralization of industry from İstanbul to eastern parts and of shifting the small town into an industrial location.

#### **4.1.1.3. Agglomeration: 1985-1999 period**

In the 1980s, the neo-liberal economy accelerated the pace of industrialization of Adapazarı. Trans-European Motorway (TEM) was constructed in 1985 which contributed to the decentralization process and the city became more attractive for new investors (Gedikli, 2004). With the establishment of Organized Industrial District, industrial development was encouraged. As the infrastructure constructed in line with requirements of industry, a great number of plants came to situate (Sengezer and Koç, 2005). The urban development and population increase of Adapazarı were observed in this period parallel to the liberal economic policy (Şengezer and Koç, 2005). Figure 4.15 summarizes the milestones in the period 1985-1999.

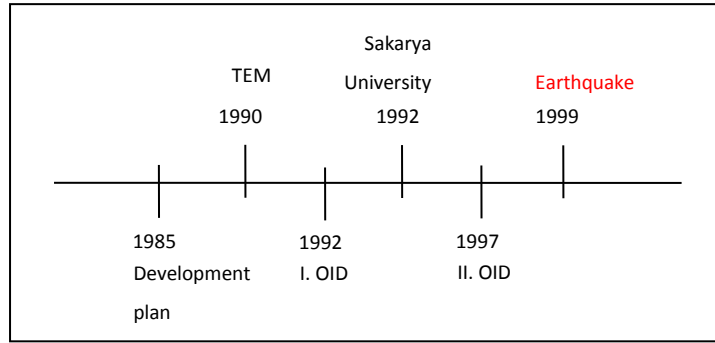


Figure 4.15. Milestones in urban development process of Adapazarı from 1985 to 1999

Source. Personal rendering.

Together with the socio-economic structuring in 1980s, Adapazarı experienced a rapid growth. Therefore, there existed the need for a new plan to regulate the restructuring of social, physical and economic environment. The 1985 development plan of Adapazarı was authored by Bülent Berksan. It aims to regulate spontaneous urban development of Adapazarı which gained pace due to industrial developments and highway construction. The 1985 plan proposes a comprehensive approach rather than partial land-use plans (Gedikli, 2004; 86). The plan includes the neighboring areas Adapazarı, Erenler and Serdivan, and also settlements around Sapanca Lake. The planned area covers 4387 ha for an estimated population of 600,000 residents (Figure 4.16).

Prior to the 1985 Plan, Bank of Provinces presented a geological report in 1982 for Adapazarı, Serdivan, Hanlıköy, and Erenler districts. This study would be the basis of planning studies by representing the seismicity of settlement districts. The report displayed possible outcomes of a further earthquake by referencing previous experiences and damages. Also, it highlighted the alluvial characteristic of soil. Therefore, the report advised considering the high groundwater table in settlement proposals. Regarding the fact that seismic sensitive structure of plain areas are not suitable for settlements, the report suggested to settle in slopes near Erenler and Serdivan which was consistent with the outcomes of 1957 Plan and 1963 Eastern Marmara Plan.

In line with this report, the 1985 Plan was prepared giving priority to seismic risks. The plan emphasized the seismic vulnerability of residential and industrial areas. Therefore, it highlighted the necessity to reside in slopes rather than alluvial plains. Parallel to this understanding, the plan proposed settlements around Serdivan in west, and Erenler in south part of the city which were determined as safer locations for settlement. The plan did not

only propose settlement areas, but also stressed the necessity to obey the building codes developed for both existing and proposed districts.

Depending on the 1985 Plan, 1/5000 scaled urban development plan and 1/1000 scaled implementation plans were prepared. According to these plans, five-storey buildings were permitted in almost all area based on width of roads. Hence, there existed multi-storey buildings over the plain despite the limitations of the 1957 Plan. That is, 1985 Plan increased the development rights that were determined in the 1957 plan.

In Berksan's Plan, a dense urban development was proposed among the city. This was to respond the population increase. Although the planner provided additional residential areas, the plan was mostly implemented on the city's existing urban structure. The scope of Berksan's 1985 planning proposal for the city center, which was primarily concerned with the existing area, was broadened towards Çark River. The plan proposed the enlargement of center with business premises and social services.

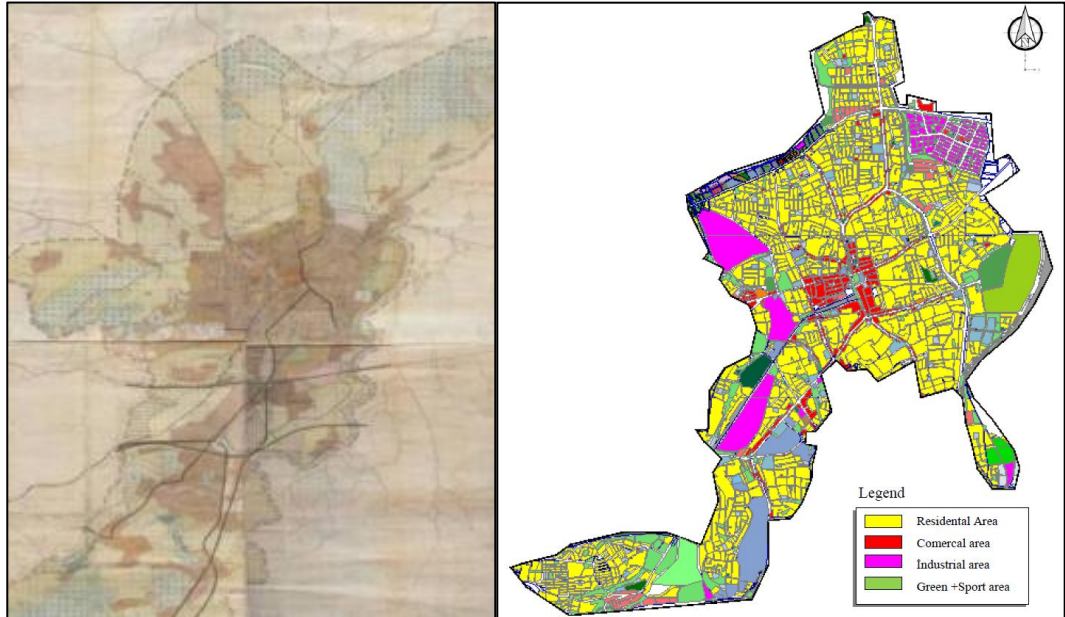


Figure 4.16. 1985 Plan of Adapazari

Source. Bank of Provinces Archive, 2011 (left), Bayhan, 2010; 56 (right).

The 1985 Plan structured the Adapazari city with modifications until 1999. There occurred exclusions in the Plan decisions in terms of number of storey which led to increase in

density. There existed apartment blocks more than five-storey despite the frame of the plan (Bayhan, 2010; 57). In time, high-rise buildings spread over the entire city from center to neighborhoods gradually (Gedikli, 2004; 86). Until the 1999 Earthquake, high-rise buildings formed the city on the plain area where soil conditions and geologic structure were not suitable for dense urbanization.

The state of development before the 1999 Earthquake could be described as attached form and high-rise buildings in center with high density, and detached form and high-rise apartment blocks around the center. The plan did not properly provide a policy for central development. Following design guides of the 1957 Plan, 1985 Plan enlarged the central area through Çark River. New development resulted in a denser urban core, and activities agglomerated within the central area. Businesses located in the center including shops, restaurants and financial services as well as other forms of activities. Since production facilities began to settle along the motorways, urban growth tended to south. This tendency was supported by the construction of E-5 Highway in 1970 and TEM in 1990. TEM attracted the industrial developments as proposed by the Eastern Marmara Development Plan, so that the city continued to grow to south. Although the organized industrial district was proposed in the north side of the transit motorway, it was situated in the southern part of the way (Gedikli, 2004; 87). Not only the OID, but also other foreign and domestic investments were located along the motorway, where the carrying capacity of land was low due to the risk of liquefaction in addition to close location to fault line. It could be said that transportation routes, therefore industrial locations played a significant role in the urban macroform. Thus, concentration of industrial development and centralization of commercial activities continued within Adapazarı until the 1999 Earthquake. For the eastern part of the city, Sakarya River was an edge for urban development. Also, with the foundation of Sakarya University in Serdivan, in the western part of the city in 1992, the growth was directed towards west. Consequently, Adapazarı macroform showed a southwest tendency to grow, as illustrated in the Figure 4.17.



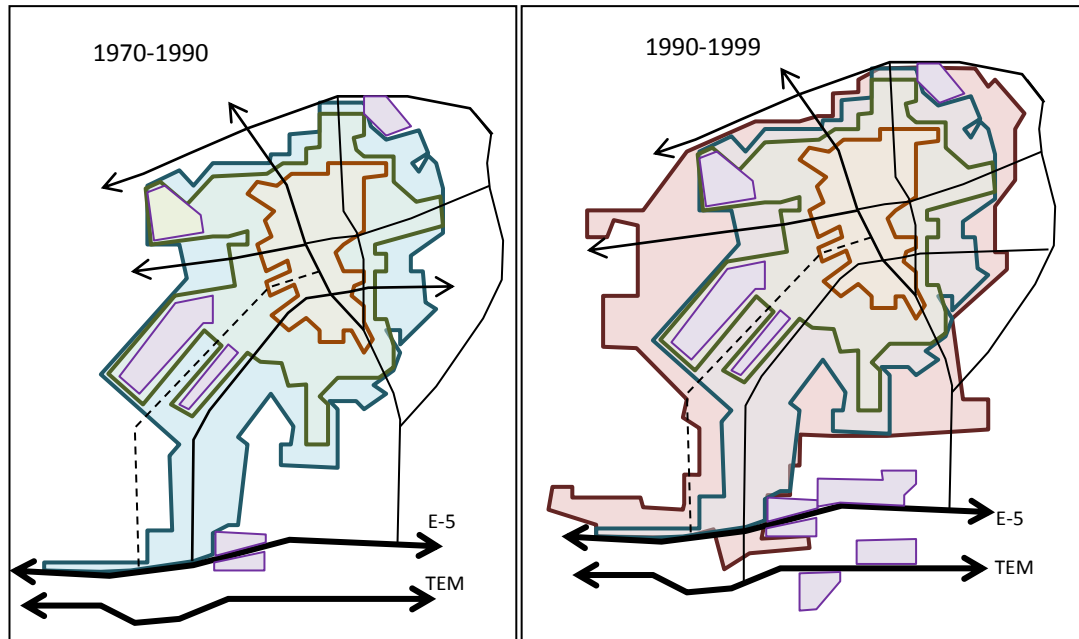


Figure 4.17. Adapazarı urban macroform analysis between 1970-1990 and 1990-1999

Source. Personal rendering.

Before the 1999 Earthquake, the city achieved an urban growth spreading to hills of Serdivan in west, Sakarya River in east, and TEM highway in south. The residential areas of Adapazarı were located around the densely built-up inner city, revealing higher seismic vulnerability. Residential areas were joined with commercial premises and offices located along both Atatürk Boulevard and Çark Street. In addition to the large scale investments, as summarized in the Table 4.8, the state of development before the earthquake achieved its limits, and had a tendency to grow along north-south directions.

Table 4.8. Land-use types within Adapazarı

Source. (1) SATSO, 2009; 159; (2) Sakarya Provincial Directorate of Industry and Commerce, 2008; (3) Sakarya University web page, 2011.

| Land-use type <sup>1</sup> | Foundation Date | Location | Area (total) | Total employment | Expected employment | Number of industrial parcels | Active firms |
|----------------------------|-----------------|----------|--------------|------------------|---------------------|------------------------------|--------------|
| 1. OID                     | 07.08.1993      | Hanlı    | 162 ha       | 7500             | -                   | 63                           | 62           |
| 2. OID                     | 07.05.1997      | Hendek   | 350 ha       | 3188             | 20,000              | 106                          | 94           |
| 3. OID                     | 08.06.1998      | Sogotlu  | 254 ha       | 3000             | 15,000              | 66                           | 28           |

Table 4.8. Land-use types within Adapazarı (cont.)

| Land-use type <sup>2</sup> | Foundation Date | Number of establishments |                              | Total employment   |                              |
|----------------------------|-----------------|--------------------------|------------------------------|--------------------|------------------------------|
| Agricultural Machinery     | 1990            | 210                      |                              | 567                |                              |
| Oto Sanko SID              | 1971            | 110                      |                              | 440                |                              |
| ASEM SID                   |                 | 20                       |                              | 140                |                              |
| Seckin furniture SID       |                 | 199                      |                              | 1150               |                              |
| Merkez Auto SID*           |                 | 88                       |                              | 150                |                              |
| Atso Cooperative           | 1980            | 657                      |                              | 1920               |                              |
| Land-use type <sup>3</sup> | Foundation Date | Number of faculties      | Number of vocational schools | Number of students | Number of academic personnel |
| Sakarya University         | 03.07.1992      | 12                       | 14                           | 50927              | 1241                         |

The review of the urban development until the 1999 Earthquake puts forward that Adapazarı city developed around its historic location. The core of the city remained as the central district and enlarged along the main roads. Similar to central district, residential areas grew with respect to the increase in population. The population growth was supported by regional policies which oriented the industrial development from İstanbul to Eastern Marmara in 1960s. With the introduction of neo-liberal economy since 1980s, this policy shifted the agricultural structure of Adapazarı into an industrial city. The shift in 1980s was responded by the 1985 Plan which gave way to increasing development rights. With the developments in construction techniques and additional development rights, the city was developed by multi-storey buildings. Thus, limits of the city have reached to Sakarya River in east and E-5 highway in south. Table 4.9 summarizes the gradual increase in population and development rights with the given plans.

Table 4.9. Plan decisions

Source. Bayhan, 2010; 65.

| Plans                         | 1957 plan            | 1985 plan      | 1999 revisions | 2006 plan*  | 2009 plan*               |
|-------------------------------|----------------------|----------------|----------------|-------------|--------------------------|
| Real population in plan years | 45,000               | 190,000        | 240,000        | 377,683     | 398,000                  |
| Planned population            | 250,000              | 600,000        | 1,000,000      | 746,000     | 760,000                  |
| Planned area                  | 1921 ha              | 2200 ha        | 2466 ha        | 2,683 ha    | 3081 ha                  |
| Proposed density              | 130 per/ha           | 300 per/ha     | 405 per/ha     | 280 per/ha  | 250 per/ha               |
| Centrality                    | Monocentric          | Monocentric    | Monocentric    | Polycentric | Polycentric              |
| Planner                       | Mehmet Ali Topaloğlu | Bulent Berksan | Municipality   | Belda       | Inta-Kentmap Partnership |

Table 4.9. Plan decisions (cont.)

| Plans                 | 1957 plan              | 1985 plan             | 1999 revisions          | 2006 plan*              | 2009 plan*              |
|-----------------------|------------------------|-----------------------|-------------------------|-------------------------|-------------------------|
| Development           | Around center          | Around center         | Around center           | Sub-urban               | Sub-urban               |
| Housing development   | South (west)           | South                 | No suggestion           | Sub-urban               | northwest               |
| Sub center            | no                     | no                    | no                      | yes                     | yes                     |
| Industrial location   | Within city limits     | Out boundary          | Out boundary            | Out boundary            | Out boundary            |
| Industrial area       | 265 ha                 | 100 ha                | 109 ha                  | 286 ha                  |                         |
| Residential area      | 739 ha                 | 820 ha                | 973 ha                  | 1241 ha                 |                         |
| Commercial area       | 43 ha                  | 85 ha                 | 104 ha                  | 373 ha                  | 109 ha                  |
| Green area            | 250 ha                 | 244 (310) ha          | 232 (260) ha            | 417 ha                  | 229 ha                  |
| Green area per person | 10 m <sup>2</sup> /per | 5 m <sup>2</sup> /per | 2.6 m <sup>2</sup> /per | 5.5 m <sup>2</sup> /per | 3.0 m <sup>2</sup> /per |
| Proposed floor number | 2-3 floor              | 3-4-5 floor           | 3-4-5 floor             | Max. 2 floor            | Max. 2 floor            |
| Building formation    | detached               | detached/attached     | attached                | detached                | detached                |
| Functions             | Separate               | mixed                 | mixed                   | mixed                   | mixed                   |

\* donates the values for Adapazarı rather than whole planned area

As illustrated in the Table 4.10, the urban growth continued despite seismic risks and experienced disasters. It could be said that, until the 1999 Earthquake, Adapazarı gathered socio-economic and physical vulnerabilities as a result of the regional and urban policies. The policies applied at national and local level have led to the development of urban area and respectively, construction of vulnerabilities. Table 4.10 introduces an evaluation of urban vulnerability in case of Adapazarı based on each predetermined periods in reference to the factors increasing urban vulnerability explained in the literature review chapter.

Table 4.10. Evaluation of urban vulnerability for different periods

| Periods             | Policies                                                                   | Socio-economic consequences                               | Physical consequences                                                   |
|---------------------|----------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------------------|
| <b>Before 1950s</b> | State-led industrialization                                                | Small town<br>Agricultural employment                     | Limited growth<br>Continuity of historical location                     |
| <b>1957-1985</b>    | Regional policies directing industrial development<br>Planned urban growth | Urban population growth<br>Demand to locate in urban area | Urbanization over weak soil<br>Rapid urbanization to meet housing needs |

Table 4.10. Evaluation of urban vulnerability for different periods (cont.)

| Periods          | Policies                                                                    | Socio-economic consequences                                                            | Physical consequences                                                     |
|------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <b>1985-1999</b> | Private entrepreneurship in industrial development                          | Urban population growth<br>Increase in industrial employment<br>Need for housing       | Industrial concentration<br>Dense urbanization<br>High development rights |
| <b>1999-2010</b> | Avoidance from hazard-prone area<br>Development in new settlement districts | Increase in urban population<br>Integration problem between new area and existing city | Reduced development rights in downtown<br>Central development in downtown |

According to the given socio-economic and physical factors, it could be noted that earthquake risks and the urban vulnerability were produced by the intense urbanization. Balamir defines the reasons behind the rapid urbanization and the vulnerability as (i) historical factors affecting settlement decisions, (ii) increasing population growth resulting in a rapid and uncontrolled urbanization, (iii) improvements in construction technology accelerating construction process, (iv) additional development rights leading to increase in density of building stock, and (v) ineffectiveness of auditing mechanisms (2007b: 35).

According to Keskinok (2001), vulnerability of cities depends on the factors affecting planning, engineering and design processes. These factors could be grouped as (i) regional development strategies and urbanization policies, (ii) city planning and urban growth regulation instruments as land use, microzonation, density restriction, and development guides, and (iii) control in construction process, and design and engineering choices regarding building (Keskinok, 2001). This means, regional development and urbanization policies, city planning, building design and construction are the processes that determine the urban vulnerability. It is claimed that urban vulnerability depends on land-use and density decisions as well as construction quality. Keskinok (2001) argues that engineering problems could be overcome possible physical disruptions; but in a country with limited resources and economic ability, risks should not be left to the last stage, i.e. engineering solutions. Therefore, the relation between these processes should be kept in a balance without preferring one to another. The steps should be as; (i) formulation of a regional development and urbanization policy regarding earthquake and risks; (ii) regulating the development from regional to localities regarding the same measures; and finally (iii) implementing true engineering decisions to building (Keskinok, 2001).

According to the study of Brauch (2003; 156) covering Mediterranean cities between 1975 and 2001, the extent of damage and fatalities led by geophysical disasters depend mostly on vulnerability of urban centers. For Brauch, reasons of the continuing vulnerability of Turkish cities are; population growth and urbanization, failure to apply existing building regulations consistently, and sites of industrial facilities (2003; 158).

Şengezer and Koç (2005) list the factors that increase the vulnerability in Turkey, as well as other developing countries as the absence of political saliency; uncoordinated and conflicting policies; uncontrolled urban growth and expansion of slums; weak design and building techniques; uncontrolled construction process; lack of enforcement of land-use regulations; inadequate technical personnel; and limited financial resources to upgrade building stock by seismic-sensitive construction technologies (2005; 171). Their primary criticism about the Turkish planning system includes the inadequacy of planning hierarchy; limited spatial concern of both central and local authorities; inadequacy of planning tools and evaluation techniques; and politicized decision-making processes not allowing public participation (2005; 174). Due to the problems exist in Turkish planning system, Şengezer and Koç stress the ineffectiveness of planning in managing disasters for a sustainable mitigation approach (2005).

Gedikli highlights regional policies, particularly industrialization and urbanization, unsuitable land-use planning and engineering processes in order to explain the reasons of vulnerability (2004). Within this context, critical points of land-use planning and engineering processes are listed as "unsuitable site selection, permission for plan amendments without a comprehensive evaluation of their possible effects, inadequate engineering services, and insufficient control of construction process" which have continued up to the Earthquake (Gedikli, 2004: 84).

To conclude, the 1999 Earthquake hit the city of Adapazarı and led to severe damage within the city. The disaster resulted to a multitude of problems in physical, social, economic, environmental, political and spatial aspects. Since the dimension of the spatial effects is the subject of the thesis, we will focus on the urban restructuring led by the location preferences of businesses after the disaster. Before examining the location choices of businesses, it is required to display the planning process run after the earthquake. Therefore, next part will present the implementations and plan proposals taken after the disaster. It is aimed to reveal what has been proposed and what has happened in spatial aspect after the disaster.

#### **4.1.2. Post-disaster period of urban growth in Adapazarı**

This part of the study identifies the post-disaster period and the policies that shape the present urban structure of the city.

Having experienced Marmara and Düzce Earthquakes in 1999, Adapazarı has suffered from the geophysical hazards which led to a number of changes within its territory in social, economic and physical terms. The earthquake has a considerable influence on the city and residents. The affected population was decided to be resettled which led to restructuring of existing urban area.

Resettlement would be a common attitude of Prime Ministry for Marmara Region's damaged districts (Gedikli, 2004). General Directorate of Mineral Research and Exploration was responsible for determination of suitable sites for settlement. The final report of the Directorate included information related to agricultural, forestry and conservation areas, and transportation network (Gülersoy et al., 2003). In line with the report, land-use plans of resettlement sites in the Region were prepared according to the geological conditions.

The resettlement site for Adapazarı was selected in the northern part of the city where the soil structure was determined as relatively safer according to geotechnical analysis. The site was allocated to housing development over 1200 hectares and left to the commitment of Adapazarı Metropolitan Municipality (Gülersoy et al., 2003). The permanent housings were under the legal responsibility of Ministry of Public Works and Settlement. The resettlement plan of permanent housing was prepared by Bank of Provinces and three different project areas were determined. The permanent housing in Karaman district was implemented by Ministry of Public Works and Settlement, Camili-Resuldivan was undertaken in the collaboration of World Bank and Prime Ministry, and third district was left as a reserve area (Gülersoy et al., 2003). Mass Housing Organization and private enterprises constructed the housing blocks and delivered to the right owners.

The planned area has a density of 120 people per hectare. The areas were designed with three-storey detached apartment blocks (Figure 4.18). The objective was to develop a center which would attract businesses and institutions that normally seek prime city-center sites. The idea of designing residential districts with commercial and service areas aims to develop an urban life separate from the existing town. Hence, the area was decided to be not only the resettled district, but also the growth direction of the city.



Figure 4.18. Permanent housing district, Adapazarı

Source. Google Earth, last achieved in February 2011 (left), personal archive, 2011.

The area has been inhabited since 2001. The residential area of resettlement districts are representatives of the Mass Housing Organization's style of housing developments: separately sited in relation to the contours and features of the landscape, but not forming a dense and qualified urban structure. Since the area is about 9 km away from the city center and connected only with a motorway by buses and minibuses, people have to commute the center for their daily needs. The intersection of the motorways was decided as an urban square to gather the facilities such as trade, health, culture, education, bazaar, administration units and terminal (Gülersoy et al., 2003). Meanwhile, the planned social facilities and services such as schools, cultural and administrative centers and trade activities has been constructing in the residential area. Since the social facilities could not run in accordance with the dwelling units, people did not move the area immediately after the disaster. The housing district alone could not attract people; therefore they preferred to dwell within the city as tenants within the main city. In the existing city, development rights were revised and reduced from five to two-storey.

During the time of earthquake, the city of Adapazarı has gone through a period of momentous change. The construction of new settlement areas had a considerable influence on city and central facilities. Households and government establishments moved out of the damaged center and relocated in the new resettlement district. However, existing city continued to hold commercial facilities and production units.

#### **4.1.2.1. Relocation and fragmentation: Post-1999 period**

The post-disaster period was primarily concerned with provision of housing to affected inhabitants in geologically safer locations, so that resources were allocated to resettlement and reconstruction activities in the recovery period. This period witnessed two macro plans

which aimed at regulating the urban growth in Sakarya, particularly Adapazarı. The plans, in the light with resettlement initiatives, proposed development of “secondary cities” on publicly owned land in Karaman, Korucuk, Camili districts, in connection with the Adapazarı center. The milestones of the post-disaster process are illustrated in the Figure 4.19.

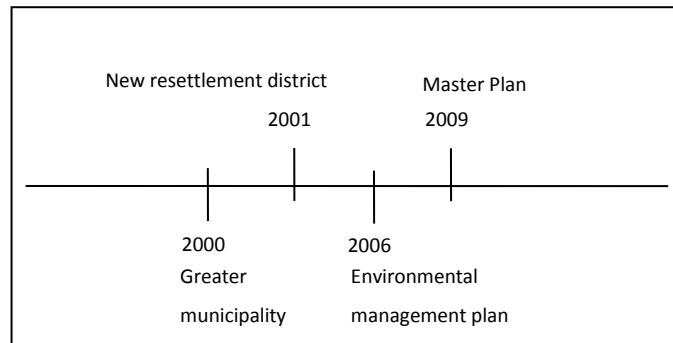


Figure 4.19. Milestones in urban development process of Adapazarı since 1985 to present  
Source. Personal rendering.

The 1/25,000 Master Plan of Adapazarı, approved in 2006, was prepared due to the planning need of the urban development occurred after the 1999 Earthquake. The plan still provides the basic framework for the development of Adapazarı and its surroundings. The main goal of the plan is to integrate the permanent housing areas constructed after earthquake into the main city, Adapazarı. The vision of the plan aims to generate an urban area which reaches economic welfare and social development as well as the merits of a livable, competitive, productive, and well-equipped settlement system (Belda, 2006; 2). In order to achieve the vision, the plan determines missions, strategies and goals in terms of economic, social, spatial and environmental issues. Disaster risks and urban vulnerability are investigated within spatial concerns. The report emphasized hazard vulnerability of the city in the main strategies such as “considering seismic characteristic of the city and its specific conditions, and protecting both citizens and urban development” (Belda, 2006; 3). In line with this strategy, the new settlement areas will become a part of a relation such as ‘center-periphery’ or ‘system-part’ by gaining special functions.

The plan developed two alternative scenarios in terms of population and employment, namely ‘do-nothing’ model and ‘Adapazarı under the influence of Eastern Marmara’ model. For the former model, the city will grow around its present development tendencies and



functions until 2030, and will present a center-periphery form of relation with the resettlement district. By this way, the city will have a fragmented macroform, containing differentiated functions of pieces. The latter scenario provides a model based on regional dynamics. According to this model, urban development will be oriented towards north-west direction. Therefore, the urban macroform will reveal a jointed form of relations among the pieces which shows a center-north-west direction growth.

Before the planning study, Research-Planning-Coordination unit of Sakarya Greater Municipality analyzed the geologic, hydro-geologic, seismicity, fault lines, forestry, soil conditions, and agricultural areas of the planning area. According to the survey results, the planning team chooses the best location for Adapazarı urban development. In line with this report and alternative scenarios, the second model supporting the essence of regional dynamics and the urban growth in north-west direction is selected.

The plan proposes that the current center of Adapazarı continues to hold its central functions whereas residential functions relocate to north and northwest directions. The plan claims that in order to integrate new settlements into main city, a comprehensive and new infrastructure system and a railway system between settlements should be created. Also, the plan suggests that social services should be hierarchically distributed among settlements. Plan decisions related to macroform development include that (Belda, 2006; 18);

- Main city contains both urban and rural functions within its center.
- Considering seismicity, urban settlements locate far away each other in physical terms on safe areas. Agricultural and forest areas separate these settlements which provide open and green space requirements.
- Adapazarı settlement has two parts which are differentiated from each other in functional terms. Adapazarı holds working places to provide service and production facilities including CBD, university, public institutions, education, health, culture and sport facilities, 1<sup>st</sup> OİD, and other industries and working units for city and sub-region, whereas the new settlements provide residential areas, specialized retail commercial areas, administrative and health services, cultural and education facilities such as second university. At the end of the planning period, estimated population of the main city will be 396,000 whereas new settlement areas will hold 350,000 inhabitants.

- The estimated population of counties within planning study borders are determined as;

| County          | Population | Function                                       |
|-----------------|------------|------------------------------------------------|
| Hendek          | 90,000     | Industry, commerce, culture, education, health |
| Akyazı          | 70,000     | Center of rural needs                          |
| Sapanca         | 70,000     | Recreation, tourism center                     |
| Ferizli-Soğutlu | 55,000     | Suburban center and industry                   |
| Karapürçek      | 10,000     | Suburban center                                |

- The new population distribution of neighborhoods within Adapazarı are demonstrated as;

| Neighborhood | Population | Function                                |
|--------------|------------|-----------------------------------------|
| Erenler      | 50,000     | CBD, commercial, need of transformation |
| Serdivan     | 120,000    | Residential                             |
| Arifiye      | 20,000     | Open spaces and limited residential     |
| Hanlı        | 3,000      | No additional functions                 |
| Güneşler     | 8,000      |                                         |
| Bekirpaşa    | 8,000      |                                         |
| Kazımpaşa    | 10,000     |                                         |
| Nehirkent    | 7,500      |                                         |
| Yazlık       | 7,500      |                                         |

The 2006 plan proposes that central business district of Adapazarı will stay in the same location with a growing direction through D100 motorway in south. Despite the fact that south part of the city, near D100 motorway is not suitable for urban development, especially for dense uses, the plan supports the idea of attracting more investments around the motorway. For manufacturing industry, the plan accepts the development of previously proposed OIDs, so that the size of OIDs will cover 1,850 ha area. The type of industry locating in the city will be technology intensive industries which do not lead to environmental problems.

Table 4.11. Proposed land-uses for planned area

Source. Belda, 2006; 29.

| Land-use type                         | Area (ha) | Ratio (%) | Land-use type                 | Area (ha) | Ratio (%) |
|---------------------------------------|-----------|-----------|-------------------------------|-----------|-----------|
| Residential areas                     | 15,884    | 11.64     | Health                        | 182       | 0.13      |
| Commerce (CBD)                        | 1,020     | 0.75      | Tourism                       | 376       | 0.28      |
| Sub-centers (commerce)                | 1,046     | 0.77      | Transportation                | 1,168     | 0.86      |
| Wholesale commercial                  | 73        | 0.05      | Open and green spaces         | 5,020     | 3.68      |
| Organized industrial districts        | 1,121     | 0.82      | Organized agriculture         | 990       | 0.73      |
| Other industries                      | 731       | 0.54      | Technical infrastructure      | 58        | 0.04      |
| Small scale industry                  | 157       | 0.12      | Agriculture                   | 60,252    | 44.17     |
| Energy                                | 33        | 0.02      | Forestry                      | 46,268    | 33.92     |
| Working places (non-residential uses) | 4,698     | 3.44      | Other (military, river, lake) | 1,032     | 0.76      |
| Education                             | 474       | 0.35      | Total                         | 136,406   | 100       |

For transportation aspect, the plan proposes three additional motorways connecting new settlements to D100 motorway and passing outer parts of the main city. The aim of the decision is to support development proposals intensely for Akyazı, Hendek and Ferizli-Söğütlü in addition to new settlements. Besides, a railway is suggested to connect new settlements and Adapazarı center. The light rail system is decided to operate between Adapazarı station, Sugar industry and new settlements. Figure 4.20 shows the proposed land-use of the 2006 Master Plan.

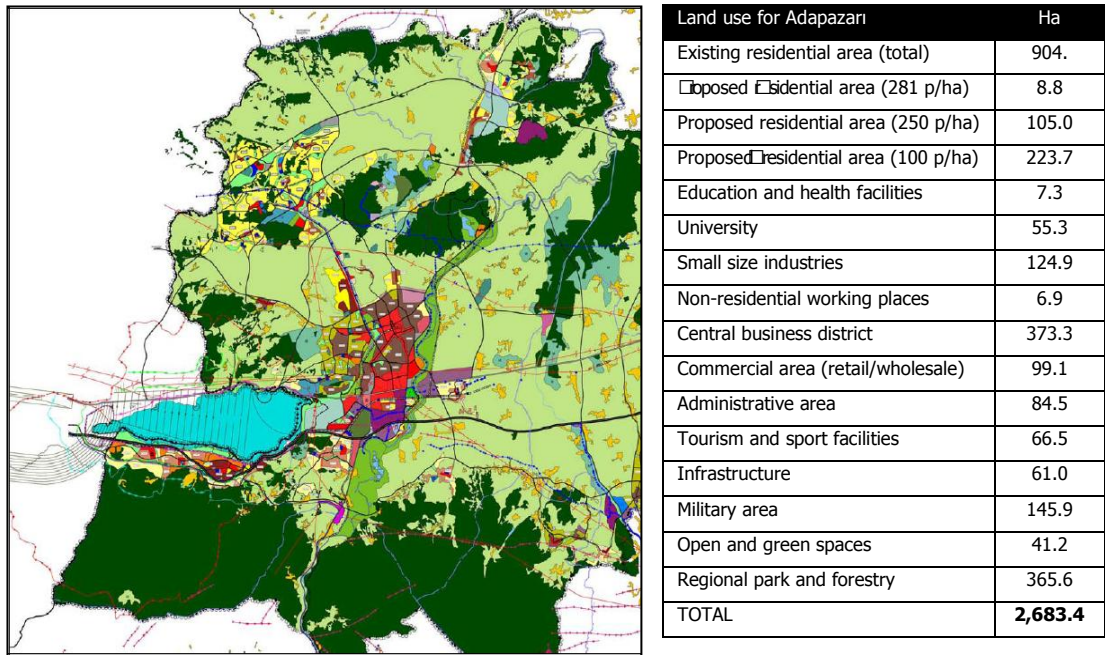


Figure 4.20. Proposed land-use of 1/25,000 master plan of Adapazarı

Source. Belda, 2006; 14.

The 1/100,000 scale Environmental Management Plan (EMP), approved in 2009 and targeting 2025, aims to determine goals and strategies of planned area to provide a basis for further planning studies.

The 2009 Plan argues that Regional relations of Adapazarı are dependent on the decisions of 1/100,000 İstanbul Environmental Management Plan of İstanbul Metropolitan Planning and Urban Design Center (IMP) which is approved in 22.08.2006. The EMP of Sakarya follows the proposals and decisions of the IMP. The Plan of IMP expresses the strengthening role of İstanbul in global markets, so that the plan supports technology intensive industries and

business sector for the city. Therefore, the vision of the IMP Plan is to restructure İstanbul as a global center for finance, logistics, tourism and culture between Europe, Asia, and Middle East (IMP, 2006; 19). Similar to the decisions of 1963 Eastern Marmara Development Plan, the main policy of the IMP plan is the decentralization of industry towards periphery of İstanbul in order to develop service sector in inner parts of the city. Therefore, the industry is expected to relocate in east-west axis of İstanbul, including Çorlu, Çerkezköy in west and Gebze, Kocaeli and Sakarya in east.

Under the regional dynamics, the vision of the 2009 plan of Adapazarı is determined as a city which is active in culture and art, in addition to industry, commerce and agriculture with its strong local government and a complete infrastructure, in order to cope with environmental problems and enhance its ability in science and technology (Kentmap, 2009; 5).

According to the vision statement and considering the seismic risks, the plan report states that "further planning studies should regard the local soil conditions, building features, all possible problems related to seismicity and environment. Also, these plans should imply the ordinances of "Building codes in disaster-prone zones" (*Afet bölgelerinde yapılacak yapılar hakkında yönetmelik*) (Kentmap, 2009; 11).

The plan report notes that settlement areas should be determined according to geological and geotechnical surveys and categorized as (i) areas suitable for settlements; (ii) areas which are not allowed to settle without taking measures, (iii) areas required detailed geotechnical analysis, and (iv) areas unsuitable for settlement (Kentmap, 2009; 12).

In addition to environmental factors, the report evaluates economic conditions of Sakarya in terms of agriculture, industry, tourism and public services. For industrial development, the report recommends to support the modernization of heavy industry with technological and managerial methods and the development of middle scale industry and heavy industry under certain environmental conditions (Kentmap, 2009; 20). Although the report mentions the environmental problems caused by industries in terms of water and environment pollution, it does not clearly define the vulnerabilities of industries and possible outcomes in case of disasters.

The plan proposes that industrial employment will increase by completing vacant areas within existing OIDs and by constructing three additional OIDs whose projects has been completed. As a result of the increase in employment in industry, service sector is expected

to grow. On the other hand, the plan estimated a decrease in the share of agricultural employment (Table 4.12).

Table 4.12. Proposed distribution of employment among sectors

| Sector      | 2000       |     | Additional<br>employment | 2025       |     |
|-------------|------------|-----|--------------------------|------------|-----|
|             | Employment | %   |                          | Employment | %   |
| Agriculture | 163 540    | 52  | 28 423                   | 191 963    | 33  |
| Industry    | 39 649     | 13  | 89 618                   | 129 267    | 22  |
| Service     | 111 564    | 35  | 151 880                  | 263 444    | 45  |
| Total       | 314 753    | 100 | 269 921                  | 584 674    | 100 |

Furthermore, the report explains spatial goals as (1) to develop settlements with respect to the protection of natural resources and natural values such as topography, climate, geologic structure, etc., (2) to reduce urbanization costs and to improve living quality, (3) to strengthen transport connections, (4) to improve technical and social infrastructure, (5) to develop renewable energy resources, and (6) to integrate rural settlements into plans (Kentmap, 2009; 26). Although the report indicates the relation between natural resources, pollution and industrial development and urbanization, it does not clearly mention seismic risks within spatial goals. Besides, the report does not obviously put forward concrete measures to prevent settlements from seismic risks and to reduce vulnerability. Rather, it only words that “urban development is planned according to the environmental protection standards, flood, and seismicity” (Kentmap, 2009; 28).

In spatial sense, Adapazarı is expected to continue to be the central county of the province. Also, the plan proposes that Adapazarı will cover all facilities of a metropolitan center at the end of a planning period. Besides, the plan determines the role of other counties in the province by considering regional tendencies. To illustrate, new settlement area will include a sub-center having retail commerce and cultural facilities. Hendek and Akyazı will be specialized due to their close location to D100 highway. Depending on these goals, the estimated population distribution among counties of Sakarya is shown in the Table 4.13, and the land-use for proposed plan year is figured out as in the Table 4.14.

Table 4.13. Estimated population distribution for 2025

Source. Kentmap, 2009; 52.

| County     | 2000    | Estimated population for 2025 |        |           |        |         |        |
|------------|---------|-------------------------------|--------|-----------|--------|---------|--------|
|            | Total   | Total                         | %      | Urban     | %      | Rural   | %      |
| Adapazarı  | 340,825 | 760,000                       | 50,67  | 660,000   | 60,69  | 100,000 | 24,24  |
| Hendek     | 77,536  | 135,000                       | 9,00   | 75,000    | 6,90   | 60,000  | 14,55  |
| Akyazı     | 63,703  | 125,000                       | 8,33   | 65,000    | 5,98   | 60,000  | 14,55  |
| Karasu     | 54,630  | 80,000                        | 5,33   | 50,000    | 4,60   | 30,000  | 7,27   |
| Geyve      | 44,907  | 70,000                        | 4,67   | 35,000    | 3,22   | 35,000  | 8,48   |
| Sapanca    | 36,496  | 65,000                        | 4,33   | 50,000    | 4,60   | 15,000  | 3,64   |
| Pamukova   | 30,676  | 55,000                        | 3,67   | 40,000    | 3,68   | 15,000  | 3,64   |
| Kaynarca   | 24,383  | 45,000                        | 3,00   | 25,000    | 2,30   | 20,000  | 4,85   |
| Ferizli    | 24,339  | 40,000                        | 2,67   | 25,000    | 2,30   | 15,000  | 3,64   |
| Kocaali    | 24,072  | 40,000                        | 2,67   | 20,000    | 1,84   | 20,000  | 4,85   |
| Söğütlü    | 14,316  | 35,000                        | 2,33   | 20,000    | 1,84   | 15,000  | 3,64   |
| Karapürçek | 11,073  | 30,000                        | 2,00   | 12,500    | 1,15   | 17,500  | 4,24   |
| Taraklı    | 9,212   | 20,000                        | 1,33   | 10,000    | 0,92   | 10,000  | 2,42   |
| Total      | 756168  | 1.500.000                     | 100,00 | 1.087.500 | 100,00 | 412.500 | 100,00 |
| %          | 100.00  | 100,00                        |        | 72,50     |        | 27,50   |        |

Table 4.14. Land-use for 2025 (ha)

Source. Kentmap, 2009.

| County       | Existing      |               | Addition      | Absolute agriculture | Forestry, Pasture, Agriculture | Other*        | Total          | %      |
|--------------|---------------|---------------|---------------|----------------------|--------------------------------|---------------|----------------|--------|
|              | Urban         | Rural         |               |                      |                                |               |                |        |
| Adapazarı    | 5.832         | 1.022         | 7.162         | 21.422               | 31,42                          | 4.472         | 71.330         | 14,80  |
| Akyazı       | 1.801         | 2.501         | 1.473         | 7.914                | 46,188                         | 1.799         | 61.676         | 12,79  |
| Ferizli      | 450           | 541           | 619           | 2.260                | 344,054                        | 662           | 16.918         | 3,51   |
| Geyve        | 451           | 646           | 582           | 3.985                | 1025,557                       | 2.290         | 65.480         | 13,58  |
| Hendek       | 1.618         | 2.105         | 1.768         | 8.952                | 579,325                        | 499           | 65.796         | 13,65  |
| Karapürçek   | 90            | 310           | 245           | 1.284                | 10,321                         | 164           | 12.414         | 2,58   |
| Karasu       | 961           | 1.277         | 1.687         | 2.624                | 30,855                         | 3.563         | 40.967         | 8,50   |
| Kaynarca     | 105           | 617           | 666           | 4.269                | 376,102                        | 2.769         | 32.880         | 6,82   |
| Kocaali      | 274           | 721           | 560           | 1.266                | 21,526                         | 1.017         | 25.364         | 5,26   |
| Pamukova     | 301           | 479           | 200           | 4.800                | 20,749                         | 1.007         | 27.536         | 5,71   |
| Sapanca      | 1.257         | 375           | 483           | 1.189                | 182,956                        | 869           | 18.298         | 3,80   |
| Söğütlü      | 171           | 346           | 543           | 3.124                | 241,091                        | 547           | 15.053         | 3,12   |
| Taraklı      | 58            | 175           | 210           | 726                  | 605,754                        | 887           | 28.390         | 5,89   |
| <b>Total</b> | <b>13.369</b> | <b>11.115</b> | <b>16.198</b> | <b>63.815</b>        | <b>357,058</b>                 | <b>20.545</b> | <b>482.100</b> | 100,00 |
| %            | 2,77          | 2,31          | 3,36          | 13,24                | 74,06                          | 4,26          | 100,00         |        |

\* donates transportation network and water elements

In this sense, the proposed spatial pattern has developed in the line with the strategic goals and population estimations. As illustrated in the Figure 4.21, Adapazarı is expected to grow in east, north and south parts of the existing structure. Sakarya River continues to be an

edge for the urban development. The plan recommends settling in the previously planned areas so that it does not propose any additional land provision for development. Development priority is given to Serdivan district. Besides, for the downtown area reduced development rights are preserved due to seismicity.

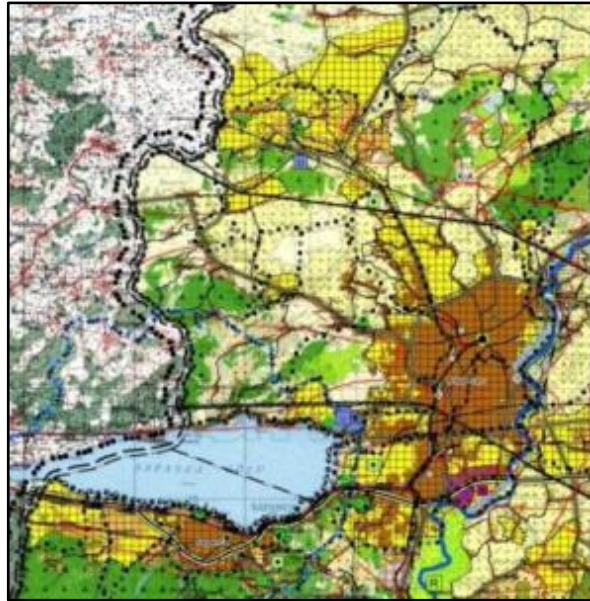


Figure 4.21. Sakarya 1/100,000 Environmental Management Plan (Adapazarı and its surroundings)

Source. Sakarya Metropolitan Municipality, 2009.

The EMP determines the conditions applied in sub-scale plans with respect to disaster risks. There are two main conditions which are defined as areas having development plans without construction and areas without development plans. For the areas having development plans without construction, the plan suggests that;

- Construction is banned on the river basin and areas which are potentially under the risk of flood. Construction is permitted in surrounding areas if the relevant measures are taken.
- Road network should not only be planned according to traffic volume of the region, but also planned adequate to carry additional volume in case of emergency. Therefore, main roads in development plans should be 15 meters in minimum, and should lie parallel to fault lines.

- Balanced urban green areas and open spaces network should be created according to the standards of the Act no.3194 in order to provide buffer zones and gathering nodes.

For the areas without development plans, the plan offers that;

- Plans are only prepared after approving the geological and geotechnical analysis which shows the soil conditions of the proposed area and its appropriateness for settlement.
- Road network should not only be planned according to traffic volume of the region, but also planned adequate to carry additional volume in case of emergency. And plan revisions which reduce main roads will not be permitted.
- Plan revisions that diminish active green areas will not be permitted since the open spaces serve as gathering places in post-disaster period.
- Open spaces serving on the purpose of gathering places, temporary settlements and centers for emergency and management should be determined.
- Measures should be taken for disasters such as land slide and flood in the line of relevant act before the disaster occurrence.

To conclude, the EMP of Sakarya aims to develop the city as a part of regional dynamics by encouraging industrialization. However, it does not mainly deal with the vulnerable characteristic of the city, so that, it becomes inadequate to develop prevention measures. Experiencing earthquakes and challenging with their consequences, especially after 1999, the plans are expected to focus on mitigation measures and to develop a resilient city. However, the 2006 EMP of Sakarya remains inadequate to meet the requirements of a resilient city.

As a result of these plans, the main city achieves an urban growth between 1999 and 2012, as illustrated in the Figure 4.22.



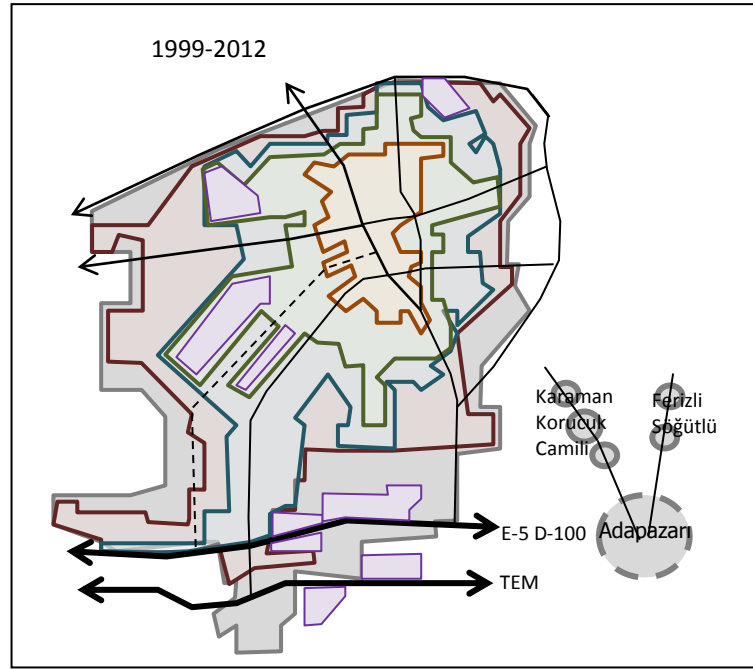


Figure 4.22. Adapazarı urban macroform since 1999 to present

Source. Personal rendering.

The current state of development of Adapazarı city achieves a fragmented structure. Figure 4.23 shows the post-disaster limits of the city, today, that have been developing with respect to the 2006 and 2009 plans. Since the policies after the earthquake have served for the development of permanent housing apart from the main city, macro-scale plans of the city are faced with the problem of fragmentation.

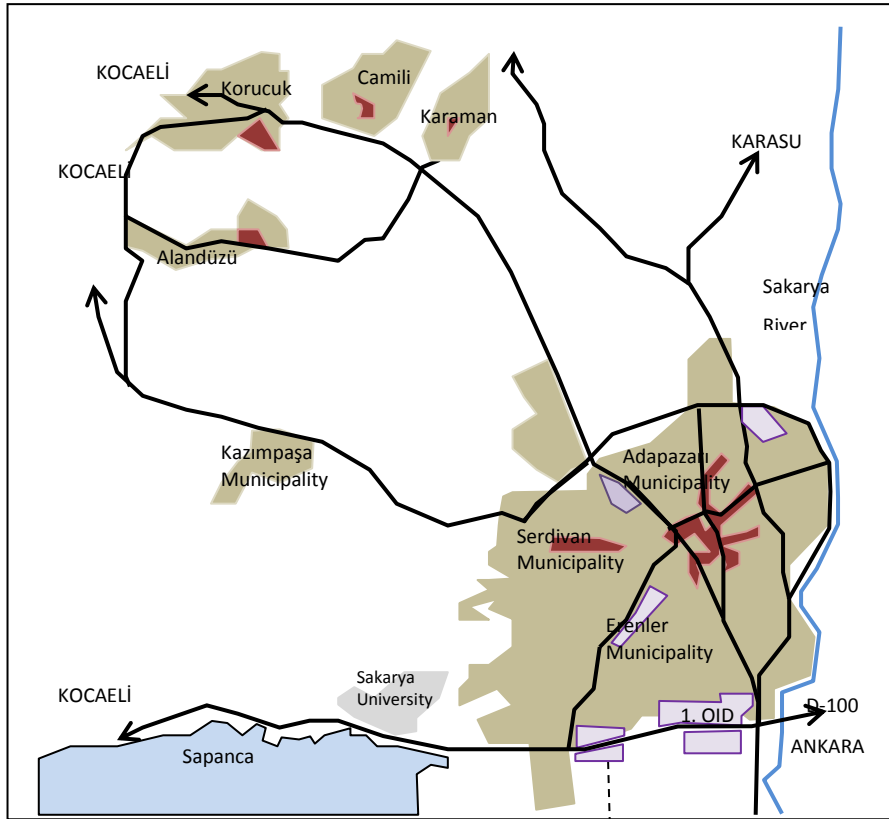


Figure 4.23. State of development in present situation

Source. Personal rendering.

## 4.2. CONCLUSION

The **core** of the Adapazarı city developed on the seismically sensitive plain. Despite its agricultural productive capacity, development scenario of the city was drawn together with İstanbul which has been the locomotive of the economy in the region. The seismic vulnerability of the city produced through the regional plan decisions which aimed at shifting İstanbul's economic base from industry to finance. The Eastern Marmara Development Plan (1963) supporting industrial decentralization of İstanbul through eastern corridor was a catalyst for the production of the vulnerability, in other words urbanization irrespective of seismic risks, for Adapazarı. Therefore, the city's economic base shifted to industrial production as a result of the increasing pace in industrialization of İstanbul.

The reflection of this macro-level decision could be observed in the urban area as a **concentration** of population and housing demand. The first plan for the city, which was prepared in 1957 with a sensitive approach to seismic risks, became inadequate to meet the

increasing demand. Thus, in 1985, a master plan was prepared with the awareness of seismic risks. In 1980s, the city began to attract the industries with respect to the investments made to support deindustrialization such as construction high ways and organized industrial district. These investments would lead to generation of business environment within the city. The **agglomeration** of functions and population brought additional burden on city and contributed to vulnerability through amendments in the plans in terms of increasing development rights and densities (Bayhan, 2010).

In sum, urbanization process was affected from the polities of central government which applied through regional planning. Regional plans influenced the spatial organization and development pattern of the city. As a consequence of regional planning, urbanization and land-use planning experiences together with the geophysical conditions of the environment, the city suffered from earthquakes severely.

The 1999 Earthquake hit the city under such circumstances. After the earthquake which led to casualties, injuries, physical damage as well as economic, spatial, social, demographic and political consequences, central government allocated resources to overcome the adverse impacts of disasters. This support obtained in forms of donations, credits, and taxes were directed for the reconstruction and recovery of the affected region.

The ongoing Turkish disaster management system addresses to resettlement policies in case of disasters. An illustration of this policy is seen in Adapazarı case. The affected population of the city moved to the resettlement district. Development of new settlement areas is expected to encourage the course of urban development in the desired direction with respect to businesses. Implementation of resettlement policies considers that;

- Building pressures on the city center and residential areas of the inner area could be reduced.
- Private sector companies, businesses and government establishments could benefit from the expansion and relocate into safer districts.
- It could be possible to reduce office building pressures in the inner city.
- Jobs could be directed towards favorable locations, especially from the standpoint of safety.
- Urban development could be oriented towards strengthening the overall integrity of community structure.
- Dispersion of commercial activities and residential units presently located in the main city could be retarded.

However, the residential areas of new settlement districts are located on the northern side of the densely built-up inner city, yet distinct from the existing center. Construction of dwellings in resettlement area has met the housing need of affected population but not provided a considerable diversity of a pleasant urban setting. Moreover, the residential areas in resettled district were not allocated to affected renter inhabitants so that shortage and unsafe conditions of rented accommodation has been still continuing in the downtown area. Apart from the problems within the residential districts, there have been inconsistencies between the development of residential units and business premises. The resettlement areas could not attract businesses parallel to dwellings, so that private entities continue to settle in damaged urban core. That is why the city displays a fragmented structure. The problem caused by recovery policies isolating businesses from household recovery leads to generation of a fragmented urban structure. While the city growing around the most vulnerable locations with its businesses and industrial plants, residents of resettlement area have to commute to urban core. Despite the investments made for a safer location in resettlement areas, a large amount of population still demands to the vulnerable urban core.

The process of urban growth based on planning history and earthquake experiences of Adapazarı shows the increasingly intensive usage of urban area which is accompanied by the construction of the vulnerability of inner city. The continuing growth of the main city around urban core contributed to construction of vulnerability. Figure 4.24 illustrates the changing urban macroform and urban growth since 1950s. Adapazarı center has been the most important site of commercial development of the Sakarya Province. Nevertheless, the city center has been subjected to increasing building pressures throughout the 1980s. As the city has becoming more crowded and densely urbanized, the vulnerability of the city has increased. 1999 trajectory was the milestone for the urban structuring of Adapazarı. The city was suffered from the earthquake in physical, social, economic, and spatial terms. The factors in the background of this phenomenon are decentralization of industry to Eastern Marmara, increasing urban population, spreading dense built environment, and locating on seismic-risk prone sites – all of these processes have promoted both economic growth and vulnerability in Adapazarı. Here, it is worthwhile to argue that experiencing the severe consequences of the disaster, policies and actions taken in recovery period could not serve for developing a resilient city. If jobs continue to be concentrated in the city center or its surrounding industrial areas, the inner city will be threatened by overcrowding and the vulnerability will increase in future. Furthermore, since the office and commercial employment relocated to resettlement district, the consequence will be the fragmentation of urban and community structure.

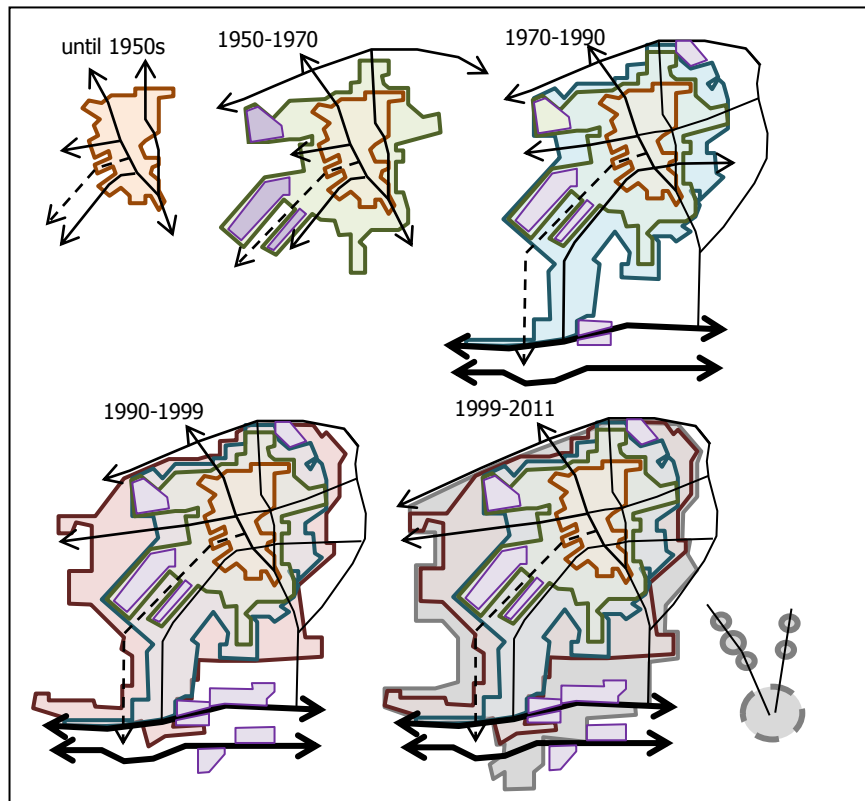


Figure 4.24. Changes in Adapazarı macroform between early 1950s and 2011

Source. Personal rendering.

The planning procedure in post-disaster period, after the completion of permanent housing districts could not achieve the problematic of the fragmentation. However, it could be expected from the plans that the creation of a system for local and district centers could represent an attempt to integrate businesses into household recovery and to generate a more resilient city. Although, household recovery policies have succeeded to some extent, the implementation of post-disaster plans has not resolved the problems related to business recovery in Adapazarı. This has led to restructure the urban space which is not consistent with the primary goals of recovery policies. The preservation of the inner city as a commercial environment and alleviation of residential environment out of the city could be resulted in construction and continuation of vulnerability in addition to fragmentation of the urban space.

## **CHAPTER V**

### **DISASTER IMPACTS AND POST-DISASTER RECOVERY POLICIES**

Earthquakes have remarkable impacts on Adapazarı's past. Deindustrialization of Istanbul, which is the center of business of the country, has affected the development and urbanization of Adapazarı which is a medium sized town of Marmara Region. Particularly after the 1980s, the agglomeration of the population in urban areas as a result of industrial development has contributed to emergence of the 'risk pool' (Balamir, 2007b).

This chapter aims at presenting the impacts of disaster and the post-disaster recovery implications in Adapazarı. In doing so, it will start with the effects of 1999 Earthquake on the economic structure of the affected region with a particular focus on Adapazarı. Meanwhile, the consequences of post-disaster policies on the urban spatial structure and economic structure of the city are analyzed.

#### **5.1. DISASTER IMPACT ON ECONOMIC STRUCTURE AND URBANIZATION**

Turkey has suffered from various types of natural disasters frequently. The most common hazard type is earthquakes leading to severe damage on citizens. According to the disaster risk index of UNDP released in 2004, Turkey holds fourth rank in terms of earthquakes (2004; 143). Particularly, following the 1999 Earthquake, there has been an increasing tendency about earthquake studies. Considering consequences of the event, none of the natural disasters experienced by Turkey throughout its history have catastrophic consequences as 1999 Earthquake in terms of fatalities, injuries, property damages and economic losses. Therefore, this part is devoted to analyze the impacts of disasters in physical and economic aspects, parallel to the scope of the study. Firstly, we analyze the direct physical losses caused by the disaster. Physical aspects deal with causalities and property losses. Then, we present the economic aspect of the earthquake to shed light on the macroeconomic effects on both the region and the city.

### 5.1.1. Physical impacts

This part briefly introduces the casualties and property losses led by the 1999 Earthquake. To do this, we present official data of state organizations released after the disaster. It is aimed to show how the city and business environment affected from the disaster.

At 3:02 a.m. on August 17, 1999 Marmara Region was awakened by an earthquake of 7.4 magnitude on the Richter scale. The earthquake has affected several cities as Kocaeli, Sakarya, Yalova, Bolu, Düzce, İstanbul, Bursa and Eskişehir in Marmara Region. Among those cities, Kocaeli, Sakarya, Yalova, Düzce and Bolu have suffered from the disaster directly in physical terms. The population of the region was approximately 16 million which constituted the 23% of the total population of Turkey. In these cities, 17,225 people died and 23,781 people were injured as figured out in the Table 5.1 (Prime Ministry Crisis Center, 2000). 23% of total deaths and 22% of total injuries were observed in Sakarya.

Table 5.1. Casualties led by 1999 Earthquake

Source. Prime Ministry Crisis Center, 01.01.2000

| Province | Death        | Injuries     | Mortality rate | Injury rate |
|----------|--------------|--------------|----------------|-------------|
| Kocaeli  | 4,363        | 4,629        | 0,37           | 0,39        |
| Gölcük   | 5,383        | 5,252        | 0,70           | 0,68        |
| Sakarya  | <b>3,890</b> | <b>5,180</b> | <b>0,53</b>    | <b>0,70</b> |
| Bolu     | 48           | 355          | 0,12           | 0,91        |
| Düzce    | 1,067        | 3,853        | 0,37           | 0,13        |
| Yalova   | 2,504        | 4,529        | 0,15           | 0,27        |
| Total    | 17,225       | 23,781       | 0,61           | 0,86        |

In addition to casualties, urban areas of provinces have experienced destruction. According to the report of OECD (2000), more than 213,000 housing units and 30,000 business premises have affected from the disaster, as shown in the Table 5.2. Approximately, one third of the total housing units and business premises were heavily damaged or demolished in the affected zone.

Table 5.2. The extent of total damage in affected region

Source. Bibbee, et al., 2000; 35.

| Number of housing unit |         | Number of business premises |        |
|------------------------|---------|-----------------------------|--------|
| Destroyed              | 66,441  | Destroyed                   | 10,901 |
| Moderately damaged     | 67,242  | Moderately damaged          | 9,927  |
| Lightly damaged        | 80,160  | Lightly damaged             | 9,712  |
| Total                  | 213,843 | Total                       | 30,540 |

Focusing on the distribution of damage among provinces, it could be observed that the earthquake has led to the most severe damage in Sakarya, Yalova and Kocaeli provinces. Nearly 66% of the total destruction has existed in Kocaeli, Yalova and Sakarya among six provinces, as summarized in the Table 5.3.

Table 5.3. Distribution of damage among provinces including both housing unit and business premises

Source. SPO, 1999; 13 and AİGM, 2008 in Erkan, 2010; 139

| Provinces      | Heavy damage-destroyed | Moderately damaged | Lightly damaged | Total damage  |
|----------------|------------------------|--------------------|-----------------|---------------|
| Kocaeli        | 3,278                  | 3,123              | 4,458           | 10,859        |
| <b>Sakarya</b> | <b>9,907</b>           | <b>2,698</b>       | <b>5,051</b>    | <b>17,656</b> |
| Yalova         | 9,123                  | 7,997              | 11,302          | 28,422        |
| Bolu           | 2,384                  | 2,999              | 1,874           | 7,257         |
| Bursa          | 32                     | 109                | 431             | 572           |
| İstanbul       | 2,840                  | 10,380             | 8,509           | 21,729        |
| Total          | 27,564                 | 27,396             | 31,175          | 86,135        |

Among other provinces, Sakarya was affected from the disaster severely in terms of property losses. Distribution of losses among counties of Sakarya province reveals that the most affected county is Adapazarı, province center, in terms of both human casualties and property losses including housing units and business premises. 87.6% of total heavy damage and 75.8% of the total moderate damage of the province have experienced in Adapazarı, (see Appendix B, Table B.1).

In Adapazarı, 49% of total housing stock and 51% of total business premises have damaged from the disaster more or less. Table 5.4 summarizes the distribution of damage among housing and businesses within Adapazarı.



Table 5.4. Distribution of damage on housing and businesses within Adapazarı

Source. Report of Sakarya Governorship, 2006 in Hayır and Akyol, 2008; 129.

| Degree of damage   | Housing |            | Businesses |            |
|--------------------|---------|------------|------------|------------|
|                    | Number  | Percentage | Number     | Percentage |
| Heavily damaged    | 21414   | 17         | 4715       | 23         |
| Moderately damaged | 13873   | 11         | 2933       | 14         |
| Lightly damaged    | 27834   | 21         | 2865       | 14         |
| Undamaged          | 64540   | 51         | 10235      | 49         |
| Total              | 127661  | 100        | 20748      | 100        |

Particularly, small and medium-sized Turkish cities have single centers and urban growth emerges around these centers. Adapazarı, similar to these cities, has grown around its center and the center has a sprawl type of growth until the 1999 Earthquake. The center has held businesses, and the periphery of Adapazarı has been surrounded by industrial developments as proposed in 1957 and 1985 master plans. Despite the severity of damages caused by earthquakes, there has been little consideration on development patterns in hazard-prone areas. The development has continued with sprawling and high density settlements. The process has associated with the expansion of commercial development within the central neighborhoods and industrial developments along highways. Such an urban growth brought additional pressure on seismic sensitive open spaces. With the 1999 Earthquake, city center of Adapazarı has damaged, hence, businesses. Figure 5.1 demonstrates the distribution of damage among neighborhoods (see also Appendix B, Table B.2).

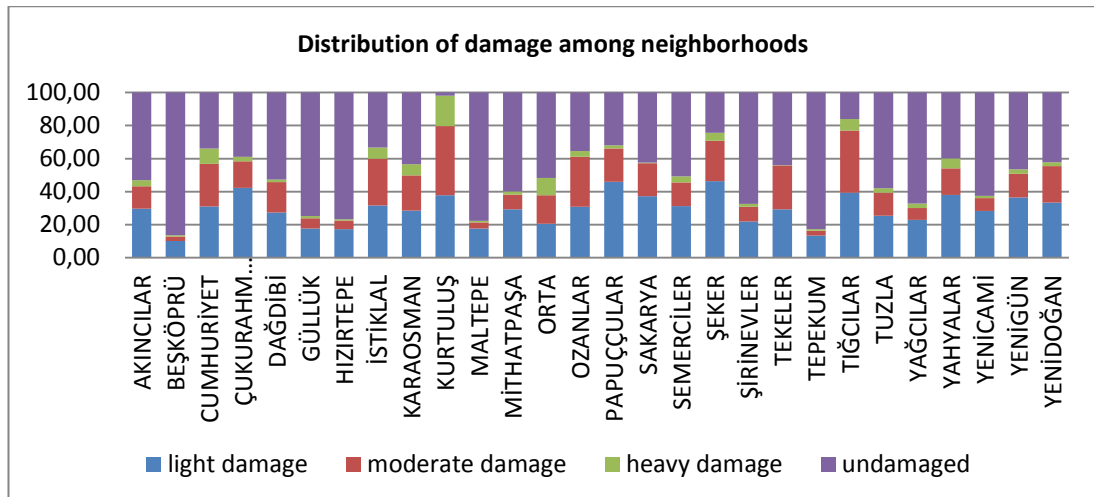


Figure 5.1. Distribution of damage among neighborhoods

Source. Adapazarı Metropolitan Municipality, 1999

### 5.1.2. Economic impacts

The 1999 Earthquake hit the economic core of Turkey. Economic productivity of the region was stopped due to the interruptions in communication, transportation, and infrastructure facilities. Production facilities have decreased as a result of physical damage and lifeline outages. Due to the business disruptions, the region also suffered from economic consequences of disasters. Therefore, this part displays the economic impacts of the 1999 Earthquake caused by the direct physical impacts of the disaster.

With respect to GDP and value added, Marmara Region is the most developed part of the country. Before the earthquake, according to the GDP values, the share of six provinces including Kocaeli, Yalova, Sakarya, Bolu, Bursa, İstanbul within GDP was 33.5%. The region, the most industrialized part of the country, generated 45.6% of total industrial value added (see Table 5.5). Similarly, most affected three provinces together with neighboring provinces as Bursa and İstanbul, created 33.5% of total GDP and produced half of the total production. The most affected provinces including Kocaeli, Sakarya and Yalova had 6.3% share in GDP, and 13.1% in industrial value added among the country.

Table 5.5. Basic parameters indicating economic structure of the region before the Earthquake.

Source. SPO, 1999; 12.

| City                              | Population<br>thousands | Share in<br>GDP, % | Share in<br>industrial<br>value<br>added,<br>% | Per capita<br>income, \$ | Share in<br>budget tax<br>revenue,<br>% | Share in<br>bank<br>deposit,<br>% | Share in<br>banking<br>credits, % |
|-----------------------------------|-------------------------|--------------------|------------------------------------------------|--------------------------|-----------------------------------------|-----------------------------------|-----------------------------------|
| Kocaeli                           | 1177379                 | 4.8                | 11.3                                           | 7845                     | 15.8                                    | 1.4                               | 0.9                               |
| Sakarya                           | 731800                  | 1.1                | 1.1                                            | 2734                     | 0.4                                     | 0.5                               | 0.2                               |
| Yalova                            | 163916                  | 0.4                | 0.7                                            | 4966                     | 0.1                                     | 0.2                               | 0.1                               |
| Bolu                              | 553022                  | 0.9                | 0.7                                            | 3104                     | 0.3                                     | 0.3                               | 0.2                               |
| Bursa                             | 1958529                 | 3.5                | 5.0                                            | 3434                     | 3.0                                     | 2.4                               | 3.2                               |
| İstanbul                          | 9198809                 | 22.8               | 26.8                                           | 4728                     | 37.5                                    | 44.1                              | 41.0                              |
| Kocaeli, Sakarya,<br>Yalova, Bolu | 2626117                 | 7.2                | 13.8                                           | 5243                     | 16.6                                    | 2.4                               | 1.4                               |
| Total of 6 cities                 | 13783455                | 33.5               | 45.6                                           | 4468                     | 57,2                                    | 48.9                              | 45,6                              |
| Turkey                            | 62865574                | 100                | 100                                            | 3031                     | 100                                     | 100                               | 100                               |

According to data from 1997 and 1998

The region, core of the production activity, had to be stopped after the disaster. The TurkStat (2001b) conducted a survey to manufacturing industry within the affected region to reveal the impacts of disaster on economic units. 63,2 % of the total manufacturing industry

were damaged by the earthquake in the provinces of Bolu, Kocaeli, Sakarya, Yalova (see Appendix B, Table B.3). This study also shows that only half the respondent firms had insurance. The ratio in Sakarya is below the average which is only 10%. Majority of businesses returned their normal level of production capacity in 16 weeks in average, and in 20 weeks in Sakarya. 29,5% of manufacturing industry in four cities reported labor force problems. Employees are affected from the disaster in terms of deaths, injuries, migration, and laid off. The research of TurkStat (2001b) shows that the most affected city from the labor force problem is Sakarya. 73,4% of their total employees were affected from the disaster (see Appendix B, Table B.4).

According to surveys of three Organizations namely TUSIAD, SPO, and World Bank, macroeconomic costs of the 1999 Earthquake were estimated by using various techniques, as shown in the Table 5.6. The costs were categorized as direct costs, indirect costs and secondary costs. Estimations of TUSIAD<sup>1</sup> show that the earthquake leads to approximately 17 billion dollar; SPO<sup>2</sup> estimated 15-19 billion dollars; and World Bank<sup>3</sup> estimated 11-16 billion dollars covering the direct and indirect costs as well as secondary effects.

Table 5.6. Macroeconomic costs of the Earthquake (billion dollar)

Source. Bibbee, et al., 2000; 37.

|                                                   | TUSIAD <sup>1</sup> | SPO <sup>2</sup> | World Bank <sup>3</sup> |
|---------------------------------------------------|---------------------|------------------|-------------------------|
| <b>Direct costs</b>                               | 10                  | 6.6 to 10.6      | 3.1 to 6.5              |
| Housing                                           | 4                   | 3.5 to 5         | 1.1 to 3                |
| Enterprises                                       | 4.5                 | 2.5 to 4.5       | 1.1 to 2.6              |
| Infrastructure                                    | 1.5                 | 0.5 to 1         | 0.9                     |
| <b>Indirect costs</b>                             | 2.8                 | 2 to 2.5         | 1.8 to 2.6              |
| Value added costs                                 | 2                   | 2 to 2.5         | 1.2 to 2                |
| Emergency relief expenditures                     | 0.8                 | --               | 0.6                     |
| <b>Total damage costs (rounded)</b>               | 13                  | 9 to 13          | 5 to 9                  |
| <b>Secondary effects</b>                          | -                   | -                | -                       |
| Current account losses                            | 2                   | -                | 3                       |
| Fiscal costs                                      | 2                   | 5.9              | 3.6 to 4.6              |
| Job losses (percent of labor force in the region) | -                   | -                | 20 to 50%               |

1. "TUSIAD first estimated the value of the loss of national wealth by surveys of its members and in co-operation with SPO. It then estimated the associated loss of national income by assuming that economic activity in the region came to a halt for two to three months (with about \$50 million lost each day), due not only to loss of physical capacity, but also employee absenteeism, lack of water and energy, supply shortages and transportation difficulties, which depressed overall output regionally as well as nationally". 2. "SPO estimated wealth losses on the basis of information given to the government from various sources (including a physical count of destroyed properties) and preliminary estimations based on certain assumptions." 3. "The World Bank used an enumerative technique to estimate physical damages by: a) assuming that the percentage of value added lost due to disruptions to industry and services in the four most severely affected regions is 50, 30, 15, and 8 per cent in 1999Q3 to 2000Q2, respectively, b) further assuming that one-third of the disruptions in the first two quarters are offset by increased economic activity in other areas; c) multiplying the net disruption by the weight of the region (7.2 per cent) in national value added."

These costs included construction of new housing, repairing of moderately damaged housing, construction of prefabricated housing, costs of losses in industrial, service and trade premises, losses in infrastructure and losses in value added, as revealed in Table 5.7.

Table 5.7. Costs led by 1999 earthquake

Source. SPO, 1999; 31.

| Requirement                                      | Cost (billion dollar) | Explanation                                                              |
|--------------------------------------------------|-----------------------|--------------------------------------------------------------------------|
| Construction of new housing                      | 2.5 to 4.0            | 120-200,000 housing units with 25% infrastructure share                  |
| Repairing of housing                             | 1.0                   | Repairing of moderately damaged housing                                  |
| Construction of prefabricated housing            | 0.1                   | Construction of 35,000 prefabricated housing                             |
| Losses in industrial, service and trade premises | 2.5 to 4.5            | Damage on building, inventory, stock, and equipment                      |
| Infrastructure                                   | 0.5 to 1.0            | Damage on roads, highway, bridge, electricity, and communication network |
| Value added losses                               | 2.0 to 2.5            | Losses in sub-sectors                                                    |
| Total                                            | 8.6 to 13.1           |                                                                          |

Affording the costs of the disaster required financial aid. The resources to recover from the disaster were met by use of different financial instruments, as shown in the Table 5.8. Domestic financial instruments included the gain from military service and additional taxes. In addition, external financial aid was obtained to recover the consequences of the disaster. The external financing was taken in forms of donations, aids, loans, and grants. IMF, World Bank, and European Union had the greatest share in external financing. Table 5.10 figures out the domestic and external financial aid allocated for recovery from the effects of 1999 Earthquake.

Table 5.8. External and domestic financial aid for 1999 Earthquake (\$ millions)

Source. SPO, 1999; 31.

|                               |              |
|-------------------------------|--------------|
| <b>Financial requirements</b> | <b>6.212</b> |
| I. External financing         | 2.460        |
| Donation and aids             | 100          |
| IMF                           | 320          |
| World Bank                    | 1,050        |
| European Union                | 690          |
| Other                         | 300          |
| II. Domestic financing        | 3035         |
| Military service              | 1330         |
| Taxes designed after disaster | 1355         |
| Additional income increases   | 350          |
| <b>Total (I+II)</b>           | <b>5495</b>  |
| <b>Financial gap</b>          | <b>717</b>   |

Foreign countries and supra-nation organizations introduced external financing in different forms for the recovery the affected region. IMF applied a program loan where World Bank, EU and other countries prepared project loans. Also, countries provided grants as a source of financing. Appendix B, Table B.5 summarizes type of assistance after the earthquake.

Apart from the external financing, national budget has gathered additional gain from domestic financing. Taxes initiated after the earthquake has become one of main income instruments of the budget. These taxes cover the additional income tax, profit tax, additional corporate tax, additional motor vehicle tax, additional property tax, additional communication tax, and transaction tax. Together with the gain from military service, these taxes applied since 1999 to 2006 provided more than 20 billion dollars. Appendix B, Table B.6 illustrates the annual gain from the domestic financing instruments.

A principal amount of financial income has been allocated to reconstruction and resettlement expenses. More than 43,000 housing units were constructed in the affected region and provisioned to right-holders. Table 5.9 and 5.10 demonstrate the number and cost of housing units according to financial resources.

Table 5.9. Number of permanent housing units according to financial resource

Source. AİGM, 2008 in Erkan, 2010.

| Province     | Ministry of reconstruction and resettlement | Council of European Development Bank | World Bank    | European Investment Bank | Grants       | Total         | %          |
|--------------|---------------------------------------------|--------------------------------------|---------------|--------------------------|--------------|---------------|------------|
| Kocaeli      | 0                                           | 7,520                                | 8,840         | 1,120                    | 656          | 17,776        | 41,3       |
| Sakarya      | 0                                           | 3,168                                | 2,572         | 1,000                    | 1,488        | 8,228         | 19,1       |
| Düzce        | 7,000                                       | 0                                    | 1,004         | 466                      | 0            | 8,470         | 19,7       |
| Bolu         | 0                                           | 1,734                                | 0             | 0                        | 0            | 1,734         | 4          |
| Yalova       | 0                                           | 5,118                                | 0             | 0                        | 358          | 5,476         | 12,7       |
| İstanbul     | 650                                         | 160                                  | -             | -                        | -            | 810           | 1,9        |
| Tekirdağ     | 559                                         | 0                                    | -             | -                        | -            | 559           | 1,3        |
| <b>Total</b> | <b>8,209</b>                                | <b>17,700</b>                        | <b>12,056</b> | <b>2,586</b>             | <b>2,502</b> | <b>43,053</b> | <b>100</b> |

Table 5.10. Cost of permanent housing units according to financial resource (TL)

Source. AİGM, 2008 in Erkan, 2010.

| Province     | Ministry of reconstruction and resettlement | Council of European Development Bank | World Bank         | European Investment Bank | Grants            |
|--------------|---------------------------------------------|--------------------------------------|--------------------|--------------------------|-------------------|
| Kocaeli      | -                                           | 229,150,053                          | 351,932,493        | 75,396,076               | 19,989,685        |
| Sakarya      | -                                           | 86,885,291                           | 157,545,011        | 55,970,011               | 40,809,758        |
| Düzce        | 193,613,798                                 | -                                    | 61,081,784         | 22,820,036               | -                 |
| Bolu         | -                                           | 51,537,537                           | -                  | -                        | -                 |
| Yalova       | -                                           | 106,353,538                          | -                  | -                        | 7,439,345         |
| İstanbul     | 21,226,743                                  | 5,225,044                            | -                  | -                        | -                 |
| Tekirdağ     | 15,718,679                                  | -                                    | -                  | -                        | -                 |
| <b>Total</b> | <b>230,559,220</b>                          | <b>479,151,462</b>                   | <b>570,559,287</b> | <b>154,186,123</b>       | <b>68,238,788</b> |

In addition to construction of permanent housing, the domestic and external financing aids were used for the recovery of the affected cities. Recovery of these cities include a diversity of investments such as education, health, waste water, sanitation, transportation, SMEs, municipality services, public administration, agriculture, manufacturing, social services, energy, technological studies, tourism, and culture. Among these services, housing sector took the highest share due to severe damage of disaster on the living units (Table 5.11). Repairing and reconstruction of educational facilities follows housing sector with 29,8%.

Table 5.11. Distribution of financial aid among sectors between 1999-2008

Source. Erkan, 2010.

| Sector                   | Investment cost | Percentage |
|--------------------------|-----------------|------------|
| Housing                  | 2,822,735,206   | 30,7       |
| Education                | 2,743,981,211   | 29,8       |
| Waste water, sanitation  | 1,637,294,349   | 17,8       |
| Health                   | 887,802,453     | 9,6        |
| Transportation           | 516,799,432     | 5,6        |
| SMEs                     | 145,977,969     | 1,6        |
| Municipality services    | 121,459,634     | 1,3        |
| Public administration    | 105,867,382     | 1,2        |
| Agriculture              | 83,206,136      | 0,9        |
| Manufacturing            | 81,285,297      | 0,9        |
| Social services          | 30,617,105      | 0,3        |
| Energy                   | 12,643,168      | 0,1        |
| Technological researches | 11,090,731      | 0,1        |
| Tourism                  | 2,139,000       | 0          |
| Culture                  | 773,670         | 0          |
| Total                    | 9,203,672,741   | 100        |

All investments were not only allocated to recovery period, but also risk reduction, preparedness, and response process took share from the budget. Table 5.12 displays the distribution of investments according to disaster management phases among cities. According to table, it could be said that 73% of the total resources were allocated to recovery phase. Risk reduction follows the recovery with its nearly 22% share in total budget. Also, it could be interpreted that Sakarya and Kocaeli provinces had attracted approximately half of the total investments. The 29% of the resources allocated to each of the provinces were used in recovery period. That is, investments made in recovery phase held the greatest share among other phases for Kocaeli and Sakarya. Additionally, the highest investments for mitigation period are observed in İstanbul. The aim in mobilizing resources for the city is to reduce the seismic vulnerability of İstanbul.

Table 5.12. Distribution of investments, by provinces and disaster phases during 1999-2008 (thousand TL)

Source. Erkan, 2010.

| Phase                 | Bolu    | Düzce     | Sakarya   | Kocaeli   | Yalova    | Istanbul | Diğer  | Total     |
|-----------------------|---------|-----------|-----------|-----------|-----------|----------|--------|-----------|
| <b>Response</b>       | 61,020  | 61,346    | 52,413    | 53,392    | 49,852    | 47,663   | 99     | 325,784   |
| <b>%</b>              | 18,7    | 18,8      | 16,1      | 16,4      | 15,3      | 14,6     | 0      | 100       |
| <b>Preparedness</b>   | 2,787   | 2,806     | 2,847     | 3,110     | 3,377     | 28,830   | 474    | 44,230    |
| <b>%</b>              | 6,3     | 6,3       | 6,4       | 7         | 7,6       | 65,2     | 1,1    | 100       |
| <b>Risk reduction</b> | 280,706 | 293,446   | 286,618   | 311,362   | 280,502   | 584,945  | 7,936  | 2,045,514 |
| <b>%</b>              | 13,7    | 14,3      | 14        | 15,2      | 13,7      | 28,6     | 0,4    | 100       |
| <b>Recovery</b>       | 570,557 | 1,315,005 | 1,964,892 | 1,972,450 | 708,122   | 208,834  | 48,285 | 6,788,144 |
| <b>%</b>              | 8,4     | 19,4      | 28,9      | 29,1      | 10,4      | 3,1      | 0,7    | 100       |
| <b>Total</b>          | 915,070 | 1,672,673 | 2,306,768 | 2,340,314 | 1,041,854 | 870,271  | 56,794 | 9,203,673 |
| <b>%</b>              | 9,9     | 18,2      | 25,1      | 25,4      | 11,3      | 9,5      | 0,6    | 100       |

As we saw above, the majority resources were allocated for recovery from the adverse impacts of earthquake in Sakarya. Due to the disruption of housing units and businesses, permanent housing units were constructed in geologically safer areas. The new resettlement districts of Adapazarı were determined as Karaman, Korucuk and Camili. These areas are housing 53,300 inhabitants according to data of 2008 (Table 5.13).

Table 5.13. Distribution of permanent housing among resettlement districts in Sakarya

Source. Hayır and Akyol, 2008; 133-136.

| District | Number of housing unit | Property of housing          | Proposed population | Construction period | Current population |
|----------|------------------------|------------------------------|---------------------|---------------------|--------------------|
| Karaman  | 4268 (575 blocks)      | 100 m <sup>2</sup> units     | 33705               | 2000-2001           | 23000              |
| Korucuk  | 3926                   | 100-120 m <sup>2</sup> units | 100000              | 2003-2006           | 8000               |
| Camili-1 |                        |                              |                     | 2002-2003           | 10000              |
| Camili-2 | 1000 (116 blocks)      | 100 m <sup>2</sup> units     |                     | 2006                | 12300              |

## 5.2. POST-DISASTER SPATIAL STRUCTURING OF ADAPAZARI

In the post-disaster period, public investments have initiated to recover the urban areas which were affected from the 1999 Earthquake. Adapazarı was one of the urban areas that experienced both **reconstruction** and **resettlement** practices. The affected population in Adapazarı was resettled in the northern part of the city where the soil structure was determined as relatively safer according to geotechnical analysis (Figure 5.2). On the other hand, the downtown was reconstructed according to new development permits. The downtown of Adapazarı was permitted to develop with a limited and reduced development

rights with respect to geotechnical considerations. Additionally, Serdivan as one of the geologically suitable location nearby the downtown has become to be populated increasingly. Due to the university and close location to city center, the district has developed gradually after the disaster.

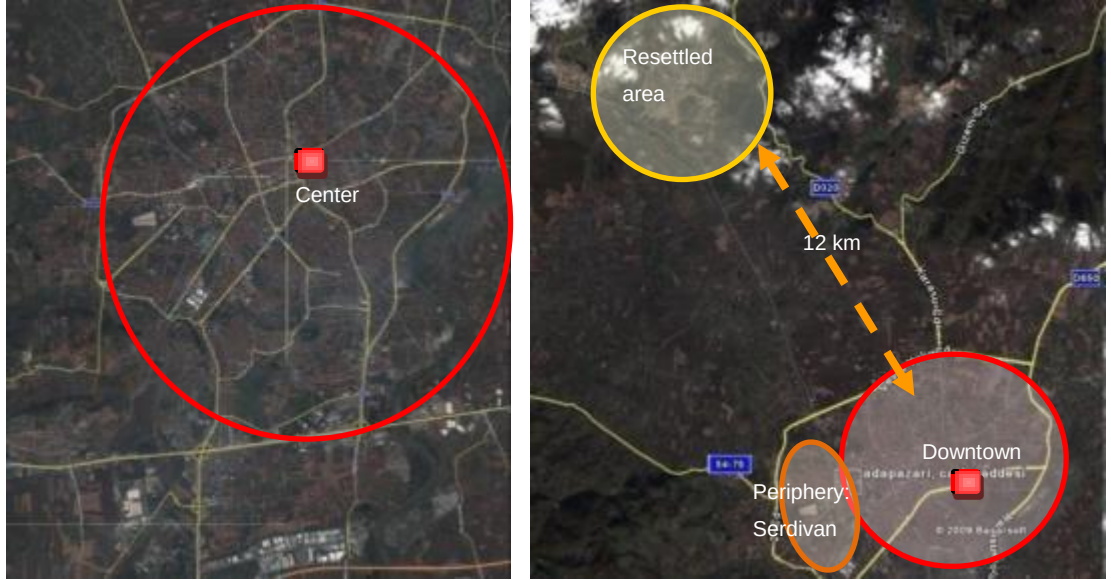


Figure 5.2. Adapazarı settlement before and after 1999 Earthquake

Source. Google Earth, 2012.

The image to the right shows the limits of the macroform of Adapazarı before 1999, while the image to the left shows the resettlement region, downtown and Serdivan district after the earthquake. The urban spatial structure which is observed after the 1999 Earthquake could be grouped in three types as reconstruction of downtown, resettlement, and development of periphery. The spatial development typology shows consistency with the recovery policies in terms of urbanization options adopted by public hand. Therefore, with respect to mitigation considerations, there occur three main urbanization options in recovery process;

1. Karaman, Camili, Korucuk and Ferizli, Söğütlü districts as **resettlement** policies: Permanent housings were constructed on geologically safer areas. Public investments and resource allocation are the means of construction. The role of planning could be defined as 'regulation of high public resource allocation'.



2. Serdivan district as **new development** policies: Urban periphery has been developing on geologically safer areas. Private sector investments are the means of development, while public investments are the means of infrastructure construction. The role of planning could be defined as 'regulation of investments and development'.
3. Downtown districts as **reconstruction** policies: Reduced development rights have been designed on geologically insecure areas. Public investments and resource allocation are the means of reconstruction of affected areas and revitalization of center. The role of planning could be defined as 'regulation of development rights'.

Table 5.14. Safe urban development models and their policies applied after the disaster

| Options                              | Resettlement                                                                                                                                                           | New development                                                                       | Reconstruction                                                                                                                                 |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Role of planning</b>              | Regulation of high public resource allocation                                                                                                                          | Regulation of investments and development                                             | Regulation of development rights                                                                                                               |
| <b>Means</b>                         | Public resources, External aid                                                                                                                                         | Private investments, Public resources                                                 | Public resources                                                                                                                               |
| <b>Mitigation policy</b>             | Creating safe environment with mass housing                                                                                                                            | Creating safe environment in urban periphery                                          | Reducing development rights                                                                                                                    |
| <b>Implications</b>                  | <ul style="list-style-type: none"> <li>• Expropriation</li> <li>• Permanent housings</li> <li>• Construction of public buildings</li> <li>• Max. four floor</li> </ul> | <ul style="list-style-type: none"> <li>• Max. two-storey new development</li> </ul>   | <ul style="list-style-type: none"> <li>• 0,25 basement area ratio</li> <li>• 0,50 floor area ratio</li> <li>• 6,5 m building height</li> </ul> |
| <b>Aim</b>                           | Attracting business by creating safe suburbs                                                                                                                           | Attracting business by using the advantage of location                                | Developing with lower density                                                                                                                  |
| <b>Businesses within each option</b> | Priority to residential areas<br>Ignorance of businesses in plans<br>Inability to attract businesses in the long-term                                                  | Proximity advantage to central area<br>Residential development and increase in demand | Continuity of businesses<br>Recovery within existing sites for production facilities<br>Recovery of commercial units within existing center    |

Businesses are the primary components of urban areas allowing urban center formations. Business recovery, therefore, have remarkable impacts on each restructuring model. Considering the spatial consequences of business recovery, it is investigated how the urban space is restructured.

Firms suffered from business interruption and disruption. The reason behind planning a central area in resettlement area is to provide business premises to affected property

owners of firms. At the same time, existing center was decided to be reconstructed. Also, during the recovery period, urban periphery has become attractive for central development. Hence, Adapazarı has faced with the problem of central development. Decision-makers recommended the development of a new center in resettled area while protecting the existing and damaged center in downtown. Consequently, there occurs a dilemma about development of center in post-disaster process. The central development problem of Adapazarı highlights a basic question that **how the recovery of businesses affect the restructuring of urban space.**

In order to find the relation between recovery actions and spatial restructuring, it is required to investigate disaster impacts in a long term period. The long term period could reveal both actions taken in recovery period and their consequences. As the study focuses on businesses, business recovery period will be investigated. It is aimed to answer the question of whether the business recovery actions are consistent with the initial recovery policies which planned a new central area within the resettlement district. By looking the spatial consequences of business recovery, it is aimed to find out the outcomes of recovery practices on spatial structure. In doing so, an empirical study will be carried on businesses in terms of their recovery process and their location choices, as well as an in-depth research on policies regarding spatial restructuring. First of all, businesses will be separated in two groups as production facilities and commercial and social activities. Together with the employed population, businesses related to production have effects on spatial structuring. Similarly, businesses dealing commercial and social activities are dominant functions of central districts. These types of businesses are components of urban space; at the same time, these facilities reveal economic components of a city. Therefore, it is required to differentiate the economic structure of the city based on this division in order to evaluate the recovery process of businesses. In the next part, the economic structure of the city is analyzed with respect to the variables of population, urbanization, GDP, foreign trade values, and employment. Taking 1999 as a breaking point, these variables will be introduced. Then, a sub-sectoral investigation is undertaken to show the economic structure of businesses locating in the city depending on the variables of number of establishments and number of persons engaged.

### **5.3. EVALUATION OF ECONOMIC STRUCTURE OF THE CITY**

Sakarya has been planned as a part of industrial corridor in Marmara Region. Since 1960s, the city was decided to attract industries as a result of deindustrialization of İstanbul. With the shift in economic perspective from planned economy to liberal economy in 1980s,

liberalization and privatization were triggered at national level. Sakarya also has been affected from the ongoing liberalization policies which gave pace to industrialization of the city. Until the 1999 Earthquake, the city had been housing large plants and small sized production units. The earthquake hit the agglomeration of population and the dense built environment. Previous section described the physical damage and economic losses led by the earthquake. Now, we present the policies designed to restore the community and their impacts in the long-term period after the disaster. The aim of this section is to show whether the recovery policies return the community to the pre-disaster conditions. In doing so, we use the official data obtained from state institutions including TurkStat and SPO.

Economic structure of Sakarya is analyzed in terms of variables showing population, urbanization, socio-economic development, employment, GDP, export-import values and sectoral dimensions. The variable of population is used in order to show how the earthquake influenced the demographic structure of the city. Before the earthquake, the city has been more populated than Kocaeli since 1955. However, the population of Kocaeli had jumped and revealed a more rapid population increase than Sakarya after 1980s, as shown in the Table 5.15. Also, it could be observed from the table that Sakarya has continued to attract population despite the 1999 earthquake. This observation is valid for cities of the Kocaeli sub-region including Kocaeli, Sakarya, Yalova, Bolu and Düzce. Constituting the most affected urban areas, population of Kocaeli sub-region has increased after the disaster. Particularly, in the long-term period after the earthquake, it could be said that cities in the affected zone show a population increase. According to the population census of 2010, the Sakarya province has gained more than 100,000 inhabitants within a ten-year period.

Table 5.15. Population of the neighboring provinces of Sakarya

Source. TurkStat, 2000.

| Year | Türkiye    | Sakarya | Kocaeli   | Yalova  | Bolu    | Düzce   |
|------|------------|---------|-----------|---------|---------|---------|
| 1955 | 24 064 763 | 297.108 | 253.174   | -       | 318.219 | -       |
| 1960 | 27 754 820 | 361.992 | 297.463   | -       | 353.004 | -       |
| 1965 | 31 391 421 | 404.078 | 335.518   | -       | 383.939 | -       |
| 1970 | 35 605 176 | 459.052 | 385.408   | -       | 403.766 | 188,734 |
| 1975 | 40 347 719 | 495.649 | 477.736   | -       | 428.704 | 204,339 |
| 1980 | 44 736 957 | 548.747 | 596.899   | -       | 471.751 | 233,338 |
| 1985 | 50 664 458 | 610.500 | 742.245   | -       | 504.778 | 251,751 |
| 1990 | 56 473 035 | 683.061 | 936.163   | 135,121 | 536.869 | 273.679 |
| 1997 | 62 866 000 | 731.800 | 1,170,546 | -       | 263,998 | 289,843 |
| 2000 | 67 853 927 | 756.168 | 1.206.085 | 168,593 | 270.654 | 314.266 |
| 2010 | 74.724.269 | 888.556 | 1.601.720 | 206.535 | 276.506 | 342.146 |

Note. The Yalova became a province in 1995, and Düzce in 1999 after the earthquake.

Sakarya locating on agricultural area, has a relatively less urban population in comparison to Turkey between 1955-2000, as illustrated in the Figure 5.3 (see also Appendix B, Table B.7). After the earthquake, despite the increase in urban population, the urbanization ratio of the province is still below the country average.

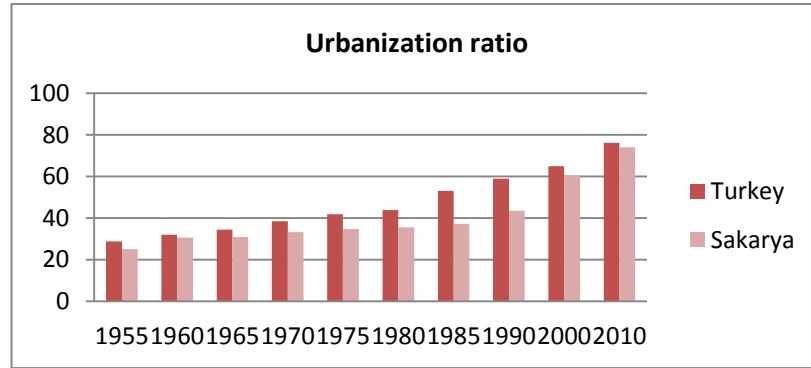


Figure 5.3. Urbanization ratio of Sakarya and Turkey, between 1955-2000

Source. TurkStat, 2000; TurkStat, 2001a; TurkStat, 2010.

For the census periods 1990, 2000, and 2010, the highest urbanization ratio is seen in Kocaeli province within the disaster-prone zone, as shown in the Figure 5.4 (see also Appendix B, Table B.8). Yalova, Bolu and Düzce have less urbanization ratio than Sakarya and Kocaeli. Also, it could be observed from the data that urbanization in Sakarya, in the long-term after the earthquake, has an increasing tendency.

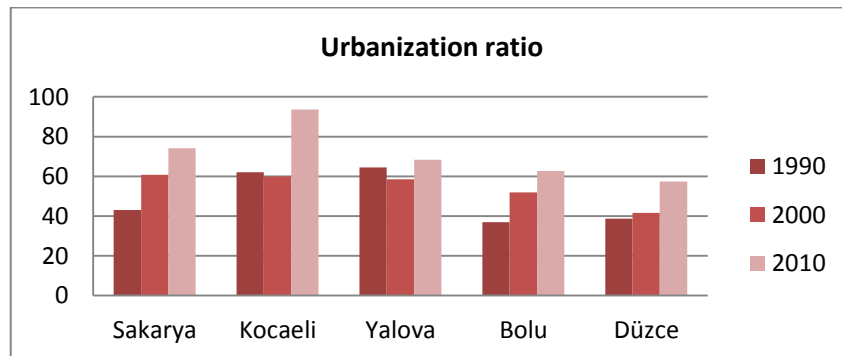


Figure 5.4. Comparison of provinces in terms of urbanization ratio

Source: TurkStat, 2000; TurkStat, 2010.

Despite the disaster risks, these figures show that Sakarya has grown in terms of population. Also, the population has become urbanized parallel to the industrial developments. The urban population of Sakarya has concentrated mostly in Adapazarı, the central county, as shown in the Figure 5.5. The comparison of Adapazarı and Sakarya in terms of population shows that Adapazarı has attracted more population than the other counties of Sakarya (see also Appendix B, Table B.9).

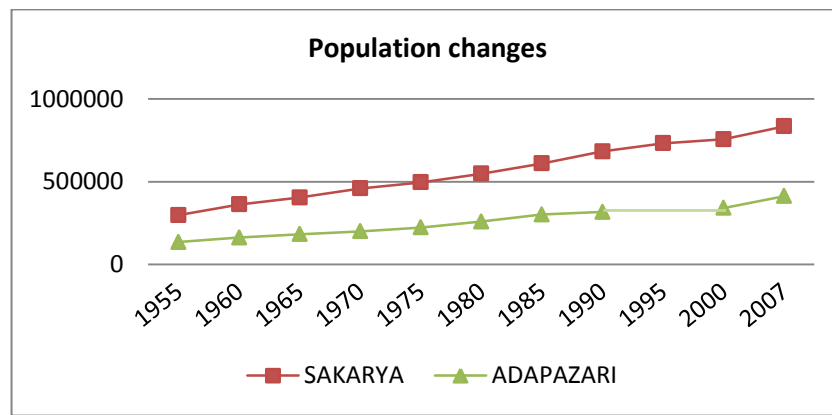


Figure 5.5. Population growth in Sakarya

Source. TurkStat, 2000; TurkStat, 2007.

Adapazarı holds about 45% of the total population and 62% of the total urban population in Sakarya province in the year 2000, as illustrated in the Figure 5.6 (see also Appendix B, Table B.10). Among other counties of Sakarya, the most populated county is Adapazarı. The reason behind the population agglomeration in Adapazarı is the primate position of the city in terms of industrial facilities and social services, which will be explained next.

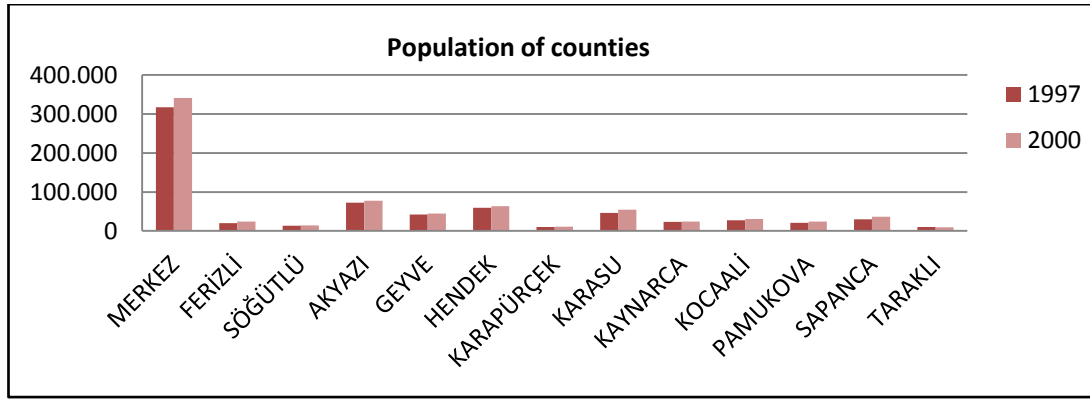


Figure 5.6. Population increase of Sakarya Province and its counties (1997-2000)

Source. TurkStat, 2000.

According to the urban populations of counties for 1990, 1997 and 2000, it be said that Adapazarı has been the most populated and most urbanized county of Sakarya. The 1999 Earthquake did not reduce the urban population of Adapazarı. That is, even after the disaster people tended to locate within the city. Table 5.16 shows that the urbanization ratio of Adapazarı is 83,25% with a density of 316,995 inhabitants.

Table 5.16. Ranking of counties according to urbanization ratio and density of total population (2000)

Source. TurkStat, 2000.

| No | County     | Urbanization ratio | County     | Density of total population |
|----|------------|--------------------|------------|-----------------------------|
| 1  | Adapazarı  | 83,25              | Adapazarı  | 316,995                     |
| 2  | Sapanca    | 59,53              | Akyazı     | 68,071                      |
| 3  | Söğütü     | 54,88              | Hendek     | 60,268                      |
| 4  | Pamukova   | 54,83              | Karasu     | 44,815                      |
| 5  | Ferizli    | 50,76              | Geyve      | 41,263                      |
| 6  | Karasu     | 45,16              | Kocaali    | 28,405                      |
| 7  | Taraklı    | 45                 | Sapanca    | 25,167                      |
| 8  | Kocaali    | 44,96              | Kaynarca   | 24,087                      |
| 9  | Hendek     | 44,79              | Pamukova   | 21,023                      |
| 10 | Geyve      | 38,56              | Ferizli    | 19,592                      |
| 11 | Karapürçek | 37,8               | Söğütü     | 13,403                      |
| 12 | Akyazı     | 29,91              | Taraklı    | 10,906                      |
| 13 | Kaynarca   | 20,8               | Karapürçek | 9,286                       |

According to socio-economic development index showing provincial ranking of Turkey, Sakarya shows an improvement between the years 1996 and 2003. For the index prepared in 1996, Sakarya holds the 28<sup>th</sup> ranking (SPO, 1996a). Among 81 provinces, Sakarya's ranking has progressed from 28 to 23 in the year 2003 (SPO, 2003). The study of Yıldız, et al. (2010) shows the ranking of provinces with respect to socio-economic development for the year 2010. According to the index developed with the same parameters represents that

for 2010, Sakarya has declined to 26<sup>th</sup> rank. Rankings of provinces are summarized in the Table 5.17 according to index years.

Table 5.17. Ranking of cities in Marmara region according to socio-economic development index

Source. SPO, 2003; SPO, 1996a; and Yıldız, et al., 2010.

| Provinces  | 1996 | 2003 | 2010 |
|------------|------|------|------|
| Istanbul   | 1    | 1    | 1    |
| Kocaeli    | 4    | 4    | 4    |
| Bursa      | 5    | 5    | 5    |
| Tekirdağ   | 8    | 7    | 10   |
| Yalova     | X    | 9    | 17   |
| Kirklareli | 15   | 11   | 13   |
| Balıkesir  | 16   | 15   | 23   |
| Edirne     | 19   | 16   | 14   |
| Bilecik    | 18   | 18   | 15   |
| Çanakkale  | 21   | 24   | 16   |
| Sakarya    | 28   | 23   | 26   |
| Bolu       | 29   | 14   | 9    |
| Düzce      | X    | 45   | 39   |

According to the table, it could be said that Sakarya has developed in socio-economic terms between the years 1996 and 2003. Including the 1999 earthquake, this time interval shows that the city has improved despite the negative consequences on community and economy.

Similar index has developed for counties for the years 1996 and 2004 (SPO, 1996b; SPO, 2004). According to ranking of the counties of Sakarya, Adapazarı holds the first rank among other counties, and its position has progressed from 34<sup>th</sup> rank to 20<sup>th</sup> rank between the years 1996 and 2004 (Table 5.18). Except the counties Hendek and Taraklı, the counties of Sakarya show an improving tendency from 1996 to 2004.

Table 5.18. Ranking of counties according to socioeconomic development index within Sakarya Province

Source. SPO, 2004; and SPO, 1996

| Counties   | 1996                        |                         | 2004                        |                   |
|------------|-----------------------------|-------------------------|-----------------------------|-------------------|
|            | Ranking within all counties | Ranking within province | Ranking within all counties | Development group |
| Adapazarı  | 34                          | 1                       | 20                          | 2                 |
| Sapanca    | 136                         | 2                       | 57                          | 2                 |
| Hendek     | 231                         | 3                       | 243                         | 3                 |
| Pamukova   | 267                         | 4                       | 193                         | 3                 |
| Akyazı     | 357                         | 5                       | 234                         | 3                 |
| Geyve      | 363                         | 6                       | 271                         | 3                 |
| Karasu     | 409                         | 7                       | 263                         | 3                 |
| Taraklı    | 459                         | 8                       | 505                         | 4                 |
| Kocaali    | 526                         | 9                       | 345                         | 3                 |
| Söğütü     | 555                         | 10                      | 299                         | 3                 |
| Ferizli    | 593                         | 11                      | 225                         | 3                 |
| Kaynarca   | 597                         | 12                      | 449                         | 3                 |
| Karapürçek | 639                         | 13                      | 326                         | 3                 |

The variable of Gross Domestic Product (GDP) is used in order to indicate Sakarya's position in Marmara Region and in Turkey. Looking the values between 1990 and 2000, some vulnerabilities could be observed. 1994 and 1999 were the years that witnessed a decrease in the share of GDP. Despite the fluctuations, Sakarya displays an increasing trend in GDP value, but its share decreases within Marmara Region as the region's GDP values increases rapidly. Including cities İstanbul, Edirne, Kırklareli, Tekirdağ, Yalova, Kocaeli, Çanakkale, Sakarya, Bursa, Balıkesir, and Bilecik, Marmara Region covers eleven cities. Since İstanbul, Kocaeli and Bursa show industrialized characteristics, they generate higher rate of GDP. As it is illustrated in Figure 5.7, it is clear that Sakarya is not the locomotive of the Marmara Region (see also Table 5.19).

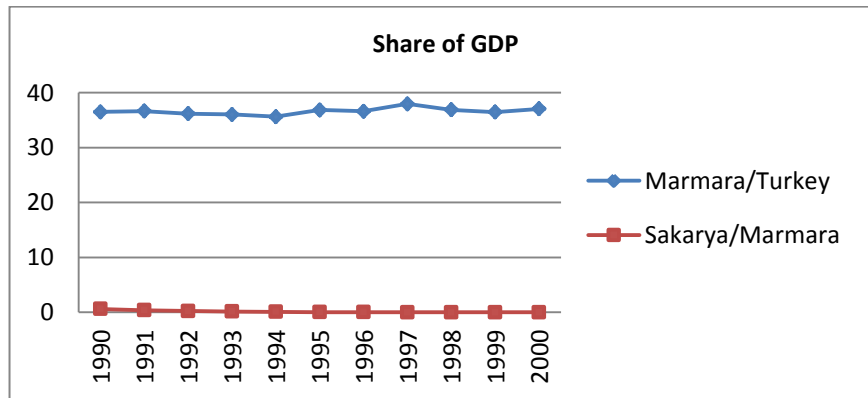


Figure 5.7. GDP shares of Marmara within Turkey and of Sakarya within Marmara

Source. SPO, 2002a.



Table 5.19. GDP shares of Marmara within Turkey and of Sakarya within Marmara

Source. SPO, 2002a.

|      | Turkey      | Marmara     | Sakarya | Marmara/<br>Turkey | Sakarya/<br>Marmara |
|------|-------------|-------------|---------|--------------------|---------------------|
| 1990 | 393060176   | 143466689   | 856483  | 36,50              | 0,60                |
| 1991 | 630116965   | 230965493   | 862164  | 36,65              | 0,37                |
| 1992 | 1093368048  | 395507302   | 924336  | 36,17              | 0,23                |
| 1993 | 1981867097  | 713815037   | 952086  | 36,02              | 0,13                |
| 1994 | 3868429190  | 1378860035  | 943518  | 35,64              | 0,07                |
| 1995 | 7762456076  | 2860126564  | 1099101 | 36,85              | 0,04                |
| 1996 | 14772110196 | 5411678292  | 1197979 | 36,63              | 0,02                |
| 1997 | 28835883136 | 10942220761 | 1253782 | 37,95              | 0,01                |
| 1998 | 52224945129 | 19262951140 | 1314815 | 36,88              | 0,01                |
| 1999 | 77415272307 | 28238555867 | 1218022 | 36,48              | 0,004               |
| 2000 | 1,24583E+11 | 46145179150 | 1343891 | 37,04              | 0,003               |

It is obvious in the figure that growth of GDP fluctuates due to macroeconomic developments. There occurs a similar pattern in Sakarya's growth of GDP parallel to regional and national economic structures. That is, growth of Sakarya has influenced from vulnerabilities occurring at regional and national levels, as shown in the Figure 5.8 (see also Appendix B, Table B.11).

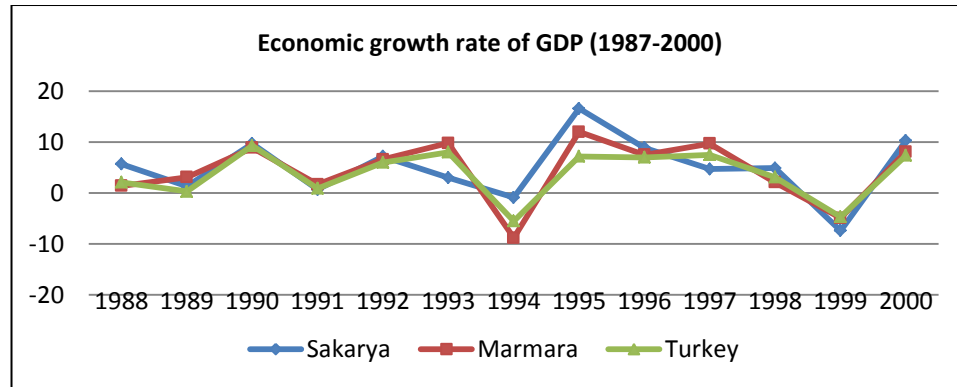


Figure 5.8. Growth rate of GDP of Sakarya, Marmara, Turkey for 1987-2000 period

Source. SPO, 2002b; 561.

According to the data covering 1991-2000, it is evident that economic growth in terms of GDP is highly dependent on macroeconomic trends. Although GDP value of Sakarya

increases in general terms (Figure 5.9), growth rates in percentages remain below the Marmara Region's and Turkey's average (Figure 5.10) (see also Appendix B, Table B.12).

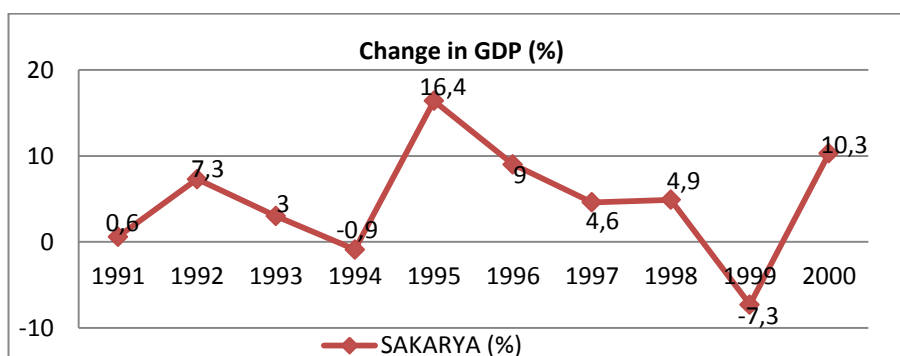


Figure 5.9. Economic growth of Sakarya

Source. SPO, 2002b; 561.

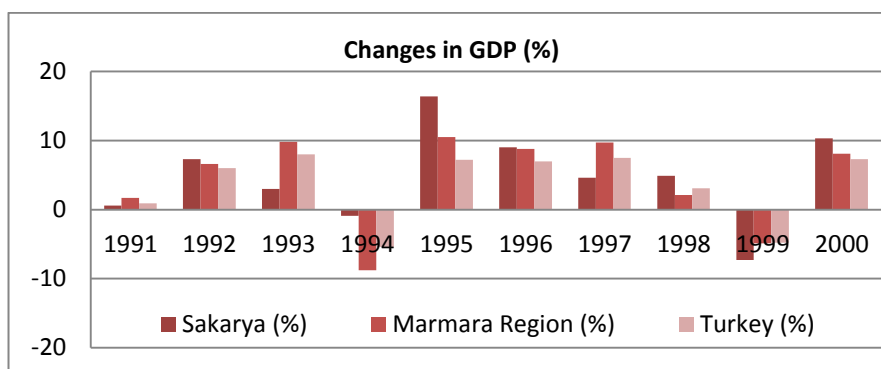


Figure 5.10. Economic growth of Sakarya, Marmara and Turkey

Source. SPO, 2002b; 561.

Depending on the data showing GDP per capita (Figure 5.11), it could be said that while GDP per capita has been below the Turkey average, after the year 2000 there occurred an increase in GDP per capita of Sakarya (see also Appendix B, Table B.13). Consequently, based on the variable of GDP, Sakarya province has a growing trend before the existence of disaster.

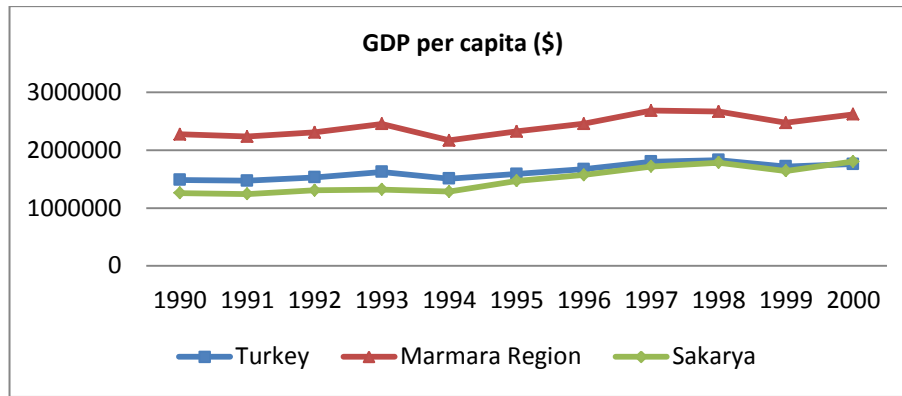


Figure 5.11. GDP per capita (thousand TL)

Source. SPO, 2002a.

Another variable showing economic growth of the city is export and import values. The values described in the Table 5.20 shows that there has been an increasing trend between 2002 and 2007 in both import and export values of Sakarya. With the year 2008, export values become to decrease while import values fluctuate. Therefore, it could be said that volume of foreign trade in Sakarya has been increasing after the 1999 Earthquake. That is, the city has a growing economic structure in terms of foreign trade in recovery period.

Table 5.20. Exports and imports of Turkey and Sakarya (000 US Dollars)

Source. TurkStat, web page, foreign trade values, last achieved in March 2011

| Year | Turkey      |             | Sakarya   |           |
|------|-------------|-------------|-----------|-----------|
|      | Import      | Export      | Import    | Export    |
| 2010 | 185 496 717 | 113 899 174 | 1 005 091 | 1 678 185 |
| 2009 | 140 928 421 | 102 142 613 | 908 949   | 1 722 375 |
| 2008 | 201 963 574 | 132 027 196 | 1 708 866 | 2 912 889 |
| 2007 | 170 062 715 | 107 271 750 | 2 018 569 | 3 522 655 |
| 2006 | 139 576 174 | 85 534 676  | 1 930 986 | 2 981 394 |
| 2005 | 116 774 151 | 73 476 408  | 1 555 407 | 2 712 960 |
| 2004 | 97 539 766  | 63 167 153  | 1 193 818 | 2 093 254 |
| 2003 | 69 339 692  | 47 252 836  | 751 905   | 843 017   |
| 2002 | 51 553 797  | 36 059 089  | 527 905   | 428 029   |

Note: According to the tax numbers of the firms located in province

In addition to the main variables showing the economic structure of the city, it is significant to emphasize the sectoral structure with respect to GDP and employment figures. Main sectors' contribution to GDP, namely agriculture, industry and service, grew %4.8 in total

between 1987 and 2000, as shown in the Figure 5.12 (see also Appendix B, Table B.14). According to given GDP values, it can be said that agriculture-based economic structure of the city has been evolved into an industry-based structure. Within this period, whilst GDP of agricultural production has only increased only %1.8, GDP of industrial production has achieved a % 8.8 increase. Considering the contribution of sectors into GDP, service sector has come to fore as well as industry. The sector has displayed a % 4.7 growth between the years 1987 and 2000.

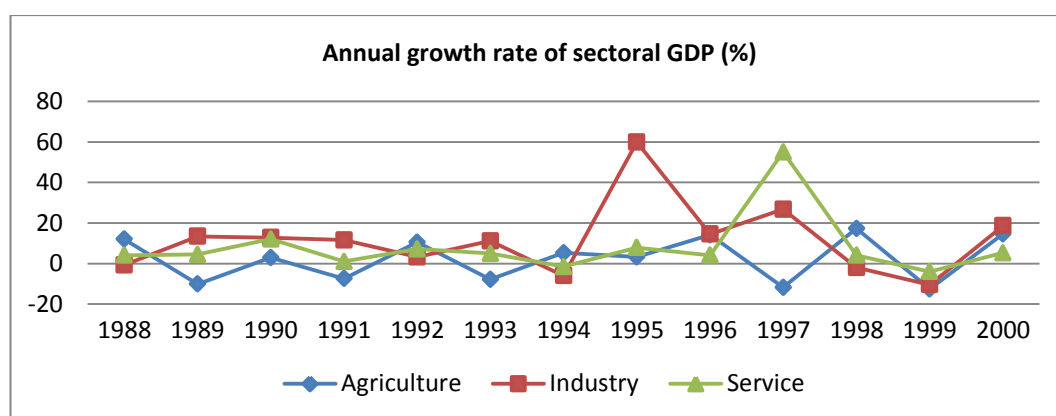


Figure 5.12. Growth rate of sectoral GDP of Sakarya for 1987-2000 period

Source. SPO, 2002b; 561.

Apart from the change in GDP values of sectors, distribution of employment could be used to explain the economic structure of Sakarya. As illustrated in the Figure 5.13, there occurs a decrease in employment of agricultural sector, while industry and service sectors gain increasing shares in employment between the years 1990-2000 (see also Appendix B, Table B.15). Similar to regional and national contexts, Sakarya shows a decreasing trend in agricultural employment, which is still higher than the regional and national average. On the other hand, industry and service sectors gain higher shares in terms of employment, which is below the regional and national average. However, shift of employment from agriculture to industry and service sectors could explain that there is also a shift in economic structure of the city from an agricultural center to an industrial city. According to GDP values and distribution of employment, it could be summarized that there has been a structural shift in the economy of Sakarya. Despite the significant employment shares, agriculture sector has decreasing GDP shares in comparison to industry and service sectors. Although the figures of Sakarya below the regional and national averages, industry and service sectors produce

more GDP than agriculture in Sakarya. Hence, it is appropriate to raise the question that whether the city becoming more industrialized and thus urbanized despite disaster risks.

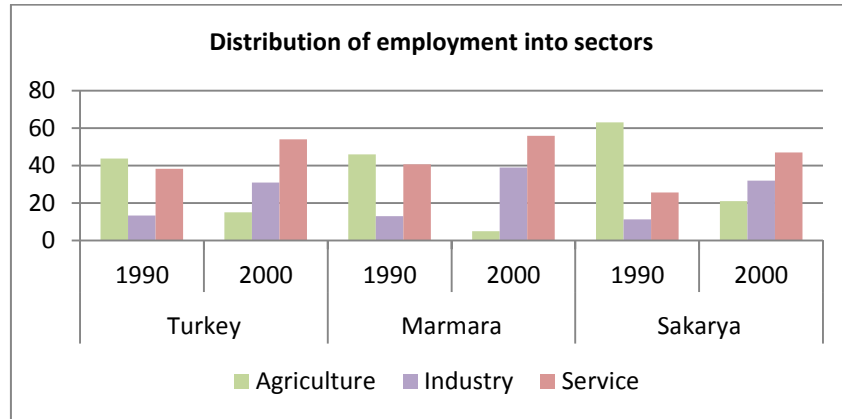


Figure 5.13. Distribution of employment among sectors

Source. TurkStat, web page, last achieved in March 2011

To sum up, agriculture, which has been the dominant economic sector of the city in terms of employment and GDP values, is not the main contributor in recent years due to the shift of the economic structure into industry. As industrial investments took place in Sakarya, industry sector has increased its share in the economic structure. Parallel to industrial developments, service sector has gained a significant share. Generating higher GDP, industry and service sectors become dominant in defining the city's economic profile. Despite the lower figures compared the regional and national averages, the city has a tendency to gain an industrial economic basis. Therefore, it is required to analyze the sub-sectoral structure in detail to determine whether there is a change in subsectoral level.

### **Sub-sectoral analysis of Sakarya's economic structure**

In order to investigate the economic structure of Sakarya in post-disaster period, it is essential to focus on the sub-sectoral structure of economy. In this respect, number of establishments and annual average number of persons engaged (employment) are the variables used in describing the sub-sectoral structure. In doing so, data from General Census of Industry and Business Establishments studies undertaken by TurkStat are used. As a result of the analysis, it is expected to understand whether there is a trend towards economic recovery for the city.

According to General Census of Industry and Business Establishments studies which has been undertaken since 1927, it could be observed that economic structure of Sakarya has diversified. Private enterprises following public investments have developed an industry-based economy. As liberalization gave pace since 1980s, industrial developments have increased after then. Therefore, results of census of 1980 and onwards would be reasonable for such an inquiry.

Looking the census data in terms of number of establishments, it could be observed from the Figure 5.14 that there has been an increase in total number of business establishments and employment in affected zone (see also Appendix B, Table B.16). The only exception is seen in Bolu, since Düzce became province in 1999 by separating from Bolu. The period covering the 1999 Earthquake shows that the cities where the disaster hit appear to gain additional establishments and employment.

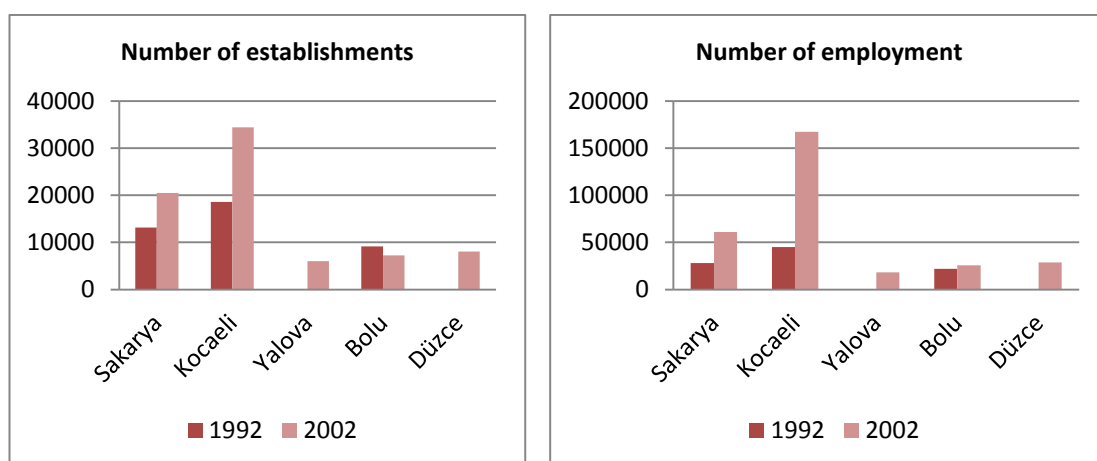


Figure 5.14. Number of establishments and annual average number of persons engaged

Source. TurkStat, 1992 and 2002.

Particularly, for Sakarya, there has been also an increase in total number of business establishments since 1980s where there were fluctuations in the total number of employment (see Appendix B, Table B.17). However, the decrease did not occur in the period covering the 1992-2002 census years, as shown in the Figure 5.15. According to the general census of industry and business establishments (Appendix B, Table B.18), until 2002, almost all sub-sectors display an increase in employment and number of establishments. Within this period, manufacturing industry gains a greater share in terms of

number of establishments and employment. Similarly, in terms of employment and number of establishments, sub-sectors of construction, wholesale and retail trade and financial institutions has benefited from growth since 1980s.

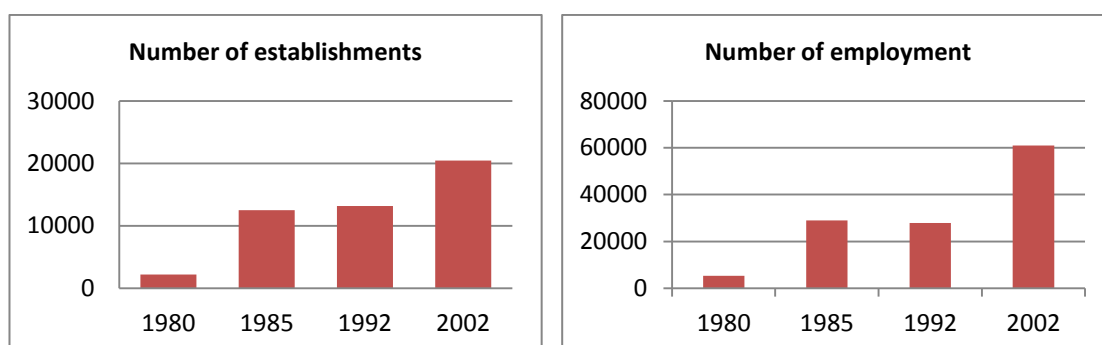


Figure 5.15. Number of establishments and annual average number of persons engaged in Sakarya

Source. TurkStat, 1980, 1985, 1992 and 2002.

With respect to the 2002 census, distribution of employment and number establishments among counties of Sakarya is considered, it is observed that Adapazarı takes the greatest share among other counties. Firms mainly locate in Adapazarı which makes Adapazarı a central area for development of businesses, as shown in the Appendix B, Table B.19. According to the Table, Adapazarı's economic structure is dominated by two main sub-sectors namely, manufacturing industry and wholesale and retail trade. Both of the sub-sectors hold higher shares of employment and this labor dependency structure of the sectors lead to increase in urbanized population.

Business demography, the last variable to indicate the long-term economic structure of Sakarya, is used to express the trend after 1999 earthquake in terms of number of establishing and closing businesses. Two groups with respect to their status as companies-cooperatives and trade name businesses are used in the analysis (Table 5.21). After the last general census of industry and business establishments, there has been an increase in number of establishing businesses despite the number of closing firms. This means, there has been an increase in total number of establishments after the 1999 earthquake.

Table 5.21. Business demography of Sakarya

| Year | Numbers of establishing companies and cooperatives | Numbers of closing companies and cooperatives | Numbers of establishing trade name businesses | Numbers of closing trade name businesses |
|------|----------------------------------------------------|-----------------------------------------------|-----------------------------------------------|------------------------------------------|
| 2002 | 199                                                | 7                                             | 286                                           | 158                                      |
| 2003 | 206                                                | 13                                            | 284                                           | 125                                      |
| 2004 | 252                                                | 27                                            | 373                                           | 120                                      |
| 2005 | 311                                                | 35                                            | 356                                           | 111                                      |
| 2006 | 424                                                | 51                                            | 436                                           | 164                                      |
| 2007 | 427                                                | 45                                            | 471                                           | 208                                      |
| 2008 | 393                                                | 50                                            | 396                                           | 156                                      |

Source. TurkStat, 2008; 96.

#### 5.4. CONCLUSION

So far, with the variables used in the analysis of Sakarya's economic structure, this chapter reveals that the province has a growing tendency in socio-economic terms since 1980s in general, and Adapazarı experienced substantial changes, in particular. Despite the serious impacts of 1999 Earthquake, Adapazarı has continued to grow in terms of population, socio-economic capacity, and GDP. These growth tendencies are also shown in the number of establishments and annual average number of persons engaged in industry and service sectors. As these variables display an increasing trend in each census year, the consequent situation shows a growth in those sectors. Although the city suffered severely from the disaster in 1999, these variables do not represent the negative impacts in the long-term period. Thus, it could be concluded there is no significant impact of the disaster on the long-term economic structure of Sakarya. Being the core location of industry and service sector, and heavily damaged from the earthquake, Adapazarı has restructured after then.



## **CHAPTER VI**

### **ANALYSIS OF BUSINESS RECOVERY AND LOCATION CHOICE FACTORS IN CASE OF ADAPAZARI**

This chapter is devoted to explain what makes the difference for businesses that recover easily and those that struggle and what affects their location choices within recovery process. Our argument is that business recovery is affected not only by the disaster and its direct impacts, but also affected from the internal characteristics of businesses and the response capacity of businesses. Previous studies focused on the factors that determine the success of business recovery (Alesh, et al, 2000; Chang and Falit-Baiamonte, 2002; Dahlhamer and D'Souza, 1995; Tierney, 1994; Webb, et al, 1999). These studies have shown inconsistent findings in terms of factors affecting the business recovery. These studies emphasize the disasters as context-dependent phenomena. That is, disasters have differentiating impacts although the type and magnitude of the disaster is same. The reason behind the variation comes from the changing conditions and context of the localities, extent of the physical damage, duration of lifeline disruption, and so forth.

The research investigates recovery strategies of business in Adapazari twelve years after the 1999 Earthquake. The research encloses the businesses which have recovered more or less after the disaster. However, it does not cover the firms that could not remain in business for 12 years after the earthquake. Besides, this research does not deal with the firms that left Adapazari and never return back, because, the study focuses on location choices of the businesses which today shape the urban space of Adapazari. Therefore, firms that could not achieve recovery are excluded from the survey as they do not take part in urban structuring. Also, it is virtually impossible to reach the firms that experienced and failed after the earthquake. Taking survived businesses as the object, this study is to show that some businesses recover easily than others. To remember, the main hypothesis of the study was that businesses are atypical which results in differentiations in the degree of recovery success. Therefore, the main objective of the thesis was to investigate the factors determining the differentiating degrees of recovery success. In line with the previous studies, this research departed from three set of variables, namely internal factors, response capacity and extent of damage in order to provide a comprehensive examination on business recovery.

In the first part of the study, it is aimed to examine the variables that determine the recovery performances of the businesses. In order to explain the long-term recovery of businesses, the following sub-questions will be addressed: (1) Which factors related to the internal business characteristic have influence on business recovery? (2) Did businesses undertake preparedness measures before disaster? Did these measures affect the continuity of businesses? (3) What direct impacts businesses were subjected due to disasters? (4) How did the disaster affect operations of the businesses?

In the second part of the study, the recovery strategies of the businesses are inquired. To investigate recovery strategies applied by businesses, the following questions will be raised; (1) What type of location choices businesses reveal after a disaster? (2) What are the characteristics of the relocated firms? (3) Which factors affect the location choice of the firm? (3) How the post-disaster urbanization pattern is changed according to recovery of businesses?

In the final part of the study, the relation between business recovery and urban spatial structure is discussed by the following questions; (1) What are the impacts of business recovery on urban restructuring? (2) Is the restructured urban space consistent with initial recovery goals?

## **6.1. BUSINESS RECOVERY**

This part of the study is allocated to explain the long-term recovery of firms based on the factors that are used in the Recovery Model. In this part, internal factors, response capacity and extent of damage are evaluated. The aim is to answer how businesses succeed in face of the disaster and how firms define the reasons, extent and results of business disruption. Hence, this part is concluded by the test of the hypothesis that is developed to explain the factors affecting long-term business recovery.

### **6.1.1. Internal factors**

The first aspect analyzed in this part is business characteristic. As previous business recovery studies show, internal factors play a crucial role in the success of recovery. The focus of this part is to evaluate characteristics of businesses in terms of (1) size, (2) sector, (3) pre-disaster economic condition, (4) occupancy, (5) market range, and (6) education level. Table 6.1 shows the parameters related to the internal factors and their descriptive statistics.

Table 6.1. Internal factors

| Internal factors                 |                | %    | N    |
|----------------------------------|----------------|------|------|
| Number of employees              | 1-5            | 97   | 225  |
|                                  | 5+             | 3    | 7    |
| Business sector                  | Manufacture    | 21,1 | 49   |
|                                  | Construction   | 9,5  | 22   |
|                                  | Trade          | 29,7 | 69   |
|                                  | FIRE           | 14,7 | 34   |
|                                  | Service        | 22,4 | 52   |
|                                  | Other          | 2,6  | 6    |
| Pre-disaster financial condition | In trouble     | 4,7  | 11   |
|                                  | Not so good    | 22,0 | 51   |
|                                  | Good           | 67,7 | 157  |
|                                  | Excellent      | 5,6  | 13   |
| Occupancy                        | Own            | 60,3 | 140  |
|                                  | Lease          | 39,7 | 92   |
| Market range                     | Neighborhood   | 17,2 | 40   |
|                                  | City           | 78,0 | 181  |
|                                  | Regional       | 4,7  | 11   |
| Education level                  | Primary school | 3,0  | 7    |
|                                  | High school    | 40,9 | 95   |
|                                  | Graduate       | 53,9 | 125  |
|                                  | Ms/PhD         | 2,2  | 5    |
| Age                              | 14-99 mean     |      | 20,7 |

We hypothesize that the variables related to internal factors affect the long-term business recovery. Therefore, this section provides descriptive statistics and cross-tabulation analysis for the variables that are used to describe the internal factors of affected firms.

#### 6.1.1.1. Business size

Business size donates a significant figure in defining internal factors. Business size of firms is calculated in terms of the number of employees which indicate the number of part-time and full-time staff. Table 6.2 presents the distribution of firms according to the number of employees. Firms having employees within the 5-9 range will occupy the Adapazarı case.

Table 6.2. Percent of number of employees

| Number of employees | %    | N   |
|---------------------|------|-----|
| 1-4                 | 31,5 | 73  |
| 5-9                 | 46,6 | 108 |
| 10-14               | 13,8 | 32  |
| 15-29               | 5,2  | 12  |
| 30+                 | 3,0  | 7   |
| Total               | 100  | 232 |

Considering the business size by sector, in the case of Adapazarı small firms are dominant regardless of sector. Table 6.3 shows the distribution of small and large firms according to sectors. Large firms that account for 3% of the total firms are seen mostly in manufacturing sector. The mean value (and the median number) of employees is highest in manufacturing sector, and smallest in FIRE sector.

Table 6.3. Distribution of businesses according to number of employees (full and part-time), by sector (%)

| Business sector      | <5   | >5   |
|----------------------|------|------|
| Manufacturing (n=49) | 89,8 | 10,2 |
| Construction (n=22)  | 100  | 0    |
| Trade (n=69)         | 98,6 | 1,4  |
| FIRE (n=34)          | 100  | 0    |
| Service (n=52)       | 98,1 | 1,9  |
| Other (n=6)          | 100  | 0    |
| Total (n=232)        | 97   | 3    |

#### 6.1.1.2. Business sector

Since the sample is stratified according to sector, it is aimed reach equal number firms in each sector. However, it is difficult to conduct questionnaires equally so that at least 20 firms were reached in each sector. Therefore, there is not a dominant type business in the sample although firms in the sample mostly operate in trade, service and industry sector. Respondent firms are asked to define their main field they are operated in. Then, these businesses are categorized into six groups as manufacturing; construction; trade; finance, insurance and real estate; service and other. Business in agriculture, mining, and transportation fall into the 'other' category. Table 6.4 displays the distribution of businesses according to main and sub-sectors.

Table 6.4. Business sector

| Business sector |                                                   | %   | Total N |
|-----------------|---------------------------------------------------|-----|---------|
| Manufacturing   | Food, beverage and tobacco                        | 3,9 | 9       |
|                 | Textile , apparel and leather                     | 2,6 | 6       |
|                 | Furniture                                         | 8,6 | 20      |
|                 | Paper and paper products                          | 0   | 0       |
|                 | Chemicals and chemical petroleum, coal and rubber | 0,4 | 1       |
|                 | Non-metalic organic products                      | 0   | 0       |

Table 6.4. Business sector (cont.)

| Business sector                                                                                    |                                         | %    | Total N |
|----------------------------------------------------------------------------------------------------|-----------------------------------------|------|---------|
| Manufacturing                                                                                      | Basic metal                             | 3,9  | 9       |
|                                                                                                    | Fabricated metal products and machinery | 1,7  | 4       |
|                                                                                                    | Total                                   | 21,1 | 49      |
| Construction                                                                                       | Residential and non-residential         | 6,9  | 16      |
|                                                                                                    | Equipment                               | 2,6  | 6       |
|                                                                                                    | Total                                   | 9,5  | 22      |
| Trade                                                                                              |                                         | 29,7 | 69      |
| Finance, insurance and real estate                                                                 |                                         | 14,7 | 34      |
| Service (hotels and restaurants, education, health and social work)                                |                                         | 22,4 | 52      |
| Other (mining and quarry, electricity, water and gas supply, transport, storage and communication) |                                         | 2,6  | 6       |
| Total                                                                                              |                                         | 100  | 232     |

As manufacturing sector covers a variety of fields, it is asked manufacturing firms to indicate their subsectors. The majority of respondent manufacturing firms are operating in furniture production. Additionally, the subdivision of construction firms could be done as residential and non-residential building sector and equipment and interior construction sector.

#### 6.1.1.3. Business age

All of the respondent firms in the sample have been operating at least thirteen years. The median age of firms is 18 years for the sample (Table 6.5).

Table 6.5. Age of businesses

|        |       |
|--------|-------|
| Mean   | 20,70 |
| Median | 18    |
| Mode   | 15    |

The relation between business size and age illustrated in the Figure 6.1 shows that young firms reveal a tendency to employ less than their elder counterparts. Average number of employees for firms aged between 20-39 is 10,7. This result is parallel to the general trend since it is expected that young firms established after 1980s have small or medium size profile due to the change in mode of production.

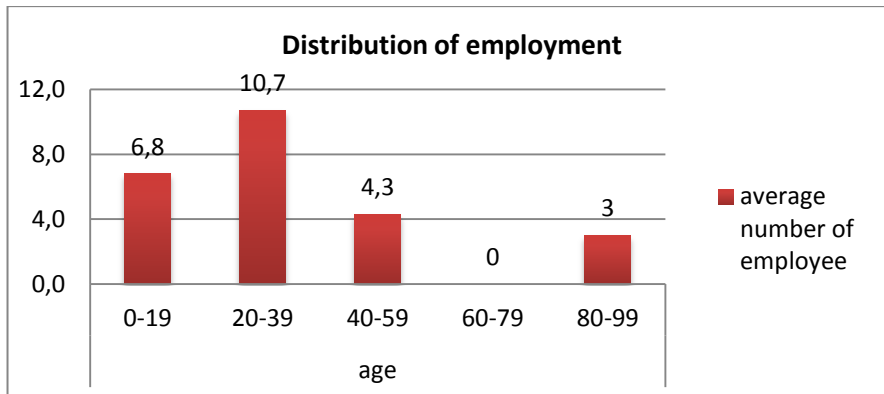


Figure 6.1. Distribution of age groups, by number of employees

Then, the age of firms are analyzed according to their sectors. Figure 6.2 shows that the young firms are mostly seen in trade, service and FIRE sectors. Also, the older business population is seen in both manufacturing and trade sectors.

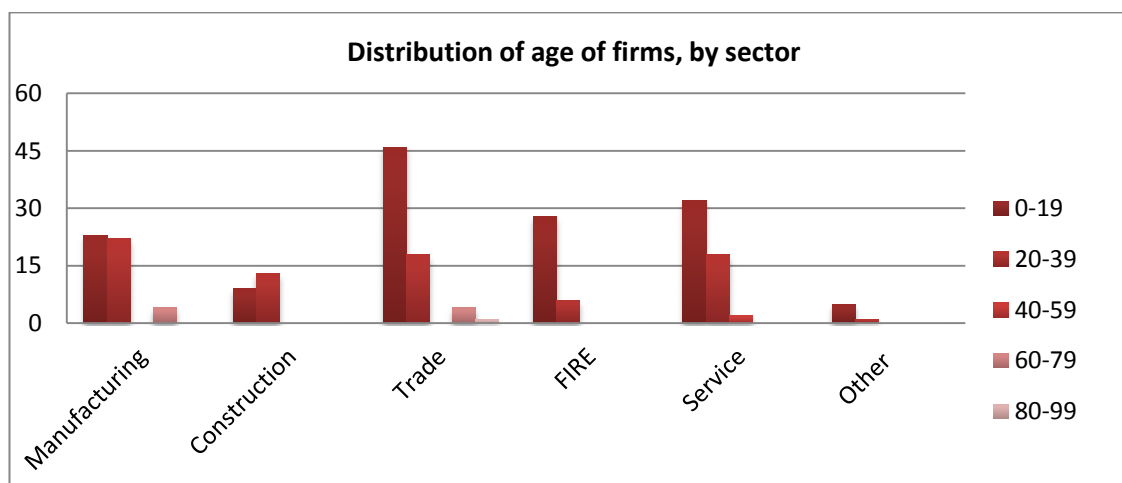


Figure 6.2. Distribution of age groups, by sector

#### 6.1.1.4. Pre-disaster economic condition

Previous studies put forward that financially robust firms in pre-disaster period are more likely to recover than others. Therefore, it is asked to respondents how they define their pre-disaster financial conditions. The responses are ranked on a four-point scale from in trouble to excellent.

According to responses, it is observed that only a small share of firms is suffering before the disaster while most of the respondent firms are doing well before the earthquake (Table 6.6). The relation between the pre-disaster financial condition and business sector reveals that especially the firms in manufacturing, FIRE and trade sectors are not doing well. The rest of the respondents are ranked as good and excellent.

Table 6.6. Pre-disaster financial condition of firms, by sector

| Business sector      | In trouble | Not doing well | Good | Excellent |
|----------------------|------------|----------------|------|-----------|
| Manufacturing (n=49) | 10,2       | 28,6           | 57,1 | 4,1       |
| Construction (n=22)  | 13,6       | 9,1            | 68,2 | 9,1       |
| Trade (n=69)         | 2,9        | 26,1           | 68,1 | 2,9       |
| FIRE (n=34)          | 0,0        | 32,4           | 58,8 | 8,8       |
| Service (n=52)       | 1,9        | 9,6            | 80,8 | 7,7       |
| Other (n=6)          | 0,0        | 16,7           | 83,3 | 0,0       |
| Total (n=232)        | 4,7        | 22,0           | 67,7 | 5,6       |

#### 6.1.1.5. Occupancy

Since the previous studies point out the importance of occupancy tenure of businesses on business recovery, it is asked how the firm occupies the space before and after the earthquake. In the pre-disaster period, small firms mostly operating in service and trade sectors tend to lease the property in which they operate. On the other hand, larger firms, particularly those in manufacturing tend to own the business property. As Table 6.7 presents, 60,3% of all respondent firms mentioned an owner-occupied status, where 39,7% reported being lease-holder. Among the all businesses, 78,1% of large businesses and 56,5% of small businesses are owner-occupied firms. It can be concluded that small firms are less likely to own a property due to their financial conditions and tend to be tenants in their operation.

Table 6.7. Occupancy status of businesses before the earthquake, by sector and size

| Business sector |              | Owner (%) | Renter (%) |
|-----------------|--------------|-----------|------------|
| Manufacturing   | Small (n=44) | 70,5      | 29,5       |
|                 | Large (n=5)  | 100       | 0          |
| Construction    | Small (n=22) | 77,3      | 22,7       |
|                 | Large (n=0)  | 0         | 0          |
| Trade           | Small (n=68) | 48,5      | 51,5       |
|                 | Large (n=1)  | 100       | 0          |

Table 6.7. Occupancy status of businesses before the earthquake, by sector and size (cont.)

| Business sector |               | Owner (%) | Renter (%) |
|-----------------|---------------|-----------|------------|
| FIRE            | Small (n=0)   | 0         | 0          |
|                 | Large (n=34)  | 73,5      | 26,5       |
| Service         | Small (n=51)  | 49,0      | 51,0       |
|                 | Large (n=1)   | 100       | 0          |
| Other           | Small (n=6)   | 33,3      | 66,7       |
|                 | Large (n=0)   | 0         | 0          |
| All businesses  | Small (n=191) | 56,5      | 43,5       |
|                 | Large (n=41)  | 78,1      | 21,9       |
|                 | Total (n=232) | 60,3      | 39,7       |

After analyzing the pre-disaster occupancy status, now we present the post-disaster occupancy status of firms. As Table 6.8 shows the distribution of occupancy status of firms in post-disaster period, present property ownership for affected firms increases in all sectors. Businesses are now less likely to be a tenant. However, we can still observe the renter type occupancy among the service, construction and trade firms.

Table 6.8. Present occupancy status of firms

| Business sector |               | Owner (%) | Renter (%) |
|-----------------|---------------|-----------|------------|
| Manufacturing   | Small (n=44)  | 92,9      | 7,1        |
|                 | Large (n=5)   | 100       | 0          |
| Construction    | Small (n=22)  | 74,1      | 25,9       |
|                 | Large (n=0)   | 0         | 0          |
| Trade           | Small (n=68)  | 78,1      | 21,9       |
|                 | Large (n=1)   | 100       | 0          |
| FIRE            | Small (n=0)   | 0         | 0          |
|                 | Large (n=34)  | 73,5      | 26,5       |
| Service         | Small (n=51)  | 66,7      | 33,3       |
|                 | Large (n=1)   | 100       | 0          |
| Other           | Small (n=6)   | 40        | 60         |
|                 | Large (n=0)   | 0         | 0          |
| All businesses  | Small (n=191) | 76,2      | 23,8       |
|                 | Large (n=41)  | 77,8      | 22,2       |
|                 | Total (n=232) | 77,5      | 23,5       |

In light of these data, we can compare the occupancy statuses in pre- and post-disaster periods. In the survey, firms are studied according to the change in their occupancy status after the earthquake to adopt the new circumstance. 42,4% of leased firms has shifted to owner-occupied status.



Table 6.9. Occupancy status of businesses before and after earthquake (%)

| Ownership pattern  | Owner | Renter | Total (N) |
|--------------------|-------|--------|-----------|
| Previous ownership | 60,3  | 39,7   | 232       |
| Present ownership  | 76,3  | 22,8   | 232       |

#### 6.1.1.6. Market range (primary market)

As previous studies emphasize the importance of the market range of the firms operate, respondents have been asked the range of their market. Figure 6.3 illustrates the possible market hinterland of firms. The market characteristics of firms are categorized as three types of relations including local, regional and national-international.

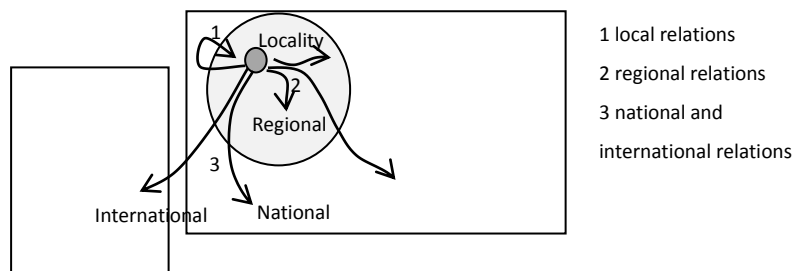


Figure 6.3. Market relations

As Table 6.10 shows, the respondent firms operate commonly at city level before the earthquake (78%). The figure is important to interpret the nature of business in the city. That is, firms are mostly operating at urban level and their businesses have local links. The share of firms with regional links is 4,7%, while that of neighborhood links is 17,2%. Thus, we claim that in the case of a disruption in local links such as loss of local customer base or interruption in local infrastructure or transportation networks at urban or neighbourhood level, firms would suffer directly from the consequences. Among the respondent firms, manufacturing firms have regional links. The rest of the firms have only local market hinterlands. Particularly, firms in trade and service sectors have smaller market range and serve to local customers. Therefore, it is worthwhile to argue that a disaster could disproportionately affect the firms serving to a local hinterland which generally operate in trade and service sectors.

Table 6.10. Market range of the firms, by sector (%)

| Business sector      | Neighborhood | City | Region |
|----------------------|--------------|------|--------|
| Manufacturing (n=49) | 30,6         | 51,0 | 18,4   |
| Construction (n=22)  | 0            | 100  | 0      |
| Trade (n=69)         | 10,1         | 88,4 | 1,4    |
| FIRE (n=34)          | 0            | 100  | 0      |
| Service (n=52)       | 34,6         | 63,5 | 1,9    |
| Other (n=6)          | 0            | 100  | 0      |
| Total (n=232)        | 17,2         | 78,0 | 4,7    |

A similar consequence could accompany with the business size. As it is shown in the Table 6.11, small firms mostly operate at urban level, while their larger counterparts have regional links. Hence, it is to be stated that small firms are affected more severe than large firms due to their dependence of local market range. Contrary, large firms having a larger market hinterland are less likely to be affected from business interruption caused by disasters.

Table 6.11. Market range of firms, by size

| Business size                         | Neighborhood | City | Region |
|---------------------------------------|--------------|------|--------|
| Small (number of employees<5) (n=191) | 16,9         | 80,0 | 3,1    |
| Large (number of employees>5) (n=41)  | 28,6         | 14,3 | 57,1   |

#### 6.1.1.7. Education level

The last investigated business characteristic is about the owner profile of the firm. The profile of owner or manager of a firm is expected to affect destiny of a business during the recovery period. In the survey, the profile of owner or manager is defined by his/her education degree. It is assumed that an owner/manager with better education degree will help the firm to show a better recovery performance than others. Actually, the management ability of business owner/manager can not be measured only by education degree. There are also other distinctive features that a good manager possesses such as experience, foresight, vision, adaptation capacity, leadership, etc. However, since these features are directly related with managerial aspects of businesses and since this study focuses on the spatial considerations of the businesses, description of a 'good' managerial ability and awareness level of the manager is simplified and reduced to 'education level'. Thus, the education level of the owner/manager of the firm was asked to the respondent firms who stand as a decision maker for the destiny of the firm. In the sample, it is observed that the

majority of the owner or manager has a graduate degree which is followed by a high school degree (Table 6.12).

Table 6.12. Education level

| Education level | %    | N   |
|-----------------|------|-----|
| Primary school  | 3,0  | 7   |
| High school     | 40,9 | 95  |
| Graduate        | 53,9 | 125 |
| Ms/PhD          | 2,2  | 5   |

The education level of the manager or owner of the firms is examined by business sectors. The figures show that the better education level of manager/owner is seen in FIRE, construction and manufacturing sectors.

Table 6.13. Distribution of business sectors, by education degree of manager/owner (%)

| Business sector      | Primary school | High school | Graduate | Ms/PhD |
|----------------------|----------------|-------------|----------|--------|
| Manufacturing (n=49) | 6,1            | 32,7        | 55,1     | 6,1    |
| Construction (n=22)  | 0              | 22,7        | 68,2     | 9,1    |
| Trade (n=69)         | 1,5            | 47,8        | 50,7     | 0      |
| FIRE (n=34)          | 0              | 29,4        | 70,6     | 0      |
| Service (n=52)       | 5,8            | 53,9        | 40,4     | 0      |
| Other (n=6)          | 0              | 50,0        | 50,0     | 0      |
| Total (n=232)        | 3,0            | 41,0        | 53,9     | 2,2    |

### 6.1.2. Response capacity

Preparedness is defined by Dahlhamer and D'Souza (1995; 3) as "any activity that has potential to save lives, lessen property damage, and reduce the negative impacts of disaster events, including long-term interruptions of commercial activity". In other words, preparedness helps to enhance disaster response capacity at individual, organizational and community levels.

This part of the study focuses on the extent of the developing a response capacity of the businesses to reduce risks that they face after disasters. In the survey, respondents are

asked to define their; (1) previous disaster experience, (2) preparedness activities taken before and after disaster, and (3) source of financial assistance they applied after the disaster. Table 6.14 displays the descriptive statistics of variable that define the response capacity.

Table 6.14. Response capacity

| Response capacity   |                   | %    | N    |
|---------------------|-------------------|------|------|
| Disaster experience | Yes               | 13,8 | 32   |
|                     | No                | 86,2 | 200  |
| Preparedness level  | No measure        | 59,9 | 139  |
|                     | Single measure    | 19,4 | 45   |
|                     | Multiple measures | 20,7 | 48   |
| Resources used      | 0-5 mean          |      | 1,75 |

We assume that the long-term recovery performance of firms are dependent to the response capacity. This section presents the descriptive statistics and cross-tabulation analysis for the variables that are used to denote the response capacity of affected firms.

#### 6.1.2.1. Previous disaster experience

As Adapazarı has faced with seismic shocks throughout her history, businesses located within the city might have experienced disasters. The 1923, 1957 and 1967 Earthquakes were the major seismic shocks that challenged the city and businesses. Also, there were other natural and technological hazards that have affected the businesses. Therefore, it is asked to firms whether they faced any disaster other than 1999 Earthquake. As it is shown in the Table 6.15, 13,8% of the respondent firms noticed disaster experienced.

Table 6.15. Previous disaster experience

| Disaster experience | %    | N   |
|---------------------|------|-----|
| Yes                 | 13,8 | 32  |
| No                  | 86,2 | 200 |

In addition, the type of natural hazard they experienced is asked. Firms wrote down the types of disaster they faced whether they were natural or not in the open-ended question.

The most frequently mentioned type of disaster is fire as a human-induced hazard type. Fire is followed by flood.

Table 6.16. Types of previously experienced disaster

| Types of previously experienced disaster | %    | N  |
|------------------------------------------|------|----|
| Fire                                     | 56,3 | 18 |
| Flood                                    | 37,5 | 12 |
| Earthquake                               | 3,1  | 1  |
| Other                                    | 3,1  | 1  |
| Total                                    | 100  | 32 |

#### 6.1.2.2. Preparedness degree

Another variable related to response capacity is the preparedness degree. Less than the half of the respondent firms mentioned to take preparedness measures before the 1999 Earthquake. 19% of the respondent firms had undertaken a single preparedness measure and 21% of them took more measures before the seismic shock. The figures show that businesses are reluctant to engage in any emergency activity.

Then, respondent firms were asked what types of preparedness activities they had taken before the earthquake. The measures include purchasing insurance, having structural assessment, preparing emergency or recovery plan, training employees, hiring a disaster manager, and building of redundancy into business, as summarized in the Table 6.17. The mean number of preparedness activities taken by firms in Adapazarı before the Earthquake is 0.81 (out of 8 measures). The most common type of preparedness measure is taking insurance for property, equipment and machinery. Other preparedness measures take small shares compared to insurance. However, despite the earthquake experiences of the city, businesses have not adequately implemented measures before 1999. That is, since the listed measures are scored at very low levels, it seems that business community of Adapazarı was not prepared to the earthquake.

Table 6.17. Type of prevention measures

| Types of prevention measures                           | Before (%)   | After (%)    |
|--------------------------------------------------------|--------------|--------------|
| <b>Insurance for property, equipment and machinery</b> | <b>29,27</b> | <b>74,14</b> |
| Business interruption insurance                        | 3,45         | 30,17        |
| Structural measures (retrofitting, fixing equipment)   | 22,41        | 55,17        |
| Preparation of emergency plan                          | 3,45         | 17,24        |
| Training employees for disaster risk management        | 3,45         | 10,34        |
| Hiring a disaster manager                              | 13,36        | 33,62        |
| Making alternative location arrangements               | 3,02         | 12,93        |
| Building of redundancy into business                   | 3,88         | 17,24        |
| Other                                                  | 0            | 10,34        |

For post-disaster period, it is asked what kind of preparedness measures the firm undertook after the disaster. The mean number of preparedness measures taken after the earthquake has increased to 2,61 out of 8 measures which is still below the expected levels. Again, the most recorded type of measure is insurance for property, equipment and machinery. It is followed by structural measures with 55,17% and hiring a disaster manager with 26,67%.

In order to understand which factors determine the preparedness before a disaster shock, we analyse the relation between preparedness and internal factors and previous disaster experience. Firstly, the relation between business size and preparedness level is examined. We found that large firms are more likely to engage in preparedness (Figure 6.4). This finding is consistent with the previous research results (Tierney and Webb, 2001; Dahlhamer and D'Souza, 1995; Tierney, 1997, Webb, et al., 1999; Tierney and Dahlhamer, 1997).

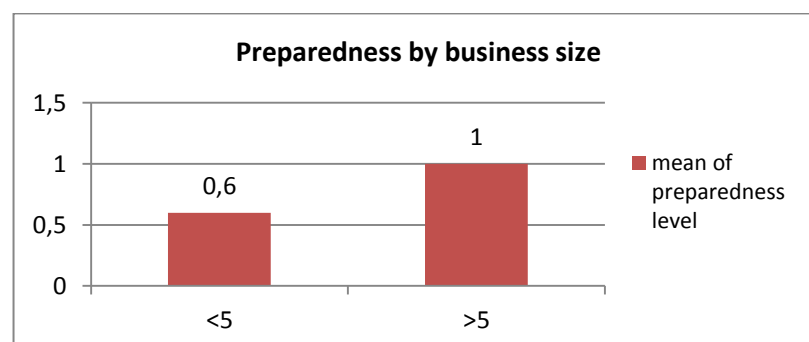


Figure 6.4. Relation between preparedness and business size

The second variable examined to understand the likelihood to preparedness is the business sector variable. Our results showed that construction sector shows the highest mean scores in preparedness (Figure 6.5). On the other hand, firms in trade sector show the least engagement in preparedness. This finding corresponds with the previous studies (Dahlhamer and D'Souza, 1995; Tierney, 1997) arguing that firms in trade sector are less likely to take measures before a disaster.

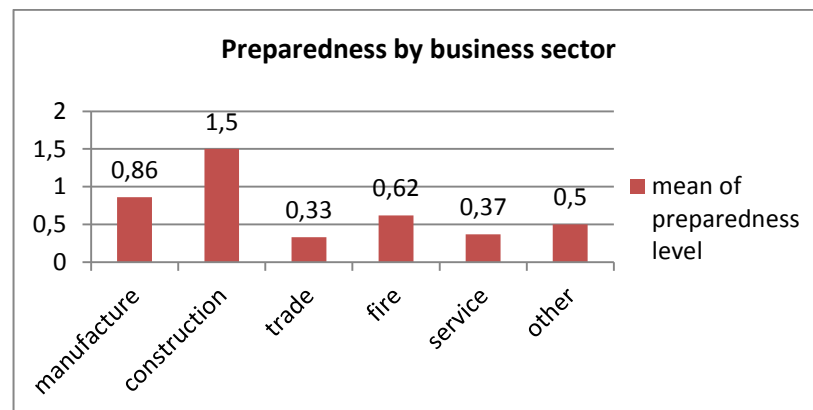


Figure 6.5. Relation between preparedness and business sector

Pre-disaster economic condition is analyzed with respect to preparedness level of firms. This study shows that firms with worse economic condition are more likely to engage in preparedness (Figure 6.6). This finding is not consistent with the expectations. We assume that financially robust firms are more likely to engage in preparedness since they have more resources to allocate before a disaster. It is surprising to find that firms in poor financial condition are more likely to initiate preparedness activities.

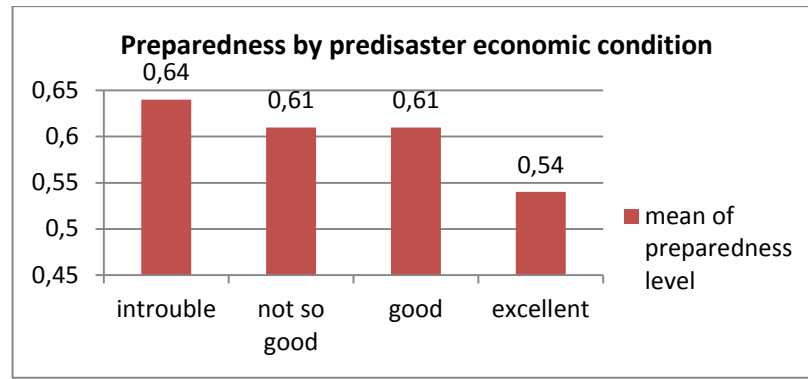


Figure 6.6. Relation between preparedness and pre-disaster economic condition

The next variable analyzed with respect to preparedness is business age. This study does not reveal a linear relation between preparedness and business age. However, Figure 6.7 shows that firms aged between 20-39 are more likely to employ preparedness activities.

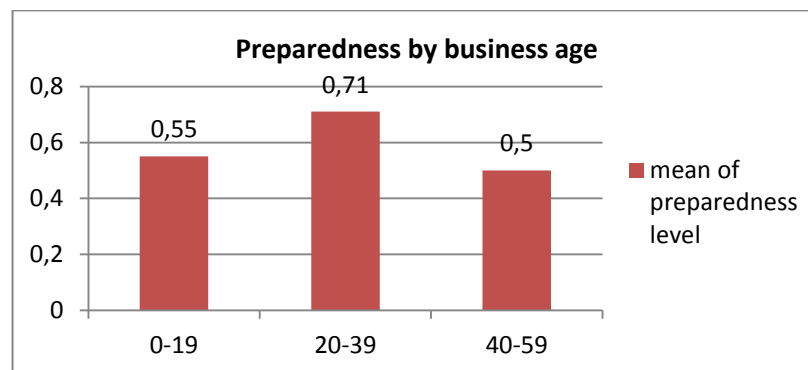


Figure 6.7. Relation between preparedness and business age

For the variable occupancy status, it is expected that owner occupied firms engage more in preparedness than firms with rented property. In line with the existing literature (Dahlhamer and D'Souza, 1995; Webb, et al, 1999), our study confirms that occupancy status influence the likelihood of taking measures. We found that owner occupied type of firms are more likely to initiate preparedness activities than those with property on rent (Figure 6.8).



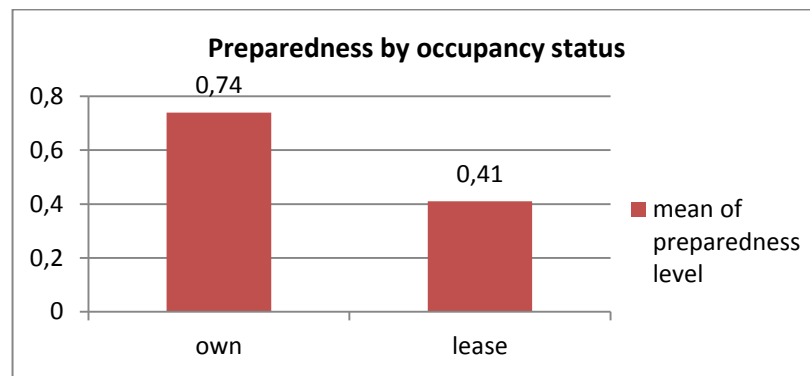


Figure 6.8. Relation between preparedness and occupancy status

The primary markets of businesses are analyzed with respect to preparedness level. This study reveals a partial relation between preparedness and market range. We found that firms serving at regional market are more likely to take measures before a disaster than those operating at neighborhood or urban scale (Figure 6.9).

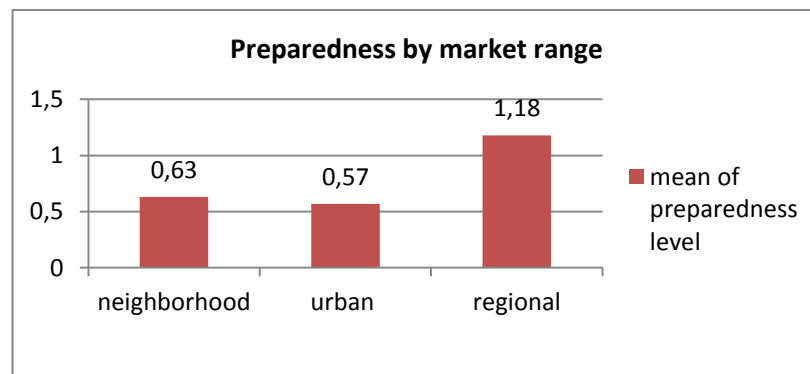


Figure 6.9. Relation between preparedness and market range

The variable related to education level is analyzed by preparedness level. We found that firms with better education level are more likely to facilitate preparedness activities, despite the scores of primary schools (Figure 6.10). We observe the highest mean scores in firms with a manager or owner holding a master or doctorate degree.

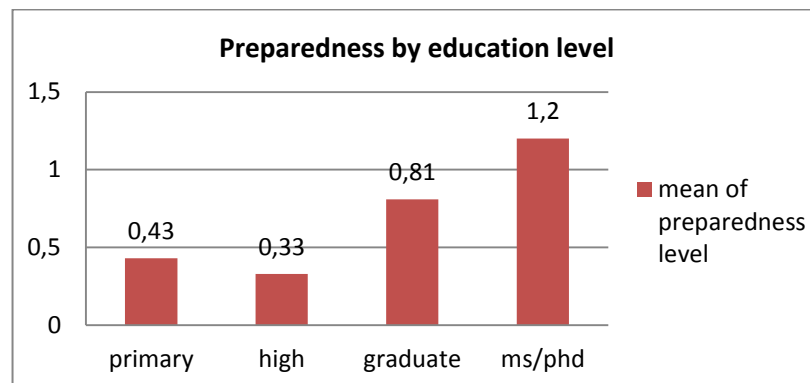


Figure 6.10. Relation between preparedness and education level

The final variable analyzed in preparedness level is the previous disaster experience. It is expected that firms experienced a disaster previously are more likely to engage in preparedness. Contrary to the expectation, we found that firms without any disaster experience took more measures than those with experience (Figure 11). The direction of relation is unexpected.

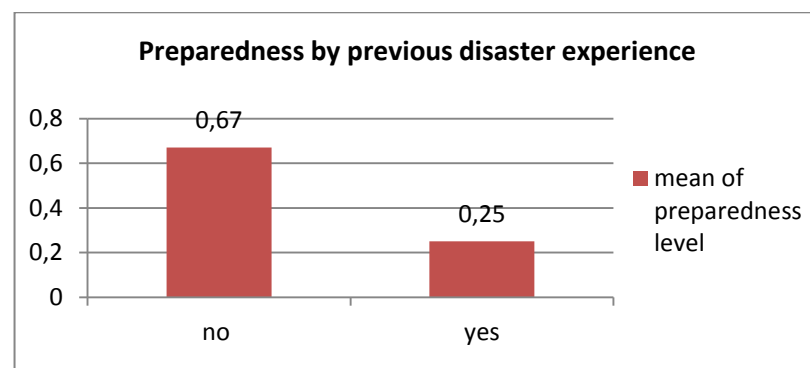


Figure 6.11. Relation between preparedness and previous disaster experience

In order to understand whether disaster experience affects preparedness and which internal factors determine the preparedness degree, a logistic regression model is developed. The model includes the following parameters; (1) size, (2) sector, (3) pre-disaster financial

condition, (4) occupancy, (5) ownership status, (6) education degree of business owner or manager, (7) age, and (8) previous disaster experience.

We hypothesize that owner-occupied type of businesses are more likely to invest in preparedness. As indicated in the previous researches, “owners of buildings have a greater stake to lose in the event of disaster in comparison to renters” (Dahlhamer and D’Souza, 1995; 19). In addition to occupancy tenure, we assume that the parameter of business size is a significant determinant of implementing preparedness activities. That is, larger firms are more likely to undertake preparedness measures than their smaller counterparts. The reason could be explained the limited number of staff and resources to be allocated for preparedness. Therefore, small businesses are assumed to be reluctant to afford for preparedness. Furthermore, we predict that education level of business manager or owner shows a significant determinant of preparedness. As education degree parameter is used to denote the awareness on disaster risks, it is expected that higher education degree of business manager/owner, higher rates of preparedness. The firms selling goods and services to local people are expected to less likely engage in preparedness than those having a geographically diverse market. Additionally, we argue that firms with robust pre-disaster financial condition are more likely to engage in preparedness. Also, older firms and firms with previous disaster experience are expected to invest more in preparedness. In line with the set of hypotheses, Table 6.18 displays the results of regression model.

Table 6.18. Preparedness activities, by internal factors and disaster experience

| Internal factors                 |                        | Beta (B) | Std.errors (S.E.) | Significant (Sig.) | Exp(B)         |
|----------------------------------|------------------------|----------|-------------------|--------------------|----------------|
| Number of employees              | 5+                     | ,157     | 1,057             | ,882               | 1,170          |
| Business sector                  | Manufacture            | ,401     | 1,009             | ,691               | 1,493          |
|                                  | Construction           | 21,601   | 8252,965          | ,998               | 2405730691,858 |
|                                  | Trade                  | -,506    | ,947              | ,593               | ,603           |
|                                  | FIRE                   | -,372    | ,985              | ,706               | ,689           |
|                                  | Service                | -,208    | ,976              | ,831               | ,813           |
| Pre-disaster financial condition | In trouble             |          |                   | ,392               |                |
|                                  | Not so good            | 1,943    | 1,213             | ,109               | 6,980          |
|                                  | Good                   | 1,938    | 1,198             | ,106               | 6,946          |
|                                  | Excellent              | 2,338    | 1,387             | ,092               | 10,358         |
| Occupancy                        | Own                    | ,532     | ,374              | ,155               | 1,702          |
| Market range                     | Local                  |          |                   | ,666               |                |
|                                  | Regional               | ,097     | ,481              | ,840               | 1,102          |
|                                  | National/international | ,792     | ,887              | ,372               | 2,209          |

Table 6.18. Preparedness activities, by internal factors and disaster experience (cont.)

| Internal factors           |                  | Beta (B) | Std.errors (S.E.) | Significant (Sig.) | Exp(B) |
|----------------------------|------------------|----------|-------------------|--------------------|--------|
| Education level            | Primary school   |          |                   | ,015               |        |
|                            | High school      | ,199     | 1,037             | ,848               | 1,220  |
|                            | Bachelor         | 1,285    | 1,024             | ,210               | 3,614  |
|                            | Master/Doctorate | 1,040    | 1,680             | ,536               | 2,829  |
| Age                        | 14-99 mean       | ,042     | ,021              | ,046               | 1,043  |
| Having disaster experience |                  | -,887    | ,590              | ,133               | ,412   |
| Constant                   |                  | -4,436   | 1,985             | ,025               | ,012   |

Note.  $p < .05$

Variables entered on step 1: age, number of employees, manufacture, construction, trade, fire, service, pre-disaster economic condition, occupancy, market range, education, disaster experience.

According to the results of the model, one variable related to internal factors is significant in determination of preparedness of firms in Adapazarı. Among the regressed firm characteristics on the degree of preparedness, the parameter of business age is the strongest predictor of preparedness. Here, for each one year, taking preparedness measure will increase 1,043 times ( $p < 0.05$ ).

The parameters found to be unrelated to preparedness are business size, sector, pre-disaster economic condition, occupancy, market range, education level, and disaster experience. The situation might be related to the number of firms which took measures before the disaster. The preparedness level model would produce more significant factors if there the number of firms with preparedness level was higher.

#### 6.1.2.3. Amount of resources used

Businesses in Adapazarı have used resources to assist recovery, therefore, another variable related to response capacity of firms is the amount of resources used. 21,1% of respondent firms in Adapazarı have an earthquake insurance and use the financial resource to recover (Table 6.19). However, the most common type of resource used after earthquake is individual savings in the form of personal debt (81%). The reason behind the greatest share of personal debt is to be explained by the inadequacy of public loans and absence of insurance. In addition, the firms those damaged mainly from disaster could not be able to access commercial loan, since they had lost their property to be put under lien.

Table 6.19. Type of financial sources used after earthquake

| Types of financial sources                            | %           | N          |
|-------------------------------------------------------|-------------|------------|
| Insurance                                             | 21,1        | 49         |
| Loan (public)                                         | 13,8        | 32         |
| Commercial loan                                       | 24,1        | 56         |
| Business reserves – self-insurance                    | 28,0        | 65         |
| <b>Individual savings</b>                             | <b>81,0</b> | <b>188</b> |
| Donations from business environments or other sources | 3,5         | 8          |
| Other                                                 | 3,5         | 8          |

Table 6.20 shows the types of resources used for recovery, by business sector and size. According to the figures, large firms have the ability to access insurance and commercial loan, and use business reserves. On the other hand, small proprietors usually address to individual savings. In addition, with respect to sectoral distribution of resources, construction firms are more likely to have insurance as compared to other firms.

Table 6.20. Businesses using resources for recovery after disaster, by sector and size (%)

| Business sector |               | Insurance | Public loan/credit | Commercial loan | Business reserves | Individual savings | Donation | Other |
|-----------------|---------------|-----------|--------------------|-----------------|-------------------|--------------------|----------|-------|
| Manufacturing   | Small (n=44)  | 9,1       | 13,6               | 27,3            | 36,4              | 75,0               | 0        | 0     |
|                 | Large (n=5)   | 20,0      | 60,0               | 40,0            | 60,0              | 80,0               | 0        | 0     |
| Construction    | Small (n=22)  | 50,0      | 4,5                | 4,5             | 50,0              | 68,2               | 0        | 0     |
|                 | Large (n=0)   | 0         | 0                  | 0               | 0                 | 0                  | 0        | 0     |
| Trade           | Small (n=68)  | 16,2      | 8,8                | 17,7            | 20,6              | 86,8               | 0        | 0     |
|                 | Large (n=1)   | 0         | 0                  | 0               | 100               | 0                  | 0        | 0     |
| FIRE            | Small (n=0)   | 0         | 0                  | 0               | 0                 | 0                  | 0        | 0     |
|                 | Large (n=34)  | 29,4      | 41,2               | 50,0            | 32,4              | 82,4               | 20,6     | 20,6  |
| Service         | Small (n=51)  | 19,6      | 3,9                | 23,5            | 17,7              | 84,3               | 2,0      | 2,0   |
|                 | Large (n=1)   | 0         | 0                  | 0               | 0                 | 100                | 0        | 0     |
| Other           | Small (n=6)   | 33,3      | 0                  | 0               | 0                 | 83,3               | 0        | 0     |
|                 | Large (n=0)   | 0         | 0                  | 0               | 0                 | 0                  | 0        | 0     |
| All businesses  | Small (n=191) | 19,9      | 7,9                | 19,3            | 26,2              | 81,2               | 0,5      | 0,5   |
|                 | Large (n=41)  | 26,8      | 41,5               | 33,9            | 36,6              | 80,5               | 17,1     | 17,1  |

Furthermore, the relation between amount of resources used and occupancy status is examined. According to the Figure 6.12, we can conclude that owners of the property that housed the business are more likely to allocate resources after the disaster than renters.

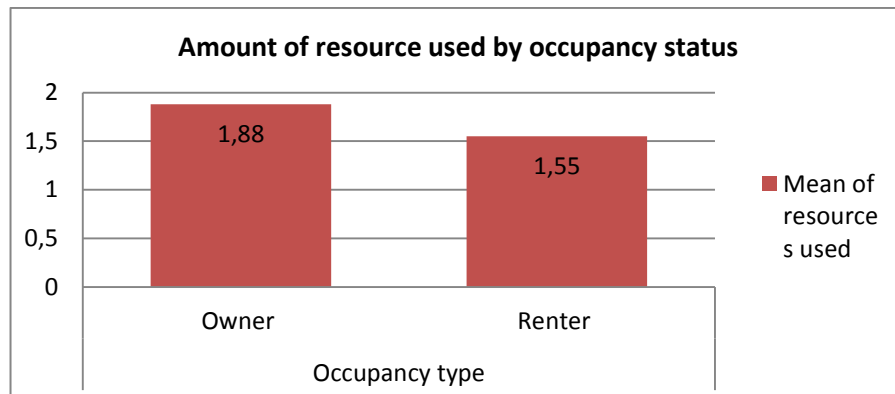


Figure 6.12. Relation between occupancy and use of external resources

Table 6.21 reveals the share of owners and renters using the specified type of resource. Owners mostly address to the individual savings, business reserves, and commercial loans to assist recovery. However, renters could mainly mobilize individual savings. Only a small amount of them had little access to insurance, business reserves and commercial loans.

Table 6.21. Distribution of resources, by ownership status (%)

| Types of financial sources                | Owner | Renter |
|-------------------------------------------|-------|--------|
| Insurance (n=49)                          | 59,2  | 40,8   |
| Public loan (n=32)                        | 75,0  | 25,0   |
| Commercial loan (n=56)                    | 71,4  | 28,6   |
| Business reserves – self-insurance (n=65) | 73,9  | 26,1   |
| Individual savings (n=188)                | 56,4  | 43,6   |
| Donation (n=8)                            | 100   | 0      |
| Other (n=8)                               | 100   | 0      |

We hypothesize that owner-occupied firms are more likely to allocate resources after a disaster. Thus, the relation between occupancy and the use of external resources is examined through logistic regression analysis. Table 6.22 reveals the regression result of the relation between the amount of resource used and occupancy. Use of external resources relates with owning property. That is, owner occupation is statistically significant in

explaining use of resources ( $p < 0.05$ ). Hence, it could be said that owners of business property are more likely to obtain loans and be insured than lease-holders. The reason behind it seems to associate with obtaining loans. Owners of properties could access loans easier than lease-holders.

Table 6.22. Relation between occupancy and use of external resources

| Relation between occupancy and access to resources |       | Beta (B) | Std.errors (S.E.) | Significant (Sig.) | Exp(B) |
|----------------------------------------------------|-------|----------|-------------------|--------------------|--------|
| Occupancy type                                     | Owner | ,242     | ,128              | ,059               | 1,273  |
| Constant                                           |       | ,010     | ,249              | ,968               | 1,010  |

Note.  $p < .05$

Variable entered on step 1: resource used.

In order to explain the relation between resource allocation and business size, we analyze the mean scores of resource used with respect to business size. We found that large firms are more likely to mobilize resources than small firms (Figure 6.13). This finding is consistent with the results of the study of Chang and Falit-Baiamonte (2002).

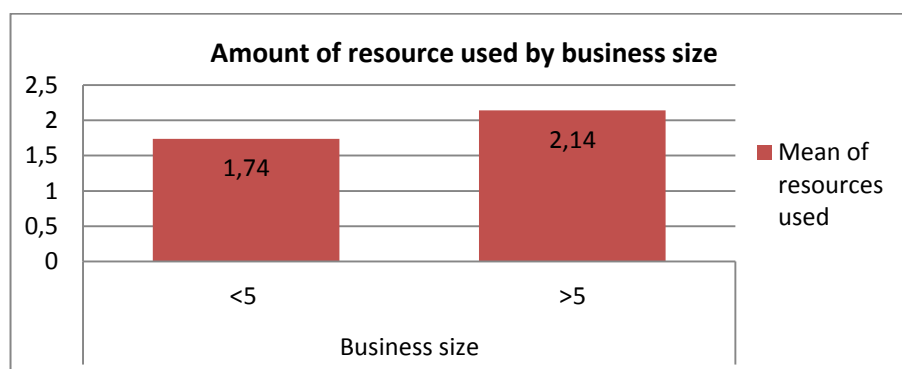


Figure 6.13. Relation between size and use of external resources

Therefore, we assume that business size may influence the use of resources. Hence, relation between business size and amount of external resources used is examined by logistic

regression analysis (Table 6.23). According to the results of regression, business size does not produce statistically significant relationship with use of external resources ( $p < 0.05$ ).

Table 6.23. Relation between size and use of external resources

| Relation between occupancy and access to resources |    | Beta (B) | Std.errors (S.E.) | Significant (Sig.) | Exp(B) |
|----------------------------------------------------|----|----------|-------------------|--------------------|--------|
| Business size                                      | >5 | ,195     | ,233              | ,404               | 1,215  |
| Constant                                           |    | ,010     | -3,844            | ,627               | ,000   |

Note.  $p < .05$

Variable entered on step 1: resource used.

The two analyses on amount of resources with respect to size and occupancy allow us to conclude that firms with a tenant ownership restrike to access the resources for recovery. Therefore, the renter firms show worse performance in recovery than owner-occupied firms. Also, this type of a relationship could be asserted for size. That is, small sized firms are less likely to allocate resources which reduces the probability of recovery for these firms.

### 6.1.3. Extent of damage

In Adapazarı, the survey also focused on the direct effects of the 1999 Earthquake on businesses. The issues specified in this section of the survey are; (1) the extent of physical damage caused by earthquake, (2) the disruptiveness of the earthquake on business continuity, (3) the length of closure and reasons of closure, (4) the role of lifeline services on business continuity, and (5) the disruption of lifeline services and impacts of lifeline outages on businesses. Table 6.24 summarizes the descriptive statistics of physical damage and length of closure used to define the extent of damage caused by disaster.



Table 6.24. Extent of damage caused by earthquake

| Extent of damage  |                    | %    | N   |
|-------------------|--------------------|------|-----|
| Physical damage   | No damage          | 0,9  | 21  |
|                   | Lightly damaged    | 17,9 | 41  |
|                   | Moderately damaged | 57,3 | 125 |
|                   | Heavily damaged    | 23,9 | 52  |
| Length of closure | Not closed         | 0,4  | 1   |
|                   | 1-3 days           | 3,0  | 7   |
|                   | 3-10 days          | 11,2 | 26  |
|                   | 10-30 days         | 34,9 | 81  |
|                   | 30+ days           | 50,4 | 117 |

We hypothesize that the long-term business recovery depends on the variables related to the extent of damage. This section is devoted to show the descriptive statistics and cross-tabulation analysis for the variables that define the extent of damage.

#### 6.1.3.1. Physical damage

One of the variable that is used to describe the extent of damage is the physical damage. Entrepreneurs of firms are asked to describe the structural and non-structural damages they have faced. The question on the extent of physical damage is asked to examine the primary effect of earthquake on the building, equipment and stock. It is observed that all of the businesses were affected from the earthquake more or less (Table 6.25). That is, only 3% of the respondent firms mentioned 'not at all disruptive'. Majority of businesses in the sample reported that the earthquake was moderately disruptive on their businesses (97%).

Table 6.25. Description of earthquake destructiveness on businesses

| Destructiveness of earthquake | %           | N         |
|-------------------------------|-------------|-----------|
| Not at all disruptive         | 3,4         | 8         |
| Not very disruptive           | 26,7        | 62        |
| <b>Moderately disruptive</b>  | <b>41,4</b> | <b>96</b> |
| Very disruptive               | 28,4        | 66        |

The distribution of damage by sector and size is investigated. Table 6.26 presents the disruptiveness of the earthquake, by size and sector. According to business size, large firms were noticed higher disruption rates than small firms. With respect to sector, trade and service sector reported the highest rates of damage. Particularly, small firms in service and trade sectors reported severe disruption.

Table 6.26. Businesses disrupted from earthquake, by sector and size (%)

| Business sector |               | Not at all disruptive | Not very disruptive | Disruptive | Very disruptive |
|-----------------|---------------|-----------------------|---------------------|------------|-----------------|
| Manufacturing   | Small (n=44)  | 4,5                   | 36,4                | 25,0       | 34,1            |
|                 | Large (n=5)   | 0                     | 0                   | 80,0       | 20,0            |
| Construction    | Small (n=22)  | 13,6                  | 54,5                | 27,3       | 4,5             |
|                 | Large (n=0)   | 0                     | 0                   | 0          | 0               |
| Trade           | Small (n=68)  | 0                     | 7,4                 | 57,4       | 35,3            |
|                 | Large (n=1)   | 0                     | 0                   | 0          | 100             |
| FIRE            | Small (n=0)   | 0                     | 0                   | 0          | 0               |
|                 | Large (n=34)  | 0                     | 44,1                | 35,3       | 20,6            |
| Service         | Small (n=51)  | 3,9                   | 23,5                | 41,2       | 31,4            |
|                 | Large (n=1)   | 0                     | 0                   | 0          | 100             |
| Other           | Small (n=6)   | 16,7                  | 33,3                | 50,0       | 0               |
|                 | Large (n=0)   | 0                     | 0                   | 0          | 0               |
| All businesses  | Small (n=191) | 4,2                   | 24,6                | 34,5       | 24,1            |
|                 | Large (n=41)  | 0                     | 36,6                | 39,0       | 24,4            |

Since the earthquake has caused several damages on businesses, firms have suffered from losses in great extent. Direct physical damages led to problems ranging from the collapse of building to injuries, as shown in Table 6.27. Therefore, some firms notified more than a single damage. Most common type of damage is seen as damage to structural elements (91,4%), damage to building (80,6%) and damage to infrastructure (78,9%).

Table 6.27. Type of physical effect caused by disaster

| Types of physical effects            | %           |
|--------------------------------------|-------------|
| Damage to building                   | 80,6        |
| <b>Damage to structural elements</b> | <b>91,4</b> |
| Damage to infrastructure             | 78,9        |
| Damage to furniture and equipments   | 73,3        |
| Damage to machinery                  | 36,2        |
| Damage on stock or inventory         | 40,1        |
| Damage to utility (data, etc.)       | 24,6        |
| Damage on site                       | 78,4        |
| Injury to employees                  | 55,2        |
| Other                                | 3,0         |

Then, it is asked firms which damage caused business interruption. Table 6.28 shows the degree of disruptiveness from zero to very disruptive for each type of damage. The most significant factors leading to business interruption are damage to structural elements (91%). The factor is followed by damage on site (81%) and damage on infrastructure (81%).

Table 6.28. Types of physical effect causing business interruption

| Types of physical effects            | No damage  | Not very disruptive | Disruptive  | Very disruptive |
|--------------------------------------|------------|---------------------|-------------|-----------------|
| Damage to building                   | 2,6        | 43,4                | 33,4        | 20,6            |
| <b>Damage to structural elements</b> | <b>0,4</b> | <b>8,8</b>          | <b>51,8</b> | <b>39,0</b>     |
| Damage to infrastructure             | 1,3        | 17,4                | 54,5        | 26,8            |
| Damage to furniture and equipment    | 4,1        | 29,5                | 40,5        | 25,9            |
| Damage to machinery                  | 25,4       | 30,3                | 16,2        | 28,2            |
| Damage on stock or inventory         | 21,9       | 23,9                | 26,5        | 27,7            |
| Damage to utility (data, etc.)       | 33,3       | 16,7                | 40,0        | 10,0            |
| Damage on site                       | 1,4        | 17,2                | 40,7        | 40,7            |
| Injury to employees                  | 33,8       | 37,7                | 25,6        | 2,9             |
| Other                                | 52,6       | 15,8                | 21,1        | 10,5            |

### 6.1.3.2. Length of time closed

Beside the primary effects of earthquake, there have been secondary effects that obstruct operation. Therefore, problems caused by disasters can impede operation of businesses. These problems may be resulted from the lifeline disruptions, inability of workers to get to business, loss of customers, inability to getting input, suppliers or material, problems in delivering products. Due to a number of reasons caused by the physical damage of earthquake, firms may have to be closed.

Table 6.29 shows the number of businesses stayed closed after earthquake due to several reasons according to their sector and size. It is observed that all businesses remained closed after the earthquake. There is not any differentiation in the rate of business closure in terms of sector and size. The variation among firms might be observed in length of closure.

Table 6.29. Distribution of firms stayed closed after the earthquake, by size and sector

| Business sector |               | %    | N   |
|-----------------|---------------|------|-----|
| Manufacturing   | Small (n=44)  | 100  | 44  |
|                 | Large (n=5)   | 100  | 5   |
| Construction    | Small (n=22)  | 100  | 22  |
|                 | Large (n=0)   | 0    | 0   |
| Trade           | Small (n=68)  | 100  | 68  |
|                 | Large (n=1)   | 100  | 1   |
| FIRE            | Small (n=0)   | 0    | 0   |
|                 | Large (n=34)  | 100  | 34  |
| Service         | Small (n=51)  | 100  | 51  |
|                 | Large (n=1)   | 100  | 1   |
| Other           | Small (n=6)   | 83,3 | 5   |
|                 | Large (n=0)   | 0    | 0   |
| All businesses  | Small (n=191) | 99,5 | 190 |
|                 | Large (n=41)  | 100  | 41  |

The median length of duration of closure in the sample is thirty days. Businesses show differentiations in length of duration based on their sector and size (Table 6.30 and Figure 6.14). With respect to size, large firms tended to close longer periods than small firms. Also, within the sectoral perspective, it is shown that small firms operating in manufacturing and trade, and large firms in FIRE sector have experienced longer closure periods.

Table 6.30. Median and mean length of time closed, by sector and size

| Business sector |               | Median | Mean |
|-----------------|---------------|--------|------|
| Manufacturing   | Small (n=44)  | 40     | 39,9 |
|                 | Large (n=5)   | 20     | 21   |
| Construction    | Small (n=22)  | 30     | 33,5 |
|                 | Large (n=0)   | 0      | 0    |
| Trade           | Small (n=68)  | 30     | 39,7 |
|                 | Large (n=1)   | 0      | 0    |
| FIRE            | Small (n=0)   | 0      | 0    |
|                 | Large (n=34)  | 37,5   | 50,1 |
| Service         | Small (n=51)  | 20     | 39,2 |
|                 | Large (n=1)   | 0      | 0    |
| Other           | Small (n=6)   | 22,5   | 42,5 |
|                 | Large (n=0)   | 0      | 0    |
| All businesses  | Small (n=191) | 30     | 40,6 |
|                 | Large (n=41)  | 30     | 75,0 |

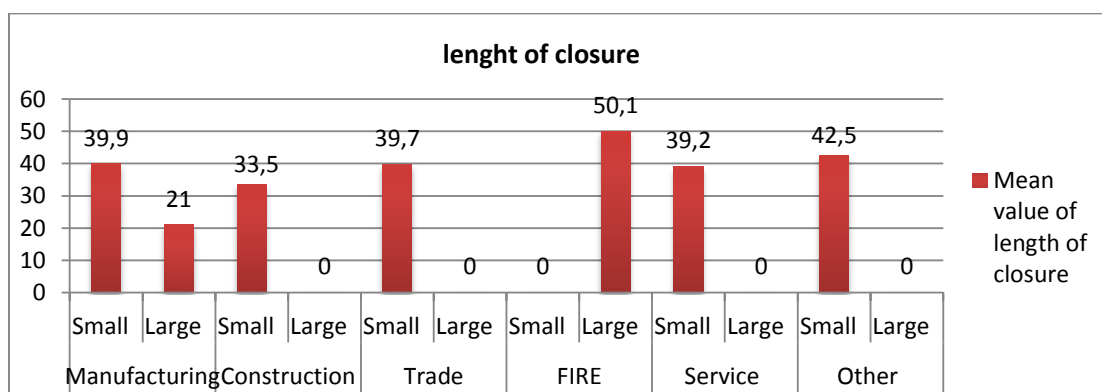


Figure 6.14. Length of closure, by size and sector

Then, we have asked why firms had to close after the earthquake. In the questionnaire, the reasons of length of time closed are asked and categorized into 13 groups as shown in the Table 6.31. The most frequently reported reasons are the need to clearance of damage to

interior and contents of building (78%), loss of customers (47%), and lifeline losses (41%). These reasons for closure accompany with the damage type that the firms faced. The most frequently mentioned damage types are parallel to the reasons of closure, damage to structural elements, damage on site and damage to infrastructure. Here, it is fair to claim that loss of customers is linked to damage on site. This type of relation is to be used in the further step of the analysis where location of customers is taken as a spatial factor.

Table 6.31. Reasons of business closure

| Reasons of closure                                              | %           |
|-----------------------------------------------------------------|-------------|
| Destruction of building and essential repairs                   | 24,6        |
| <b>Clearance of damage to interior and contents of building</b> | <b>78,4</b> |
| Need to have building structurally assessed                     | 18,1        |
| Loss of machinery and office equipments                         | 11,6        |
| Loss of inventory and stock                                     | 15,5        |
| Loss of customers                                               | 47,4        |
| Difficulties in getting supplies or input material              | 15,1        |
| Difficulties in delivering products/services                    | 4,7         |
| Inability of workers to get to work                             | 3           |
| Inability to afford to pay employees                            | 37,5        |
| Problems in transportation                                      | 15,9        |
| Lifeline losses                                                 | 41,4        |
| Other                                                           | 1,3         |

Note. Number of businesses that closed is 231.

Then, we have analyzed the relation between length of closure and extent of damage and taking preparedness. Table 6.32 shows the results of the first inquiry related to extent of damage. A positive relation is observed between the length of closure and extent of damage. That is, the higher levels of damage seem to increase the length of business closure.

Table 6.32. Relation between extent of damage and length of closure (%)

| Length of closure | No damage | Not very disruptive | Disruptive | Very disruptive |
|-------------------|-----------|---------------------|------------|-----------------|
| Not closed (n=1)  | 100       | 0                   | 0          | 0               |
| 1-3 days (n=7)    | 14,3      | 42,9                | 42,9       | 0               |
| 3-10 days (n=26)  | 0         | 50,0                | 23,1       | 26,9            |
| 10-30 days (n=81) | 6,2       | 33,3                | 45,7       | 14,8            |
| 30+ days (n=117)  | 0,9       | 16,2                | 42,7       | 40,2            |

Also, the relation between business closure and preparedness level is analyzed, as shown in the Table 6.33. However, there seems no systematic relation between these variables. Therefore, it is hard to argue that there is a linear relation between those factors, i.e. taking measure reduces the length of closure.

Table 6.33. Relation between taking preparedness and length of closure (%)

| Length of closure | No damage | Single measure | Multiple measures |
|-------------------|-----------|----------------|-------------------|
| Not closed (n=1)  | 100       | 0              | 0                 |
| 1-3 days (n=7)    | 85,7      | 0              | 14,3              |
| 3-10 days (n=26)  | 76,9      | 3,8            | 19,2              |
| 10-30 days (n=81) | 39,5      | 30,9           | 29,6              |
| 30+ days (n=117)  | 68,4      | 16,2           | 15,4              |

Chi-square test could not be employed for both of the variables to explain length of closure. Because, 40% of cells have expected count less than 5. Therefore, it is statistically meaningless to interpret the results for preparedness level and extent of damage.

#### 6.1.3.2.1. Role of lifeline losses in business continuity

In order to understand how vulnerable businesses are to lifeline losses, the relation between business sectors and lifelines is investigated. In the survey, firstly, it is asked to businesses to score their dependency on each infrastructure type on a three-point scale ranging from 'not important' to 'very important'. Table 6.34 shows the distribution of importance of lifeline services among business sectors. According to the responses, it is found that electricity is scored as the most crucial service by all businesses. This findings is consistent with the study of Tierney (1994) made after the Midwest Floods in Iowa. Following the electricity supply among all businesses, water, sewer and phone seem as equally crucial for their operations.

Table 6.34. Importance of lifeline systems (%)

| Lifeline systems | Not imp.   | Important   | Very imp.   |
|------------------|------------|-------------|-------------|
| <b>Electric</b>  | <b>0,4</b> | <b>12,5</b> | <b>87,1</b> |
| Water            | 38,4       | 33,2        | 28,4        |
| Sewer            | 27,4       | 40,9        | 31,7        |
| Phone            | 24,9       | 39,3        | 35,8        |

Then, the importance of infrastructure is examined by business sectors. The relation between sectors and lifeline services show the dependency of business continuity on lifeline services (Table 6.35). Also, it provides a basis for understanding to what extent the sectors were disrupted after the infrastructure losses. In this respect, manufacturing and FIRE sectors are more likely to dependent on electricity than others. Water supply seems more crucial for the firms operating in service and manufacturing sectors. Also, firms in construction and FIRE sectors are more dependent on phone services. In addition, sewer system is more important for firms in manufacturing, construction and service sectors.

Table 6.35. Importance of lifeline, by business sector (%)

| Business sector |          | Not imp. | Important | Very imp. |
|-----------------|----------|----------|-----------|-----------|
| Manufacturing   | Electric | 0        | 6,1       | 93,9      |
|                 | Water    | 16,3     | 26,5      | 57,1      |
|                 | Sewer    | 10,2     | 38,8      | 51,0      |
|                 | Phone    | 22,4     | 57,1      | 20,4      |
| Construction    | Electric | 0        | 22,7      | 77,3      |
|                 | Water    | 0        | 100       | 0         |
|                 | Sewer    | 4,5      | 45,5      | 50,0      |
|                 | Phone    | 0        | 31,8      | 68,2      |
| Trade           | Electric | 0        | 18,8      | 81,2      |
|                 | Water    | 59,4     | 30,4      | 10,1      |
|                 | Sewer    | 30,4     | 56,5      | 13,0      |
|                 | Phone    | 44,9     | 44,9      | 10,1      |
| FIRE            | Electric | 0        | 0         | 100       |
|                 | Water    | 85,3     | 2,9       | 11,8      |
|                 | Sewer    | 61,8     | 29,4      | 8,8       |
|                 | Phone    | 11,8     | 20,6      | 67,6      |
| Service         | Electric | 1,9      | 15,4      | 82,7      |
|                 | Water    | 17,3     | 34,6      | 48,1      |
|                 | Sewer    | 28,8     | 26,9      | 44,2      |
|                 | Phone    | 23,1     | 30,8      | 46,2      |
| Other           | Electric | 0        | 0         | 100       |
|                 | Water    | 66,7     | 16,7      | 16,7      |
|                 | Sewer    | 33,3     | 33,3      | 33,3      |
|                 | Phone    | 33,3     | 16,7      | 50,0      |
| All businesses  | Electric | 0,4      | 12,5      | 87,1      |
|                 | Water    | 39,2     | 35,3      | 28,1      |
|                 | Sewer    | 28,0     | 40,5      | 31,5      |
|                 | Phone    | 25,9     | 38,8      | 35,4      |

After determining the importance of lifeline services according to personal evaluation, the next step is to understand how the earthquake affected the provision of lifeline services. According to the responses, it could be interpreted that there is widespread lifeline service interruptions. Almost all businesses in the sample indicated electricity services interruption

as a result of earthquake, as shown in the Table 6.36. Approximately, more than 85% of respondent firms reported water, sewer and phone losses due to the disaster. According to business sectors, firms in trade and FIRE sectors have mostly faced with all types of lifeline interruption.

Table 6.36. Percent of businesses reporting lifeline losses, by sector

| Business sector      | Electric | Water | Sewer | Phone |
|----------------------|----------|-------|-------|-------|
| Manufacturing (n=49) | 98,0     | 77,6  | 81,6  | 85,7  |
| Construction (n=22)  | 100      | 100   | 77,2  | 77,2  |
| Trade (n=69)         | 98,5     | 92,7  | 91,3  | 97,1  |
| FIRE (n=34)          | 100      | 100   | 94,1  | 94,1  |
| Service (n=52)       | 96,1     | 84,6  | 76,9  | 78,8  |
| Other (n=6)          | 83,3     | 100   | 100   | 100   |
| Total (n=232)        | 97,8     | 89,6  | 85,3  | 88,4  |

Then, it is asked whether the lifeline interruptions affect business operation. Disruptiveness of lifeline interruptions on business is investigated and shown in the Table 6.37. Loss of infrastructure has caused severe limitations on business continuity. Respondent firms are asked to score the disruptiveness of lifeline outages from 'no damage' to 'very disruptive'. Loss of electricity is the most frequently mentioned reason of business discontinuity. Electricity loss was mostly disruptive for firms in manufacturing, trade and service sectors. Firms in FIRE sector saw phone service losses as very disruptive. Among all businesses, manufacturing firms rated loss of electricity as very disruptive. It could be observed that loss of sewer system did not have crucial effect on business continuity compared to electricity and phone services.

Table 6.37. Percent of business discontinuity due to lifeline losses, by sector

| Business sector |          | No damage | Not very disruptive | Disruptive | Very disruptive |
|-----------------|----------|-----------|---------------------|------------|-----------------|
| Manufacturing   | Electric | 0         | 0                   | 14,3       | 85,7            |
|                 | Water    | 4,1       | 49,0                | 8,1        | 38,8            |
|                 | Sewer    | 4,1       | 42,9                | 30,6       | 22,5            |
|                 | Phone    | 4,1       | 67,4                | 28,6       | 0               |
| Construction    | Electric | 0         | 4,5                 | 86,4       | 9,1             |
|                 | Water    | 9,1       | 72,7                | 18,2       | 0               |
|                 | Sewer    | 4,5       | 81,8                | 9,1        | 4,5             |
|                 | Phone    | 4,5       | 45,5                | 50,0       | 0               |



Table 6.37. Percent of business discontinuity due to lifeline losses, by sector (cont.)

| Business sector |          | No damage | Not very disruptive | Disruptive | Very disruptive |
|-----------------|----------|-----------|---------------------|------------|-----------------|
| Trade           | Electric | 0         | 7,2                 | 31,9       | 60,9            |
|                 | Water    | 8,8       | 76,8                | 13,1       | 1,5             |
|                 | Sewer    | 7,3       | 78,3                | 14,5       | 0               |
|                 | Phone    | 5,8       | 71,0                | 23,2       | 0               |
| FIRE            | Electric | 0         | 5,9                 | 52,9       | 41,2            |
|                 | Water    | 5,9       | 88,2                | 5,9        | 0               |
|                 | Sewer    | 5,9       | 91,2                | 2,9        | 0               |
|                 | Phone    | 0         | 35,3                | 29,4       | 35,3            |
| Service         | Electric | 0         | 13,5                | 34,6       | 51,9            |
|                 | Water    | 9,6       | 42,3                | 32,7       | 15,4            |
|                 | Sewer    | 3,8       | 65,4                | 25,0       | 5,8             |
|                 | Phone    | 1,9       | 65,4                | 17,3       | 15,4            |
| Other           | Electric | 0         | 0                   | 50         | 50              |
|                 | Water    | 16,7      | 66,7                | 16,7       | 0               |
|                 | Sewer    | 16,7      | 83,3                | 0          | 0               |
|                 | Phone    | 16,7      | 33,3                | 16,7       | 33,3            |
| All businesses  | Electric | 0         | 7,8                 | 36,2       | 56,0            |
|                 | Water    | 7,8       | 64,2                | 16,0       | 12,0            |
|                 | Sewer    | 5,6       | 70,3                | 17,7       | 6,4             |
|                 | Phone    | 6,0       | 58,2                | 26,3       | 9,5             |

As a result, for the role of lifeline services, the most frequently mentioned reason of business closure is the loss of electricity service. 56% of the total sample of businesses was forced to close due to electricity interruption after the earthquake. Nigg's research (1995) on business infrastructure dependency shows that businesses are affected from electricity outages independent of their sector and size since electricity is a universally critical service. However, interruptions in phone, water, gas and sewer systems would lead variations among sectors in the reliance on services.

#### 6.1.4. Long-term recovery

In Adapazarı, the long-term recovery part of the business survey is concluded by asking firms evaluation on present state of businesses to understand whether the business was worse off, the same or better off after the earthquake. The evaluation is made through four parameters namely number of employees, number of customers, profit levels, and personal evaluation on present state of business.

The long-term recovery as the dependent variable of the study is an index of four variables which are measured on three-point scale. Index ranges from 4 to 12. In this range, 12 point

indicates the most positive recovery situation where 4 point indicates the least situation in recovery.

The long-term recovery variable which is denoted by four indicators ranges from 4 to 12. The mean score on long-term recovery index was 7, as shown in the Table 6.38.

Table 6.38. Long-term recovery variable

| Long-term recovery | Score |
|--------------------|-------|
| Mean               | 7     |
| Median             | 9,5   |
| Mode               | 6     |

According to nearly half of the respondents, the businesses go worse off compared to their pre-disaster conditions in terms of number of customers, profit level, and present state of business, as shown in the Table 6.39. Approximately half of the firms mentioned that their businesses are worse off in comparison to pre-disaster condition. Only 45% of the firms noted to do about same before the earthquake struck in terms of number of employees. The figure showing the number of employees meets the expectations since the dominant employment structure of firms in the sample is small. Therefore, it is expected that number of employees should not be under the pre-disaster levels in order to run their works. The worse off situation might be seen in larger firms who had to shrink their jobs. The present of state business variable shows also the expectations of firms for future. 32% of businesses are notified being better off and 53% are notified worse off with respect to present state of businesses. This figure could be interpreted as there is a negative climate within the business environment.

Table 6.39. Long-term recovery (%)

| Long-term recovery        | Worse off | Same | Better off |
|---------------------------|-----------|------|------------|
| Number of employees       | 37,9      | 44,8 | 17,2       |
| Number of customers       | 61,6      | 9,1  | 29,3       |
| Profit level              | 48,3      | 24,1 | 27,6       |
| Present state of business | 52,9      | 14,7 | 32,4       |

Note: N=232

After determination of the recovery scores, the factors that affect the long-term business recovery are evaluated. Long-term recovery scores are analyzed with respect to the dependent variables identifying the internal factors, response capacity and extent of damage. The first variable related to internal factors is the business size. Long-term recovery scores are analyzed by the number of employees. It seems that small size firms are less likely to recover in comparison to large firms (Figure 6.15). In line with the previous studies (Webb, et al., 2002; Alesch, et al., 2000; Zhang, et al, 2009; Dahlhamer and Tierney, 1998; Tierney and Dahlhamer, 1997; Tierney and Webb, 2001; Chang and Falit-Baiamonte, 2002; Webb, et al., 2002), this study confirms that large firms show better performance in recovery than their small counterparts. In an urban central district, where small sized firms are dominant, additional policies are required to support the small business recovery.

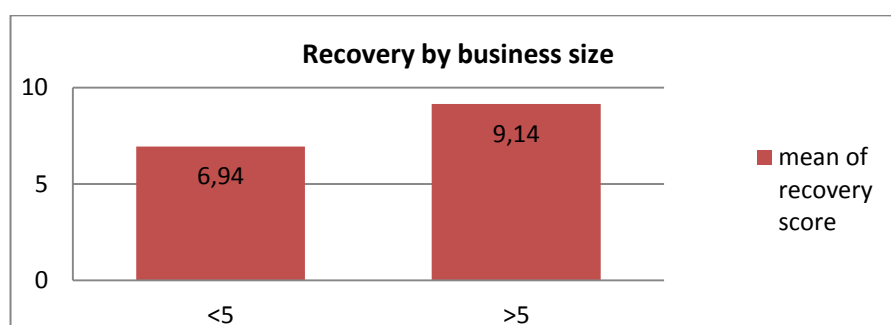


Figure 6.15. Recovery by business size

The second variable analyzed with recovery score is the business sector. The highest values of recovery scores are seen in FIRE and construction sectors (Figure 6.16). Firms in the manufacture, trade and service sectors are less likely to recovery. The least recovery score is observed in trade. Since trade sector is highly competitive, firms operating in trade sector become disadvantageous in recovery. Also, the reason of failing in recovery may relate with the size of trade firms. Since we found that %98 of firms in trade are small sized businesses, they are less likely to recover than other sectors. This finding corresponds with the previous studies of Chang and Falit-Baiamonte (2002), Webb, et al (2002), Alesch (2000).

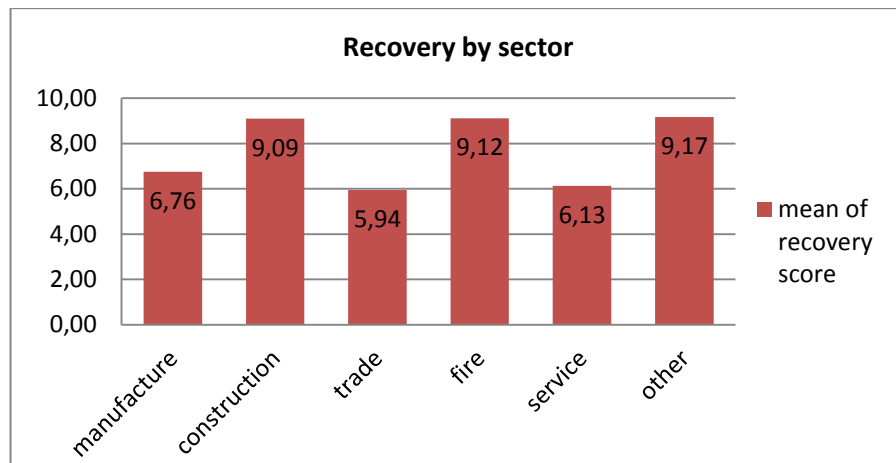


Figure 6.16. Recovery by business sector

We analyzed the recovery scores with respect to the age groups. For the variable business age, we found that older firms are more likely to recover than their younger counterparts (Figure 6.17). This finding does not accompany with the previous studies of Webb, et al (2002) which found a controversial relation between age and recovery.

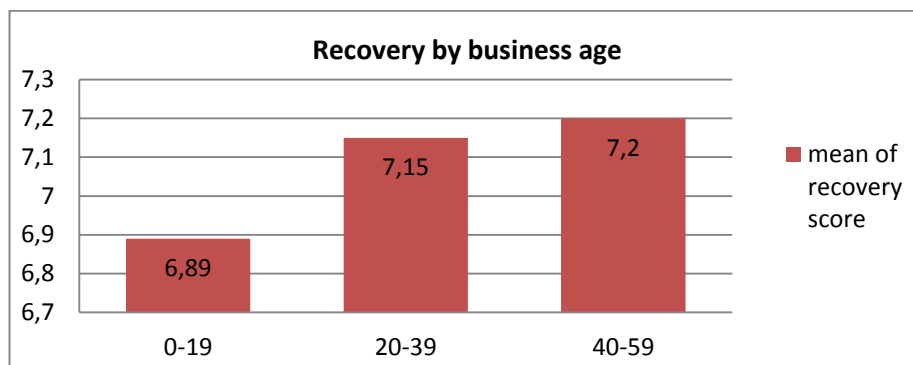


Figure 6.17. Recovery by business age

The pre-disaster economic conditions of firms are analyzed by mean of recovery scores. Although there is a partially linear relation between recovery and pre-disaster economic condition, we found that the highest recovery scores are observed in firms with excellent financial conditions (Figure 6.18).

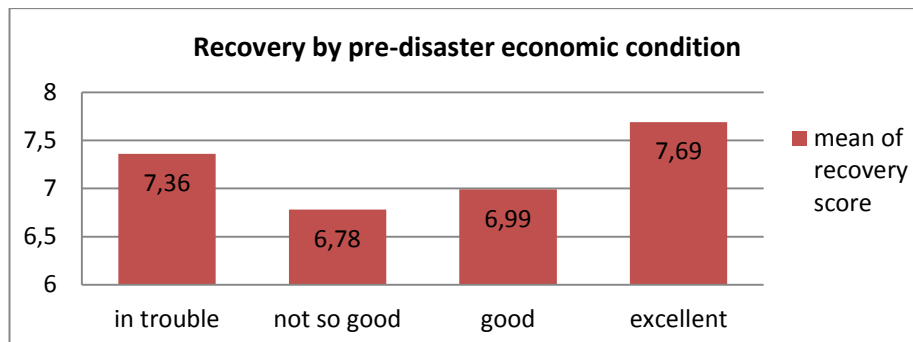


Figure 6.18. Recovery by pre-disaster economic condition

The long-term recovery of firms is analyzed according to the occupancy status. We found that owner occupied-type of firms are more likely to recover than those with rented property (Figure 6.19). Corresponding with the findings of previous research (Chang and Falit-Baiamonte, 2002; Dahlhamer and Tierney, 1998; Tierney, 1997; Tierney and Dahlhamer, 1997; Nigg, 1995; Powell and Harding, 2009; Wasileski, et al, 2011), this study puts forward that occupancy status affects the recovery performance of businesses.

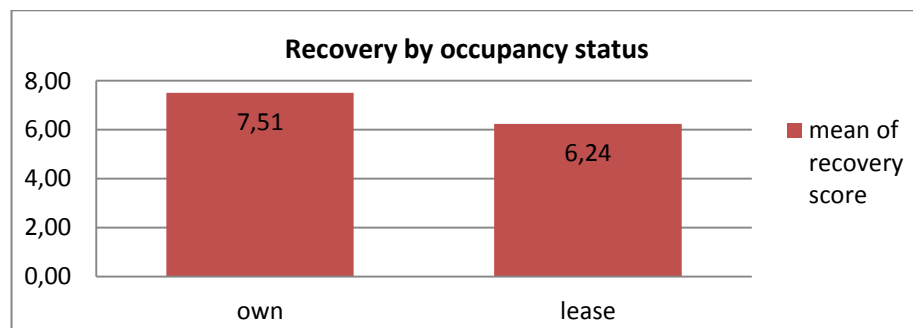


Figure 6.19. Recovery by occupancy status

Another internal factor analyzed with recovery scores is the variable measuring the market range. There is a partially linear relation between recovery pattern and market range (Figure 6.20). However, the results show that the highest recovery scores belong to firms serving to a regional market range. Firms with regional links are more likely to recovery those with neighborhood or urban market range. This finding corresponds to the previous studies of

Tierney and Webb (2001), Chang and Falit-Baiamonte (2002), Webb, et al. (2002), and Zhang, et al. (2009).

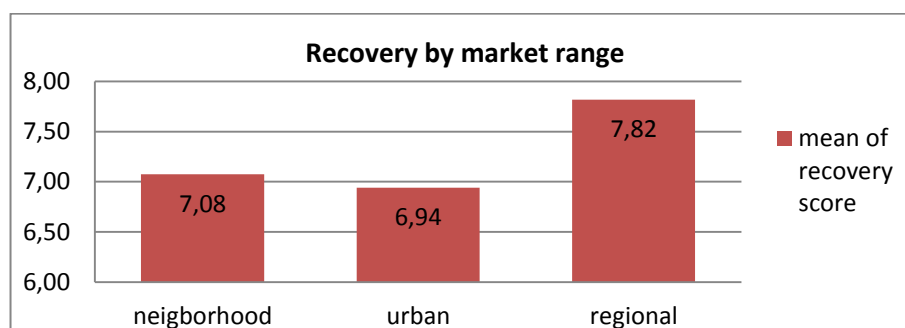


Figure 6.20. Recovery by market range

The variable of education level is another factor that influences the recovery process of businesses. We found that as the level of education of a firm owner or manager increases the recovery performance of firm increases (Figure 6.21). Firms with higher education degree are more likely to recover than others. The highest recovery scores are observed in the firms with a manager or owner with a master or doctorate degree.

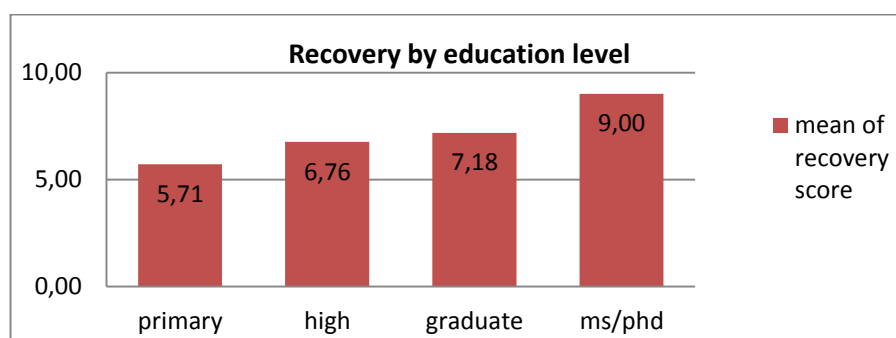


Figure 6.21. Recovery by education level

Variables related to the response capacity are the previous disaster experience, preparedness level and amount of resources used after a disaster. To start with the previous

disaster experience, we would expect to observe a positive relationship between recovery and previous disaster experience. That is, firms with a previous experience are expected to enhance their recovery ability (Tierney and Webb, 2001; Webb, et al., 2002; Dahlhamer and Tierney, 1998). However, we found a reverse relationship between previous disaster experience and recovery (Figure 6.22). The figure shows that firms without a disaster experience are more likely to recover than those with a disaster experience.

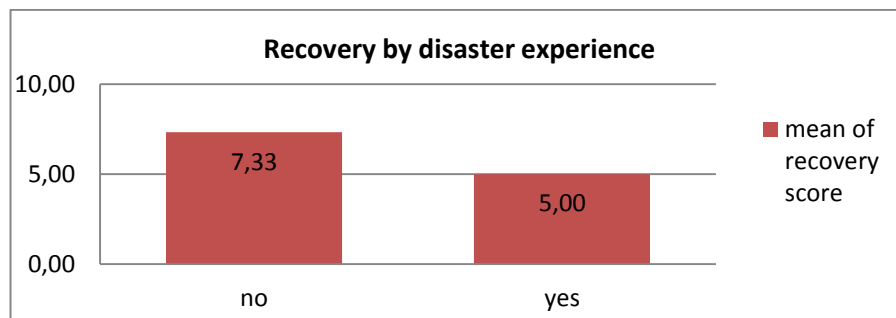


Figure 6.22. Recovery by previous disaster experience

Another variable that associates with response capacity is preparedness level of a firm. We found in the case study that firms with higher preparedness level can facilitate the disaster outcomes (Figure 6.23). In other words, firms engaging in more preparedness activities are more likely to recovery than those having less preparedness. This finding is consistent with the previous studies (Dahlhamer and D'Souza, 1995).

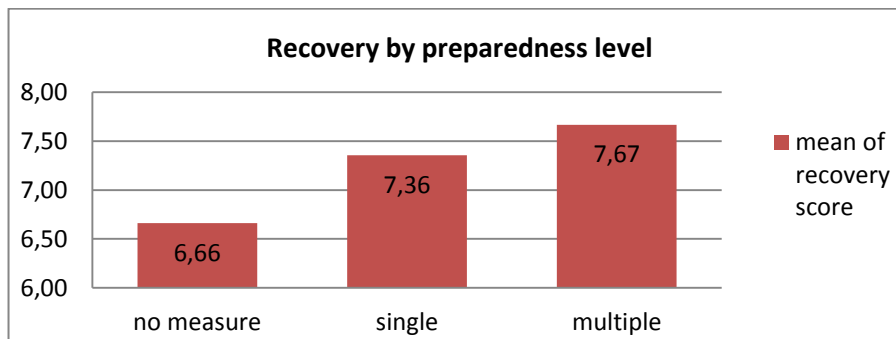


Figure 6.23. Recovery by preparedness level

Recovery scores of businesses are analyzed with respect to the variable of amount of resources used. We observed that there is a positive relation between the resource allocation and recovery (Figure 6.24). The higher amount of resources used, the more likely to recover the firm. This finding is consistent with the expectation arguing that firms using greater amount of resources are more likely to recover. However, previous studies find reverse relation between recovery and resource allocation (Tierney and Webb, 2001; Dahlhamer and Tierney, 1998; Webb, et al., 1999; Tierney and Dahlhamer, 1997). Scholars show that firms using more external resources after a disaster are less likely to recover than those who do not rely on the external aid.

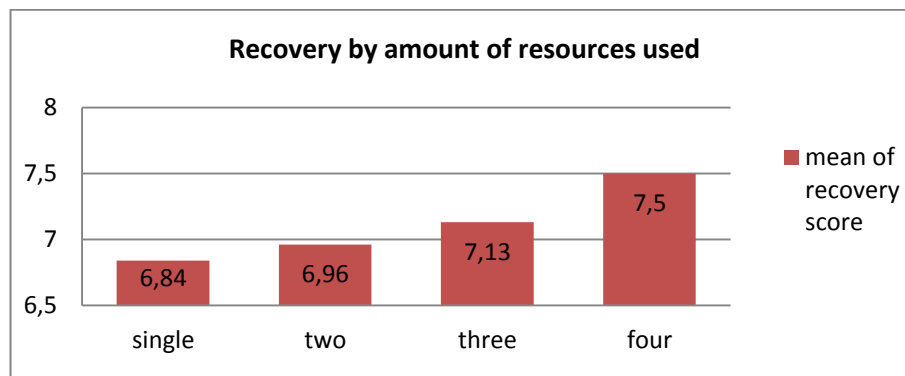


Figure 6.24. Recovery by amount of resources used

Variables identifying the extent of damage are the physical damage and length of closure. The destructiveness of disaster is analyzed with the recovery scores. We found that there is a negative relation between recovery and physical damage (Figure 6.25). That is, firms taking heavier damage are less likely to recover. The highest recovery scores are observed in the firms reported no damage. In line with many scholars (Chang and Falit-Baiamonte, 2002; Dahlhamer and Tierney, 1998; Tierney, 1997; Webb, et al., 2002; Wasileski, et al, 2011), this study confirms that physical damage influence the recovery performance in a negative way.



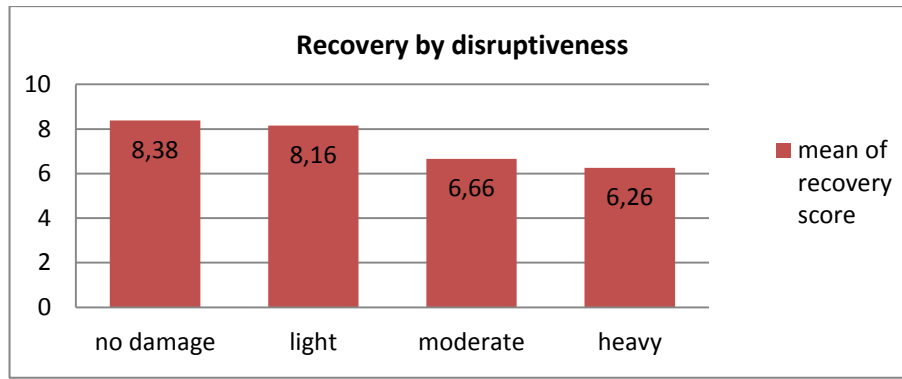


Figure 6.25. Recovery by physical damage

Business closure is analyzed with respect to the recovery scores. Although there is a partially linear relation between business closure and recovery, the lowest recovery scores are observed in the firms that suffered from closure more than 30 days (Figure 6.26). The previous research findings show that the length of closure has negative impacts on recovery (Chang-Faiamonte, 2002; Webb et al., 2002; Runyan, 2006; Dahlhamer and Tierney, 1998; Tierney and Webb, 2001). This study does not put evidence on the relation between recovery and length of closure.

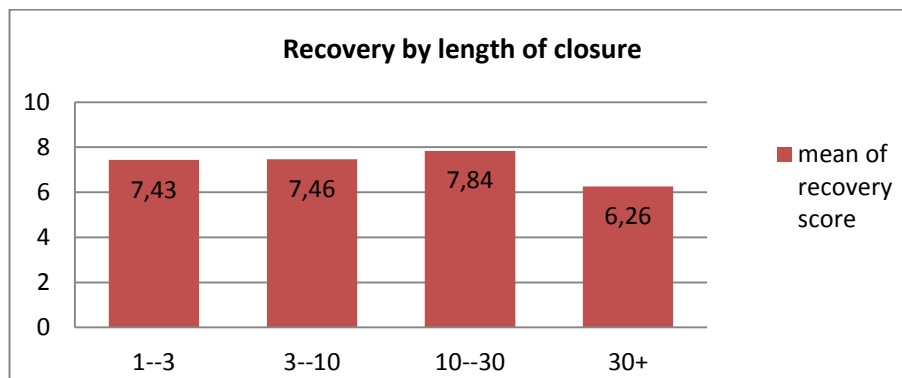


Figure 6.26. Recovery by length of closure

### **6.1.5. Evaluation of the business recovery**

This section of the study identifies the underlying factors of recovery in line with the aim of responding the first minor research question. Following the descriptive statistics of independent and dependent variables, this section provides the findings of analysis which reveal significant determinants of business recovery in Adapazarı. Logistic regression is used to examine the relationship between independent variables and the recovery scores. The factors that are expected to determine the long-term recovery of businesses are related to (1) internal factors, (2) response capacity and (3) extent of damage.

To analyze the long-term recovery, we, first, transferred the dependent variable into an ordinal measure. The recovery score of firms ranging from 4 to 12 is divided from the mean value which is 7. Firms having a recovery score 7 or less are denoted by "0" and those having a recovery score higher than 7 are marked as "1". The division is done in order to create a dependent variable that is applicable to run a logistic regression test.

In the following step, we have examined the relationship between dependent and independent variables, by using the Logistic Regression Analysis. Wasileski, et al (2011; 115) claim that "logistic regression does not allow us to estimate the value of the dependent variable itself; rather, we will estimate the probability that the dependent variable will assume a certain value". We will examine whether businesses are more likely to recover or not.

The analysis, respectively, reveals the relationship between the sample's self-assessment of recovery and independent variables. The independent variables are (1) number of employees, (2) business sector, (3) pre-disaster economic condition, (4) occupancy, (5) age, (6) market range, (7) education degree, (8) previous disaster experience, (9) preparedness level, (10) amount of resource used, (11) extent of physical damage, and (12) length of closure.

The relation between recovery and the independent variables are defined through hypotheses. Before giving the results of regression analysis, these hypotheses are introduced to explain expected relations about recovery and independent variables.

#### **Relationship between recovery and internal factors**

***Hypothesis 1.*** Firms with large number of employment, operating in construction and manufacturing sector, having a robust pre-disaster financial condition, well-educated owner

or manager, serving to large market range, being owner-occupied and older are expected to perform better after the disaster.

In line with the previous studies, first, we predict that large firms tend to have a better recovery success than small ones. Second, we hypothesize that firms in manufacturing and construction sector perform better in recovery than those in other sectors. Third, we expect that firms with robust pre-disaster financial condition have a tendency to recover than those with weak financial condition. Fourth, it is predicted that firms with broader market range have a chance to recovery easily than those serving to local market domain. Fifth, we argue that firms operating in owner-occupied type recover easily than lease-holder ones. Sixth, firms having well-educated owner or manager do better in long-term period than others. Seventh, elder firms are expected to recover easily than their younger counterparts.

### **Relationship between recovery and response capacity**

**Hypothesis 2.** Businesses having a previous disaster experience, taking more preparedness measures and obtaining more resources after disaster are more likely to recover than others. According to the response capacity variable, first, we hypothesize that firms having a previous disaster experience perform better than those without any disaster experience. Second, firms taking preparedness measures before disaster are expected to recover easily than those do not obtain any measure. Third, firms allocating resources after a disaster are more likely to recover than those could not access resources.

### **Relationship between recovery and extent of damage**

**Hypothesis 3.** Firms taking less physical damage and less operational problems, and experienced less closure period are expected to show higher ability for recovery than others. According to the extent of damage variables, first, we expect that firms taking less physical damage from disaster and experiencing more operational problems perform better in recovery than those suffering from diverse physical damage. Second, we hypothesize than firms with shorter closure period tend to recover easily than those with longer closure period.

After setting the hypotheses, we applied the analytical procedure. Table 6.40 presents the results of the regression test for the case study predicting business recovery after the 1999 Earthquake.

Table 6.40. Logistic regression coefficients and standard errors for independent variables of recovery

| Internal factors                 |                    | Beta (B) | Std.errors (S.E.) | Significant (Sig.) | Exp(B)                |
|----------------------------------|--------------------|----------|-------------------|--------------------|-----------------------|
| Number of employees              | 5+                 | 1,780    | 1,333             | ,182               | 5,932                 |
| Business sector                  | Manufacture        | -2,722   | 1,446             | ,060               | ,066                  |
|                                  | Construction       | 1,711    | 1,631             | ,294               | 5,535                 |
|                                  | Trade              | -2,788   | 1,350             | ,039               | ,062                  |
|                                  | FIRE               | 3,022    | 1,577             | ,055               | 20,541                |
|                                  | Service            | -3,115   | 1,366             | ,023               | ,044                  |
| Pre-disaster financial condition | In trouble         |          |                   | ,097               |                       |
|                                  | Not so good        | -3,026   | 1,292             | ,019               | ,049                  |
|                                  | Good               | -1,694   | 1,133             | ,135               | ,184                  |
|                                  | Excellent          | -1,158   | 1,592             | ,467               | ,314                  |
| Occupancy                        | Own                | ,138     | ,549              | ,802               | 1,148                 |
| Market range                     | Neighborhood       |          |                   | ,001               |                       |
|                                  | All around city    | -2,400   | ,725              | ,001               | ,091                  |
|                                  | Regional           | ,998     | 1,248             | ,424               | 2,714                 |
| Education degree                 | Primary school     |          |                   | ,600               |                       |
|                                  | High school        | -,366    | 1,372             | ,790               | ,693                  |
|                                  | Bachelor           | -,696    | 1,392             | ,617               | ,499                  |
|                                  | Master/Doctorate   | 1,611    | 2,095             | ,442               | 5,008                 |
| Age                              | 14-99 mean         | -,030    | ,029              | ,304               | ,971                  |
| Response capacity                |                    |          |                   |                    |                       |
| Having disaster experience       |                    | ,645     | ,877              | ,462               | 1,906                 |
| Preparedness level               | No measure         |          |                   | ,280               |                       |
|                                  | Single measure     | -,792    | ,696              | ,255               | ,453                  |
|                                  | Multiple measures  | -,993    | ,757              | ,190               | ,371                  |
| Resources used                   | 0-5 mean           | -,273    | ,291              | ,347               | ,761                  |
| Extent of damage                 |                    |          |                   |                    |                       |
| Physical damage                  | No damage          |          |                   | ,004               |                       |
|                                  | Lightly damaged    | -,487    | 1,369             | ,722               | ,614                  |
|                                  | Moderately damaged | -2,268   | 1,360             | ,095               | ,103                  |
|                                  | Heavily damaged    | -2,907   | 1,464             | ,047               | ,055                  |
| Extent of damage                 |                    | Beta (B) | Std.errors (S.E.) | Significant (Sig.) | Exp(B)                |
| Length of closure                | Not closed         |          |                   | ,000               |                       |
|                                  | 1-3 days           | -21,164  | 40194,166         | 1,000              | ,000                  |
|                                  | 3-10 days          | -20,561  | 40194,166         | 1,000              | ,000                  |
|                                  | 10-30 days         | -17,661  | 40194,166         | 1,000              | ,000                  |
|                                  | 30+ days           | -21,072  | 40194,166         | 1,000              | ,000                  |
| Constant                         |                    | 27,711   | 40194,166         | ,999               | 108293979827<br>9,911 |

Note.  $p < .05$

Variables entered on step 1: age, education, number of employees, manufacture, construction, trade, fire, service, occupancy, market range, disaster experience, preparedness level, physical damage, length of closure, pre-disaster economic condition, resource used.

Among the regressed internal factors on the long-term recovery, the parameter of operating in FIRE sector is positively related with recovery. That is, businesses are more likely to

recover if they are in FIRE sector ( $p < 0.05$ ). On the other hand, variables of being in trade and service sector, doing not well in pre-disaster period in economic aspect, having a local market hinterland, and taking moderate or heavy damage are less likely to recover ( $p < 0.05$ ).

We have hypothesized that business sector is one of the factors that would affect the performance of businesses in recovery. Respectively, firms in manufacturing and construction sector are expected to be more likely to recover than firms in other sectors, due to the need of reconstruction of the city. In this case for Adapazarı study, we show no statistically significant relation between those sectors and recovery. Rather, the regression result shows that firms in FIRE sector are more likely to recover than others. The odds multiplier ( $\text{Exp}(B) = 20.5$ ) shows that the odds of recovery of firms that operating in FIRE sector increased by a factor of 20.5 compared to those in other sectors. The reason behind the success of recovery can be related to the higher probability of increasing earnings. Therefore, firms functioning in FIRE are more likely to recover than other sectors due to the increasing real estate and insurance sales.

Additionally, for the firms in trade and service, the regression model presents a reverse relation with recovery. Firms in trade sector are expected to show worse performance in recovery. In the model, we see that operating in both trade and service sectors negatively associate with recovery. Firms in service and trade sector are less likely to recover ( $p < 0.05$ ). The odds ratio of service sector refers that the odds of recovery of firms in service sector decreased by a factor of 22.7 compared to those in other sectors ( $\text{Exp}(B) = .044$ ). Similarly, the odds of recovery of firms in trade sector decreased by a factor of 16.1 compared to others ( $\text{Exp}(B) = .062$ ). In line with the previous studies of Alesh et al (2000), Webb, Tierney and Dahlhamer (2002) and Chang and Falit-Baiamonte (2002), this study confirms that operating in trade and service sectors is statistically significant in determining recovery and negatively affect the process. According to results of the regression model, the significance of the relation between recovery and sectors is dependent upon the competitive structure of their market. Firms functioning in service and trade sectors are less likely to recover than other sectors due to the crowdedness of their market which reduce the probability of recovery. Also, their failure could be associated to their limited access to resources and less investment on preparedness. Therefore, the recovery process for firms in trade in service sectors tend to be disproportionate than other firms.

Pre-disaster economic condition is another significant predictor of long-term recovery. The odds multiplier of recovery of firms doing not so good before disaster decreased by a factors of 52.63 relative to those in trouble ( $\text{Exp}(B) = .049$ ). Despite the previous studies (Alesh, et

al, 2002; Webb, et al, 1999; Dahlhamer and Tierney, 1998) showing that financially weaker businesses are less likely to recover, this study does not confirm the expectation.

Additionally, market range seems to affect the Recovery Model. According to the regression results, firms serving to a local market area at urban level are less likely to recover. The odds multiplier of recovery of firms serving to urban market range decreased by a factor of 10.99 in comparison to those serving to neighborhood level ( $\text{Exp}(B)=.091$ ). In previous studies of Tierney and Webb, 2001; Chang and Falit-Baiamonte, 2002; Webb, et al., 2002; Zhang, et al., 2009 show that firms having a wider market scope has tended to recover easily than those serving to more local markets. In the present analysis, the expectation is not confirmed. However, the direct relationship between market range and recovery is to be emphasized.

Businesses reporting moderate and heavy damage are less likely to recover than those notifying 'no damage'. The odds multiplier of firms with moderate damage ( $\text{Exp}(B)=.103$ ) decreases recovery by a factor of 9.71 compared to firms with no damage. Similarly, the odds ratio of firms claiming heavy damage ( $\text{Exp}(B)=.055$ ) decreases recovery by a factor of 18.18 relative to firms with no damage. That is, higher the damage firms took, lower the probability to recovery. This finding is consistent with the previous studies of Wasileski, et al, (2011), Chang and Falit-Baiamonte, (2002), Webb, et al., (2002) that argue the difficulty of recovery in terms of damage level.

We have hypothesized that the characteristics of business in terms of business size, occupancy, education level and age would significantly affect the long-term recovery of businesses. Also, we have predicted the response capacity would influence significantly the likelihood of recovery in terms of previous disaster experience, preparedness level and amount of resource used. Furthermore, we have expected a significant relation between recovery and extent of damage in terms of length of closure. However, contrary to our expectations, these variables do not significantly affect the business recovery process.

After defining the variables used in the Recovery Model and determining their relation with recovery, next part explains the location choices of businesses.

## **6.2. LOCATION CHOICES OF BUSINESSES**

The previous part reveals the long-term recovery process of businesses and the factors that affect the process. To express the process in spatial terms, second part of the study

introduces the location choices of businesses after the disaster. To remember, we hypothesized that firms that are ignored in recovery process make location decisions as a part their recovery strategies. This part focuses on describing the main factors that affect firms' location choices. In order to analyze the location choices of businesses after the disaster, this part of the study examines the availability of location alternatives, location arrangement decisions, the factors that affect location choices, and future expectations. The objective is to shed light on the urban restructuring after the disaster with respect to the location choices of the businesses. Therefore, in this part of the research, the descriptive statistics about the relocated firms are given and the factors affecting relocation are analyzed through regression tests.

### 6.2.1. Pre-disaster location choices

This section concentrates on the pre-disaster location choices of the firms. Firstly, the pre-disaster locations of the firms are described in order to understand the main location preferences of the firms. As it is seen in the Table 6.41 on the distribution of pre-disaster locations of firms, the most preferred location is the center (75%). Central district is followed by the preferences of firms in Serdivan (12%), Erenler (6%) and industrial district (4%).

Table 6.41. Pre-disaster locations of firms

| Business location    | %    | N   |
|----------------------|------|-----|
| Serdivan             | 12,5 | 29  |
| Center               | 74,6 | 173 |
| Erenler              | 6,0  | 14  |
| Industrial districts | 4,3  | 10  |
| Other                | 2,6  | 6   |

The pre-disaster locations of firms are analyzed according to their sectors (Table 6.42). According to the sectors of firms, the pre-disaster locations of firms give clues about the clustering. The city center was mostly inhabited by almost all types of firms. That is, there is not any dominant sector group in the central area. However, the firms in manufacturing sector preferred to settle in industrial districts which are situated nearby the motorways. Manufacturing sector is clustered in these industrial sites. Also, we may argue that the Serdivan district began to be developed as a central area before the earthquake. Among the

respondents, half of the construction firms and a quarter of firms in manufacturing sector were settled in Serdivan district.

Table 6.42. Pre-disaster locations of firms, by sector (%)

| Business sector      | Serdivan | Center | Erenler | Industrial district | Other |
|----------------------|----------|--------|---------|---------------------|-------|
| Manufacturing (n=49) | 28,6     | 44,9   | 4,1     | 20,4                | 0     |
| Construction (n=22)  | 45,5     | 54,5   | 0       | 0                   | 0     |
| Trade (n=69)         | 1,4      | 91,3   | 4,4     | 0                   | 2,9   |
| FIRE (n=34)          | 0        | 100    | 0       | 0                   | 0     |
| Service (n=52)       | 5,7      | 69,2   | 17,3    | 0                   | 7,7   |
| Other (n=6)          | 0        | 100    | 0       | 0                   | 0     |

Secondly, entrepreneurs of firms are asked whether they had any location alternative before the earthquake (Table 6.43). The vast majority of firms had a single location and did not have any location alternative to rearrange their businesses in case of any disaster.

Table 6.43. Distribution of firms with location alternatives for post-disaster situation

| Location alternatives | %    | N   |
|-----------------------|------|-----|
| Yes                   | 33,6 | 78  |
| No                    | 66,4 | 154 |

Now, it is important to analyze the firms having location alternatives according to their size and sector. Table 6.44 shows the distribution of firms holding location alternatives before the earthquake. It is observed that large firms were more likely to hold location alternatives than small counterparts. Also, firms operating in FIRE and service sector were more likely to have alternatives than others.



Table 6.44. Distribution of firms with location alternatives for post-disaster situation, by size and sector

| Business sector |               | %    |
|-----------------|---------------|------|
| Manufacturing   | Small (n=44)  | 27,3 |
|                 | Large (n=5)   | 40   |
| Construction    | Small (n=22)  | 18,1 |
|                 | Large (n=0)   | 0    |
| Trade           | Small (n=68)  | 30,9 |
|                 | Large (n=1)   | 100  |
| FIRE            | Small (n=0)   | 0    |
|                 | Large (n=34)  | 47,1 |
| Service         | Small (n=51)  | 43,1 |
|                 | Large (n=1)   | 0    |
| Other           | Small (n=6)   | 0    |
|                 | Large (n=0)   | 0    |
| All businesses  | Small (n=191) | 30,8 |
|                 | Large (n=41)  | 46,3 |

Additionally, the sites of location alternatives are investigated. As it is shown in the Table 6.45, the alternative locations of firms were observed within the central area (25%) and in Serdivan (8,2%).

Table 6.45. Distribution of location alternatives, by sites

| Location alternatives | %    | N  |
|-----------------------|------|----|
| Serdivan              | 24,4 | 19 |
| City center           | 74,4 | 58 |
| Erenler               | 8,9  | 7  |
| Out of center         | 10,1 | 8  |
| Region                | 19,2 | 15 |

Note. The total number of firms having a location alternative before a disaster is 78.

Firms operating in different sectors show variations in terms of location alternatives. Table 6.46 displays the sites of location alternatives of firms, by their sectors. Center was the most preferred area for all sectors, except manufacturing. Here, it is observed that while firms in trade, FIRE, and service sectors were holding an alternative location in central place and Serdivan districts, firms in manufacturing and construction sectors preferred to obtain the alternative both of the city center and out of city.

Table 6.46. Distribution of sites of location alternatives, by sector (%)

| Business sector      | Serdivan | City center | Erenler | Out of Adapazarı | Region |
|----------------------|----------|-------------|---------|------------------|--------|
| Manufacturing (n=49) | 0        | 10,2        | 0       | 0                | 20,4   |
| Construction (n=22)  | 0        | 13,6        | 0       | 4,5              | 0      |
| Trade (n=69)         | 10,1     | 26,1        | 7,2     | 2,9              | 1,5    |
| FIRE (n=34)          | 11,8     | 38,2        | 3,0     | 11,8             | 3,0    |
| Service (n=52)       | 15,4     | 36,5        | 1,9     | 1,9              | 5,7    |
| Other (n=6)          | 0        | 0           | 0       | 0                | 0      |

Lastly, pre-disaster locations of firms are analyzed according to sites of location alternatives, as shown in Table 6.47. Before the disaster, firms located at center preferred to choose an alternative still within the central place because there was no reason to go outside or outer skirts of the city. Considering their pre-disaster locations, it is usual practise for firms to hold an alternative within the city since they did not want to move out of the city. For the others locating in Serdivan, they also tended to obtain an alternative within the center. However, firms locating in Erenler and industrial districts and others showed variations in location alternatives as holding a space out of the city.

Table 6.47. Distribution of sites of location alternatives, by pre-disaster location of firms (%)

| Business location           | Serdivan | City center | Erenler | Out of Adapazarı | Region |
|-----------------------------|----------|-------------|---------|------------------|--------|
| Serdivan (n=29)             | 7,1      | 25,0        | 3,5     | 0                | 3,5    |
| Center (n=173)              | 8,8      | 27,8        | 3,5     | 4,6              | 4,1    |
| Erenler (n=14)              | 0        | 0           | 0       | 0                | 7,1    |
| Industrial districts (n=10) | 0        | 10,0        | 0       | 50,0             | 0      |
| Other (n=6)                 | 0        | 16,7        | 16,7    | 16,7             | 0      |

After describing the pre-disaster location conditions, it is time to display the post-disaster locations of firms and put forward the factors that affect their location decisions.

### 6.2.2. Post-disaster location choices

Previous section defines the pre-disaster location of firms. After the disaster shock, businesses make arrangements about their location as a part of their recovery strategies. This section is devoted to express the post-disaster location decisions of firms. Respectively, it shows the relocation types, number of replacements and dates, and reasons of choices.

Location preferences of firms in Adapazarı case are basically grouped in two categories as staying in the same lot and relocation. As Table 6.48 shows, 35% of the respondent firms have relocated after the earthquake, while 65% of the total sample has stayed on the same lot. Non-relocation includes two sub-groups as staying in the same location in the center (60%) and staying in the industrial district (5%). On the other hand, relocation covers four sub-groups as moving to two-storey building at the center (28%), moving to resettlement district (3%), moving to periphery (3%) and moving to industrial district (1%).

Table 6.48. Location choices of businesses in the recovery process

| Location choices |                                          | %    | N   |
|------------------|------------------------------------------|------|-----|
| Non-relocated    | Staying in the same location within city | 60,3 | 140 |
|                  | Staying in the industrial district       | 4,7  | 11  |
| Relocated        | Moving to two-storey building in center  | 28,0 | 65  |
|                  | Moving to resettlement district          | 3,4  | 8   |
|                  | Moving to periphery                      | 2,6  | 6   |
|                  | Moving to industrial district            | 0,9  | 2   |

Another issue about the relocated firms is related to the question that how many times those firms have replaced. 35% of all businesses moved at least once after the earthquake (Table 6.49). After the first relocation, 34 of the 81 firms moved once again. All the replacements would be permanent rather than temporary. This means that firms avoid changing addresses several times which bring additional burden and disadvantages in keeping their customer base. Also, this situation could be interpreted as replacement would bring about the costs of establishing new networks embedded in space. Once, the network is constructed, firms become reluctant to move another site which makes the location choice is permanent.

Table 6.49. Number of replaced businesses

| Location choice process          |   | %    | N  |
|----------------------------------|---|------|----|
| Replacement number               | 1 | 20,3 | 47 |
|                                  | 2 | 14,7 | 34 |
| Total replacements within sample |   | 34,9 | 81 |

In relation with the relocation process, it is observed that 90% of the businesses have replaced between 2000 and 2003 for the first time (Table 6.50 and Figure 6.27). This result seems to be related to the year of completion of resettlement district in 2003 and of almost all reconstruction activities in downtown. The majority of second replacements began after the year 2003 (87%). Therefore, 2003 could be taken as a cornerstone in explaining the relocation process of firms.

Table 6.50. Date of replacement of firms (%)

| Date                               | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005+ |
|------------------------------------|------|------|------|------|------|------|-------|
| Number of firms first replacement  | 1,3  | 9,1  | 9,9  | 3,9  | 8,6  | 1,3  | 0,9   |
| Date                               | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005+ |
| Number of firms second replacement | 0    | 0,4  | 0,4  | 1,3  | 3,4  | 2,2  | 6,9   |
| Date                               | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005+ |
| Number of firms all replacements   | 3    | 19   | 19   | 10   | 27   | 9    | 14    |

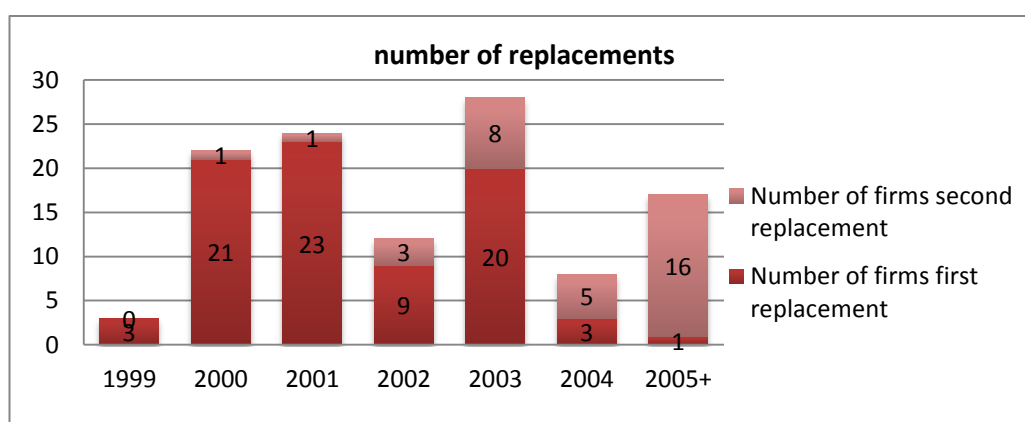


Figure 6.27. Date of replacement of firms (N)

Additionally, we have focused on the question where the businesses preferred to locate with respect to given replacement dates. Between 1999 and 2003, relocated firms in general preferred to locate within downtown (Table 6.51 and Figure 6.28). However, after 2003, more than 20% of relocated firms preferred to settle in resettlement district.

Table 6.51. Location choices of relocated firms, by relocation year (%)

| Location choices         |        |                  | Downtown | Resettlement district | Serdivan | Other |
|--------------------------|--------|------------------|----------|-----------------------|----------|-------|
| Replacement (first one)  | period | 1999-2003 (n=76) | 71,1     | 5,3                   | 15,8     | 6,6   |
|                          |        | 2003+ (n=5)      | 40,0     | 20,0                  | 0        | 0     |
| Replacement (second one) | period | 1999-2003 (n=13) | 92,3     | 0                     | 7,8      | 0     |
|                          |        | 2003+ (n=21)     | 71,4     | 23,8                  | 4,8      | 0     |

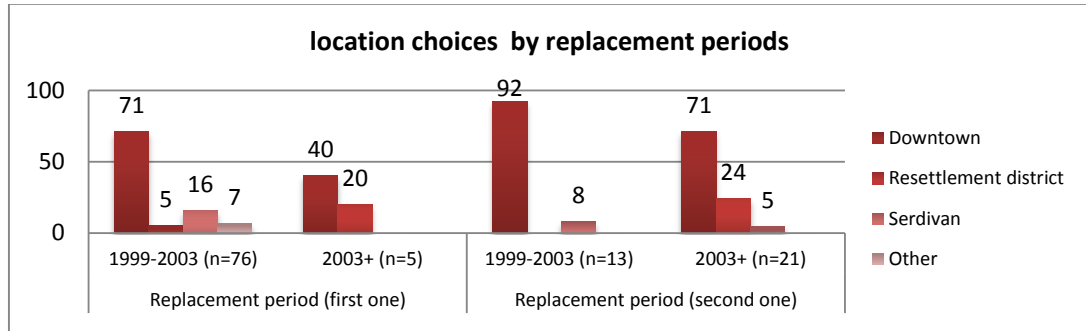


Figure 6.28. Location choices of relocated firms, by relocation year (%)

During the period between 1999 and 2012, spatial structure of Adapazarı was fragmented through resettlement policies of central government. Also, the space was sprawled with the safety peripheral development through private sector initiatives.

The location choices of businesses are studied with respect to their sectors. Table 6.52 shows that all types of businesses mainly preferred to stay in their pre-disaster locations. Also, the tendency to locate in the center resulted in moving to two-storey building. Only, firms in manufacturing and trade sectors moved to periphery and only a number of manufacturing firms moved to industrial district. What is surprising here is that the limited number of relocation to resettlement district. Firms in trade, FIRE and service sectors preferred the resettlement districts, but the relocation was limited despite the large amounts of investments made in the area.

Table 6.52. Location choices of businesses, by sector (%)

| Business sector      | Staying in the same location | Moving to two-storey building in center | Moving to resettlement district | Moving to periphery | Moving to industrial district |
|----------------------|------------------------------|-----------------------------------------|---------------------------------|---------------------|-------------------------------|
| Manufacturing (n=49) | 61,2                         | 24,5                                    | 0                               | 10,2                | 4,1                           |
| Construction (n=22)  | 81,8                         | 18,1                                    | 0                               | 0                   | 0                             |
| Trade (n=69)         | 68,1                         | 27,5                                    | 2,9                             | 1,5                 | 0                             |
| FIRE (n=34)          | 50,0                         | 44,1                                    | 5,9                             | 0                   | 0                             |
| Service (n=52)       | 65,4                         | 30,8                                    | 3,9                             | 0                   | 0                             |
| Other (n=6)          | 66,7                         | 33,3                                    | 0                               | 0                   | 0                             |

At this step, the location choices of the businesses are examined with respect to the firms' pre-disaster locations. Table 6.53 shows the pre- and post-disaster location choices. According to the findings, most of the firms maintained their previous locations after the disaster. 38% of the firms in Serdivan moved to two storey buildings in center. 64% of them were relocated within Serdivan. For the firms in the central area, 27% of them preferred to relocate within center, 3% moved to resettlement district and 3% moved to periphery while the majority preferred to stay in the same location (66%). For Erenler, 57% of firms moved to the center, 57% moved to industrial district and periphery in equal amounts (7%). All firms located in industrial districts maintained their pre-disaster locations.

Table 6.53. Location choices of businesses, by pre-disaster locations (%)

| Pre-disaster location       | Staying in the same location | Moving to two-storey building in center | Moving to resettlement district | Moving to periphery | Moving to industrial district |
|-----------------------------|------------------------------|-----------------------------------------|---------------------------------|---------------------|-------------------------------|
| Serdivan (n=28)             | 64,3                         | 35,7                                    | 0                               | 0                   | 0                             |
| Center (n=173)              | 65,9                         | 27,2                                    | 3,5                             | 3,5                 | 0                             |
| Erenler (n=14)              | 28,6                         | 57,1                                    | 0                               | 0                   | 14,3                          |
| Industrial districts (n=10) | 100                          | 0                                       | 0                               | 0                   | 0                             |
| Other (n=6)                 | 66,7                         | 0                                       | 33,3                            | 0                   | 0                             |

It is asked to non-relocated firms why they preferred to stay in the same location. The most frequently mentioned reason is the occupancy status (43%). Following this, difficulty of relocation (40%) and dependency to customers (21%) take the highest shares. Table 6.54 shows the frequency distribution of mentions related to non-relocation.

Table 6.54. Reasons of business non-relocation

| Reasons of non-relocation                  | %           | Frequency |
|--------------------------------------------|-------------|-----------|
| Difficulty of relocation                   | 39,7        | 92        |
| <b>Occupancy status</b>                    | <b>42,7</b> | <b>99</b> |
| Need to be close to business agglomeration | 9,9         | 23        |
| Dependency to customers                    | 21,1        | 49        |
| Dependency to transportation               | 15,5        | 36        |
| Dependency to infrastructure               | 2,2         | 5         |
| Other                                      | 0           | 0         |

Note. Number of non-relocated firms is 151.

On the reasons behind maintaining the pre-disaster location after the disaster, by sectors, Table 6.55 presents the percentage of frequency of mentions of the predetermined reasons for each sector. For manufacturing sector, the main reasons for non-relocation associates with the difficulty of relocation (74,4%) and occupancy status (74,4%). For firms in construction sector, the primary reason is the occupation status (100%). For firms in trade sector, the reasons for non-relocation are the occupancy status (60%), difficulty to relocation (53,3) and dependency to transportation (46,7). Again for firms in FIRE sector, occupancy status is an obstacle for relocation (75,9%) and difficulty to relocation is another significant factor in keeping location (51,7%). Firms in service sector the reasons are similar; difficulty of relocation comes first with 78,6% and occupancy status second with 46,4%.

Table 6.55. Reasons of non-relocation, by sector (%)

| Business sector      | Difficulty of relocation | Occupancy status | Business agglomeration | Customers | Transportation | Infrastructure |
|----------------------|--------------------------|------------------|------------------------|-----------|----------------|----------------|
| Manufacturing (n=39) | 74,4                     | 74,4             | 33,3                   | 38,5      | 5,1            | 5,1            |
| Construction (n=5)   | 0                        | 100              | 0                      | 0         | 0              | 0              |
| Trade (n=45)         | 53,3                     | 60,0             | 8,9                    | 42,2      | 46,7           | 0              |
| FIRE (n=29)          | 51,7                     | 75,9             | 6,9                    | 37,9      | 10,3           | 6,9            |
| Service (n=28)       | 78,6                     | 46,4             | 10,7                   | 10,7      | 25,0           | 35,7           |
| Other (n=5)          | 40,0                     | 60,0             | 16,67                  | 22,1      | 60,0           | 0              |

Note. Number of non-relocated firms is 151.

It is asked to respondent firms why they had relocated. The aim of the question was to find out the relations of businesses with urban components, such as transportation, infrastructure, residential areas, consumers, employees and other firms. Table 6.56 presents the frequency of mentions for relocation. The most frequently mentioned answers are determined as the destruction or heavily damaged of building (26%). They are followed by the need to be close to customer base (13%), and the need to be close to business

agglomerations (7%). These answers explain the reasons behind relocation of firms. These associate with the proximity of other firms and marketing opportunities. In addition, it is worthwhile to indicate that firms did not consider the residential location of employees in their relocation choices. Also, they put no concern on getting input or delivering output. These results are significant since firms did not regard the costs of transportation which would put additional burden on production costs and employees during the post-disaster recovery period.

Table 6.56. Reasons of business relocation

| Reasons of relocation                                | %           | Frequency |
|------------------------------------------------------|-------------|-----------|
| <b>Destruction of building and essential repairs</b> | <b>26,3</b> | <b>61</b> |
| Need to be close to customer base                    | 13,4        | 31        |
| Need to get supplies or input material               | 0,4         | 1         |
| Need to deliver products/services                    | 0           | 0         |
| Need to be close to business agglomeration           | 6,5         | 15        |
| Need to be close to employees                        | 1,3         | 3         |
| Reduce rent or possess an estate                     | 5,6         | 13        |
| Settle in a safer location                           | 5,2         | 12        |
| Depart from problems in transportation               | 1,3         | 3         |
| Depart from problems in infrastructure               | 1,3         | 3         |
| Other                                                | 0           | 0         |

Also, the reasons for relocation are investigated, by location choices of firms. Table 6.57 shows the most frequently mentioned reasons for each location choice. For the firms that moved to two-storey buildings after the disaster, their most frequently mentioned reasons are destruction of building (75%), need to be close customer base (39%) and need to be close to customer base (19%). For the ones who moved to resettlement district explained relocation based on need to be close customer base (75%), destruction of building (63%), and settle in a safer location (63%). Thirdly, in the case of firms moving to periphery, the reason of relocation is put forward in terms of destruction of building (83,3), need to be close business agglomeration (17%), and settle in a safer district (17%). Lastly, all the firms moving to industrial district explained their relocation by destruction of building, and depart from transportation and infrastructure problems (100%). Along with the results, we may concluded that firms moving to periphery and resettlement districts aim to settle in safer locations which is not mentioned by those who moved to central area. Also, firms moving to resettlement area are generally in trade, FIRE, and service sectors which makes reasonable the higher rates of mentioning 'seeking for proximity to customer base'. Especially the small firms operating at local and neighborhood scale, moved to resettlement districts. On the



other hand, in the case of firms relocated within the center, we may argue that firms decided to benefit from the established relations by staying within the same district. That is why most of the firms referred to 'being close to customer base and business agglomeration'.

Table. 6.57. Reasons of business relocation, by location choice (%)

| Reasons of relocation                         | Moving to two-storey building in center (n=65) | Moving to resettlement district (n=8) | Moving to periphery (n=6) | Moving to industrial district (n=2) |
|-----------------------------------------------|------------------------------------------------|---------------------------------------|---------------------------|-------------------------------------|
| Destruction of building and essential repairs | 75,4                                           | 62,5                                  | 83,3                      | 100                                 |
| Need to be close to customer base             | 38,5                                           | 75,0                                  | 0                         | 0                                   |
| Need to get supplies or input material        | 0                                              | 12,5                                  | 0                         | 0                                   |
| Need to deliver products/services             | 0                                              | 0                                     | 0                         | 0                                   |
| Need to be close to business agglomeration    | 18,5                                           | 25,0                                  | 16,7                      | 0                                   |
| Need to be close to employees                 | 4,6                                            | 0                                     | 0                         | 0                                   |
| Reduce rent or possess an estate              | 18,5                                           | 12,5                                  | 0                         | 0                                   |
| Settle in a safer location                    | 9,2                                            | 62,5                                  | 16,7                      | 0                                   |
| Depart from problems in transportation        | 0                                              | 12,5                                  | 0                         | 100                                 |
| Depart from problems in infrastructure        | 0                                              | 12,5                                  | 0                         | 100                                 |
| Other                                         | 0                                              | 0                                     | 0                         | 0                                   |

As a result, with respect to location choices, it is obvious that a great deal of businesses have replaced once and permanently. According to the location choice analysis of the firms, we observe that the most preferred type of location is 'staying in the same location'. This type is followed by 'relocation in downtown' and then, 'moving towards resettlement district'. The least preferred location type is 'relocation towards periphery'.

According to these figures, among the firms, there is a tendency to execute near the downtown in order to maintain the customer base and keep close relation with business agglomerations. As concerns the reasons of relocation, the effects of getting input, delivering output and being close of employees are the weakest.

In brief, it is clear that the firms adopt location strategies in order to take advantages of business agglomeration and proximity to customer base. Both relocated and non-relocated firms are looking for the locational advantages. The firms whether they tend to keep their pre-disaster locations or tend to relocate, aim to generate networks with business agglomeration and customers. The reason to keep the advantages of proximity to other

businesses and customers is to be related to stay close production and marketing facilities, that is, firms in Adapazarı are embedded in spatial relations covering economic facilities. They do not make location arrangements individually, apart from the business community.

Table 6.58. Sample quotations for relocation

"I relocated my bureau to temporary housing district as a result of destruction of the building which was located within the center. After the relocation of government office and court house to the resettlement district, I moved to Camili district. Formerly, there were four or five law bureau in the area, nearby the court house, in time there are only two firms."  
(Law bureau, Camili district)

Table 6.59. Sample quotations for non-relocation

"If there is any real estate firm in resettlement district, it must be a new one. There is not any firm moving to resettlement district from center. Real estate firms do not relocate in resettlement district upon the development of new housing units. Almost all estate firms maintain to stay within the center. New ones might prefer those areas, but the share of them does not exceed 5%."  
(Head of chamber of estate commission, Downtown)

### 6.2.3. Characteristics of relocated firms

This section aims to give descriptive information about the firms relocated from their pre-disaster sites. Characteristics of relocated firms are analyzed through the variables used in Recovery Model. The independent variables defining the internal factors are composed of business sector, business size, business age, pre-disaster economic condition, occupancy tenure, market range, and education level. Furthermore, the reasons of business relocation are examined through the factors used in Recovery Model related to response capacity and extent of damage. The independent variables used in the model to explain relocation are the previous disaster experience, pre-disaster preparedness measures, the amount of resources used, the extent of physical damage, and the length of business closure. The additional

factors related to spatial concerns are determined as location of customers and location of workers. The dependent variable defined in explaining the business location choices model which denotes whether the firm is relocated or not.

#### 6.2.3.1. Internal factors

Internal factors incorporate a variety of attributes related to business characteristics, as defined in the business Recovery Model. The set of variables consist of business size, sector, age, pre-disaster economic condition, occupancy tenure, market range, and education level.

Firstly, variables related to size and sector, are analyzed in relocation. Table 6.60 shows the distribution of firms by their number of employees within the relocated firms which is 81 in total. In the sample, it is observed that small-sized firms invested in relocation more than large firms after the earthquake. This is understandable because the large firms despite their economic ability to make relocation arrangements, are the property owners. This seems to reduce their spatial mobility.

Table 6.60. Distribution of relocated firms, by size

| Number of employees | %  | N  |
|---------------------|----|----|
| 1-4 (n=73)          | 28 | 23 |
| 5-9 (n=108)         | 62 | 50 |
| 10-14 (n=32)        | 0  | 0  |
| 15-29 (n=12)        | 9  | 7  |
| 30+ (n=7)           | 1  | 1  |

Note. % column denotes the share of specified group within the total relocation, which is equal to 81.

Additionally, relocated firms are studied according to their sectors, as shown in the Table 6.61. Firms in service, trade and construction sectors showed higher rates in relocation. However, the firms in manufacturing and FIRE sector were reluctant to relocate and prefer to stay in the same location. As the firms in manufacturing sector obtained fixed equipment to operate business, our findings is that they did not prefer to move due to difficulties in replacement. Also, large firms in any sector in the sample did not tend to relocate. On the other hand, small firms are dominantly seen in almost all sectors except FIRE which show higher rates of relocation.

Table 6.61. Distribution of relocated firms, by size and sector

| Business sector |               | %    | N  |
|-----------------|---------------|------|----|
| Manufacturing   | Small (n=44)  | 12,3 | 10 |
|                 | Large (n=5)   | 0    | 0  |
| Construction    | Small (n=22)  | 21,0 | 17 |
|                 | Large (n=0)   | 0    | 0  |
| Trade           | Small (n=68)  | 28,4 | 23 |
|                 | Large (n=1)   | 1,2  | 1  |
| FIRE            | Small (n=0)   | 0    | 0  |
|                 | Large (n=34)  | 6,2  | 5  |
| Service         | Small (n=51)  | 29,6 | 24 |
|                 | Large (n=1)   | 0    | 0  |
| Other           | Small (n=6)   | 1,2  | 1  |
|                 | Large (n=0)   | 0    | 0  |
| All businesses  | Small (n=191) | 92,6 | 75 |
|                 | Large (n=41)  | 7,4  | 6  |

In terms of the age of businesses, it is expected that older firms are less likely to be mobile. If the relationship between business and relocation is examined, it is observed that young firms were relocated after the disaster. Table 6.62 shows the relation between relocation and the age of business. In the sample, 58% of the relocated firms are younger than 20 years old. Older firms tend to stay in the same area to maintain their familiarity advantage across their customers. Newly established firms at time of earthquake, are more likely to relocate since their networks are not spatially embedded as much as their older counterparts.

Table 6.62. Distribution of relocated firms, by age

| Business age | %    | N  |
|--------------|------|----|
| 0-19         | 58,0 | 47 |
| 20-39        | 37,0 | 30 |
| 40-59        | 4,9  | 4  |
| 60-79        | 0    | 0  |
| 80-99        | 0    | 0  |

Another indicator for relocation is the variable showing pre-disaster financial condition. It is probable for financially robust firms in pre-disaster period to have more chance to make location arrangements after the disaster shock. Therefore, we have found on the relationship between relocation and pre-disaster economic condition (Table 6.63). In the

sample, the outcome is partially supported as it is observed that firms with a good financial condition in pre-disaster term showed higher percentage to relocate (58%).

Table 6.63. Distribution of relocated firms, by pre-disaster financial condition

| Pre-disaster economic condition | %    | N  |
|---------------------------------|------|----|
| In trouble                      | 11,1 | 9  |
| Not doing well                  | 21,0 | 17 |
| Good                            | 58,0 | 47 |
| Excellent                       | 9,9  | 8  |

Occupation status is another variable used in explaining the characteristics of relocation. Firms that occupy as owner on the property that houses their firms are expected to less likely to relocate another site. Parallel to the argument, in the sample, it is observed that 63% of renters moved another site (Table 6.64). In the literature, it is common that owners of property are less likely to relocate due to the cost of vacation. On the other hand, firms operating as renters within buildings destroyed by the earthquake had to move to another site. The compulsory condition for renters made them more mobile than property owners. Because, owner-occupied type of firms had the chance to reconstruct their buildings which would cause non-relocation of affected firms.

Then, our concern was that whether the occupation status of firms has changed after their relocation. Despite their previous ownership status, previous renters of relocated firms have preferred to become single proprietor in current condition. That is, more firms become to possess a property to run their businesses. Here, it should be noted that since the owner-occupied firms are less likely to move another site, and since more firms become proprietor after the earthquake, in the current case there exists a less mobile structure for the city.

Table 6.64. Distribution of relocated firms, by pre-disaster and post-disaster occupation status

| Occupancy status   |        | %    | N  |
|--------------------|--------|------|----|
| Previous ownership | Owner  | 37,0 | 30 |
|                    | Renter | 63,0 | 51 |
| Present ownership  | Owner  | 58,0 | 47 |
|                    | Renter | 42,0 | 34 |

Relocation decision of firms depends on their market range. Firms having local, regional or national market ranges are expected to differentiate in terms of their location choices. Based on input and output relations with other firms, market range becomes a determinant in location choices. Firms limited with local markets are more vulnerable to changing consumption behavior of consumers. Therefore, if firms lost their customer bases they attempt to change their location. The location choices of the firms depend on the consumption pattern, that is, firms make location choices according to density of customers. This can be explained by the other characteristics of locally oriented firms. Here, the firms with local market range operate as tenants due to financial constraints. This makes the firms more mobile. On the other side, firms with regional, national and international market ranges did not consider spatial proximity to customers during their location choices. Their location decisions are generally related to the availability of transport facilities to accessibility. Therefore, once a firm with wider market range has located somewhere, it continues to exploit the spatial advantages of the site until the loss of the relations. In Adapazarı case, although the earthquake has affected a regional district, firms having relations with out of the region show the least tendency to relocate. That is, firms with regional market hinterland show little tendency to relocate. As far as the result is concerned, it should be noted that there are certain reasons related to other internal factors such as occupancy status. For the firms with wider hinterland and the property ownership, the probability of relocation reduces. Table 6.65 shows the market range of relocated firms. Here, the firms serving at city level tended to relocation more than others. 84% of the relocated firms were providing goods and services to urban area, while 12% serving at neighborhood level and 4% of them producing for region. The figures obtained from the case study verify the assumptions.

Table 6.65. Distribution of relocated firms, by pre-disaster market range

| Business sector | %    | N  |
|-----------------|------|----|
| Neighborhood    | 12,3 | 10 |
| City            | 84,0 | 68 |
| Region          | 3,7  | 3  |

Also, present market range of relocated firms is investigated. Table 6.66 shows the new distribution of market range of relocated firms. Again, the majority of the relocated firms are serving to local customers at urban level (88%). In current situation, we observe that the

share of the neighborhood level market range decreases while the share of regional scale market increases.

Table 6.66. Distribution of relocated firms, by post-disaster market range

| <b>Business sector</b> | <b>%</b> | <b>N</b> |
|------------------------|----------|----------|
| Neighborhood           | 6,2      | 5        |
| City                   | 87,7     | 71       |
| Region                 | 6,2      | 5        |

The last variable of internal factors affecting the relocation of firms after the disaster is education level of the owner/manager of the firm. The background of owner/manager which is measured by education level is effective on taking relocation decisions. It is assumed that owner/managers with better education levels will have higher awareness about seismic risks and make a relocation decisions in favor of safer districts. Thus, the highest shares in education level of the owners of the firms that are relocated to another site address to high school and graduate degree (Table 6.67). In the sample, it is observed that the majority of business owners has either a graduate degree (49%) or a high school degree (44%) among the relocated ones.

Table 6.67. Distribution of relocated firms, by education level of owner/manager of firm

| <b>Education level</b> | <b>%</b> | <b>N</b> |
|------------------------|----------|----------|
| Primary school         | 1,2      | 1        |
| High school            | 44,4     | 36       |
| Graduate               | 49,4     | 40       |
| Ms/PhD                 | 4,9      | 4        |

To sum up, it is fair to claim that internal characteristics determine the relocation decisions of the firms. Firms relocated after disaster show different characteristics of their sector, size, age, economic condition, occupancy status, market range, and education degree of owners or managers of firms. Next section examines the factors related to response capacity of firms to make relocation decisions.

### 6.2.3.2. Response capacity

The second component in defining the characteristics of the relocated firms is the response capacity. Regarding the response capacity, relocated firms are investigated by the measures taken before the disaster and their previous disaster experience.

To start with, relocated firms are analyzed with respect to their previous disaster experience, as shown in the Table 6.70. It is observed that only 5% of the relocated firms had a previous disaster experience.

Table 6.70. Distribution of relocated firms, by previous disaster experience

| Previous disaster experience | %    | N  |
|------------------------------|------|----|
| Yes                          | 4,9  | 4  |
| No                           | 95,1 | 77 |

Another point related to preparedness is the number of measures taken before the earthquake. It is assumed that firms taking measures before the earthquake show a greater response to earthquake by relocating. However, in the sample, the reverse is the case (Table 6.71). That is, firms without any preparedness were more likely to relocate (61%).

Table 6.71. Distribution of relocated firms, by pre-disaster preparedness measures

| Preparedness measures | %    | N  |
|-----------------------|------|----|
| No measure            | 60,5 | 49 |
| Single measure        | 19,8 | 16 |
| Multiple measures     | 19,8 | 16 |

To summarize, our findings show that taking preparedness measures taken before the earthquake do not accompany with relocation. Similarly, it seems that previous disaster experience do not relate with relocation. Apart from the pre-disaster approaches of the firms, it seems crucial to look at the direct impacts of the disaster to understand how they were close to relocate.



### 6.2.3.3. Extent of damage

Describing the characteristics of relocated firms, now we have come to examine the variables related to the extent of damage of firms, as the third component. Considering the impacts of a disaster, it is assumed that firms taking more damage from disaster including both physical damage and operational problems are expected to relocate to safer districts.

To begin with, the extent of damage of relocated firms is considered. As Table 6.68 shows, approximately half of the relocated firms are damaged heavily due to the earthquake. On the other hand, firms that were lightly damaged from the disaster take a smaller share in relocation.

Table 6.68. Distribution of relocated firms, by the extent of damage

| Extent of damage   | %    | N  |
|--------------------|------|----|
| No damage          | 3,7  | 3  |
| Lightly damaged    | 18,5 | 15 |
| Moderately damaged | 34,6 | 28 |
| Heavily damaged    | 43,2 | 35 |

Another indicator related to extent of damage is the length of closure of firms triggered by the earthquake. It is expected that the length of closure caused by physical damage and operational problems will foster the firms to relocate from the site in order to resettle a safer district. Looking the length of closure of relocated firms in the sample, it is observed that longer the firm stayed closed, higher the tendency to relocate (Table 6.69). More than the half the relocated firms were suffered from longer periods of closure.

Table 6.69. Distribution of relocated firms, by length of closure

| Length of closure | %    | N  |
|-------------------|------|----|
| Not closed        | 0    | 0  |
| 1-3 days          | 2,5  | 2  |
| 3-10 days         | 8,6  | 7  |
| 10-30 days        | 38,3 | 31 |
| 30+ days          | 50,6 | 41 |

As a result, the findings of analysis show that extent of damage associates with the relocation. Firms taking more damage and staying closed longer tend to move another site. Up to this point, we analyze the variables that are used in the business Recovery Model. In addition to these, now, we add a new component, namely spatial factors to explain location choices of the firms.

#### 6.2.3.4. Spatial factors

This section mainly concentrates on the factors concerning the spatial dimension. Spatial dimension is related to the location preferences of community element. Community plays a role in business environment as consumers and employees. The spatial factors affecting the location choices of firms are related to the post-disaster location of customers and employees.

Firstly, we have put forward a question where the majority of their customers usually come from after the disaster. The aim of the question is to determine how the post-disaster location choices of customers affect relocation of the firms in the recovery period. Table 6.72 shows the locations of customers after the disaster. According to the findings, the majority of the customers of the firms came from all around the city. Respectively, firms staying in the same location and moving to two-storey buildings in center have a local customer base. Moreover, firms moving to resettlement district out of the city hold a more narrow market range. 50% of their customers come from the same area. On the other hand, firms moving periphery serve to a wider market. 17% of them has customers from the region, where 83% of these from all around city. Lastly, the firms which moved to industrial district only have customers coming from the region.

Table 6.72. Location choices of firms, by post-disaster location of customers

| Business post-disaster location                | Same neighborhood | City | Region | Out of region |
|------------------------------------------------|-------------------|------|--------|---------------|
| Staying in the same location (n=151)           | 15,9              | 73,5 | 9,9    | 0,7           |
| Moving to two-storey building in center (n=65) | 1,5               | 95,4 | 3,1    | 0             |
| Moving to resettlement district (n=8)          | 50,0              | 50,0 | 0      | 0             |
| Moving to periphery (n=6)                      | 0                 | 83,3 | 16,7   | 0             |
| Moving to industrial district (n=2)            | 0                 | 0    | 100    | 0             |

Figure 6.29 illustrates the locations of firms and their customers in pre-disaster and post-disaster periods which aims to reflect the urban structure before and after disaster.

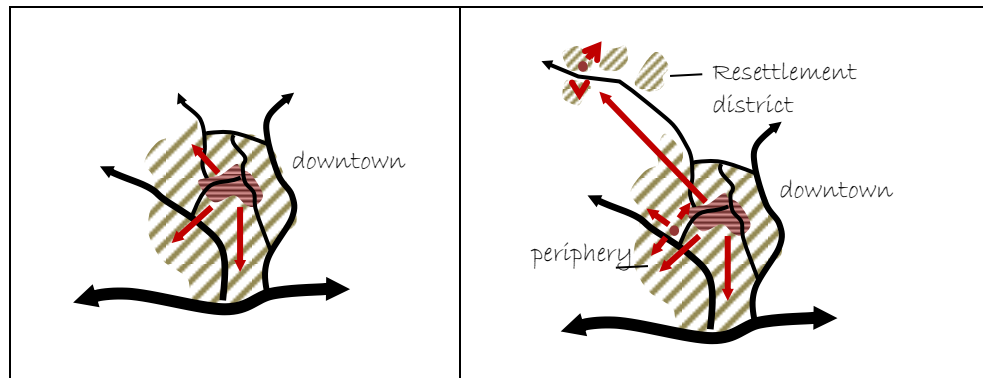


Figure 6.29. Location of firms and customers in pre-disaster period (left) and post-disaster period (right)

Another spatial factor determining the location of the firms is the location of employees. The question allows us to understand whether firms consider the spatial proximity to workers in making location choices. Therefore, the study put forward a question where the majority of their employees reside before the earthquake. Table 6.73 shows the responses about pre-disaster location of the workers. Respondents marked neighborhoods of Adapazarı at most.

Table 6.73. Location choices of firms, by (residential area) pre-disaster location of workers

| Business post-disaster location                | Serdivan | Other neighborhoods of Adapazarı | Out of Adapazarı | Region |
|------------------------------------------------|----------|----------------------------------|------------------|--------|
| Staying in the same location (n=151)           | 18,5     | 72,2                             | 9,3              | 0      |
| Moving to two-storey building in center (n=65) | 20,0     | 63,1                             | 16,9             | 0      |
| Moving to resettlement district (n=8)          | 25,0     | 75,0                             | 0                | 0      |
| Moving to periphery (n=6)                      | 0        | 100                              | 0                | 0      |
| Moving to industrial district (n=2)            | 0        | 0                                | 100              | 0      |

Additionally, in the study we have asked the question where their employees come from after the disaster. Table 6.74 shows the new distribution of location of employees. Here, the

firms moving to the resettlement district have an employee base that seems to locate within downtown. Similarly, firms moving to periphery hold employees residing mostly in downtown (83%) as in previously. For the firms staying in the same location and downtown, the situation shows differences from those moving resettlement area or periphery. For them, there occurs diversity in locations of customers. That is, none of the location of employees is dominant for those firms. The survey showed that while workers inhabit in different locations is the city, the majority of the firms prefer to settle in the downtown. The firms make location choices with a little concern on the residential location of employees. Hence employees become to change their residential area according to relocation of firms. This is significant because the firms did not consider the spatial proximity to employees. They made location choices independent of the location of employees which would affect the workers negatively due to the increasing transportation costs to reach the job or force them live close to their businesses.

Table 6.74. Location choices of firms, by (residential area) post-disaster location of workers

| <b>Business post-disaster location</b>         | <b>Serdivan</b> | <b>Resettlement district</b> | <b>Within Adapazarı</b> | <b>Out of Adapazarı</b> | <b>Region</b> |
|------------------------------------------------|-----------------|------------------------------|-------------------------|-------------------------|---------------|
| Staying in the same location (n=151)           | 15,9            | 33,8                         | 47,0                    | 3,3                     | 0             |
| Moving to two-storey building in center (n=65) | 26,2            | 15,4                         | 33,8                    | 24,6                    | 0             |
| Moving to resettlement district (n=8)          | 0               | 75,0                         | 25,0                    | 0                       | 0             |
| Moving to periphery (n=6)                      | 0               | 16,7                         | 83,3                    | 0                       | 0             |
| Moving to industrial district (n=2)            | 0               | 0                            | 100                     | 0                       | 0             |

Figure 6.30 shows the locations of firms and employees in pre-disaster and post-disaster periods. It aims to conceptualize the urban restructuring in the post-disaster period.

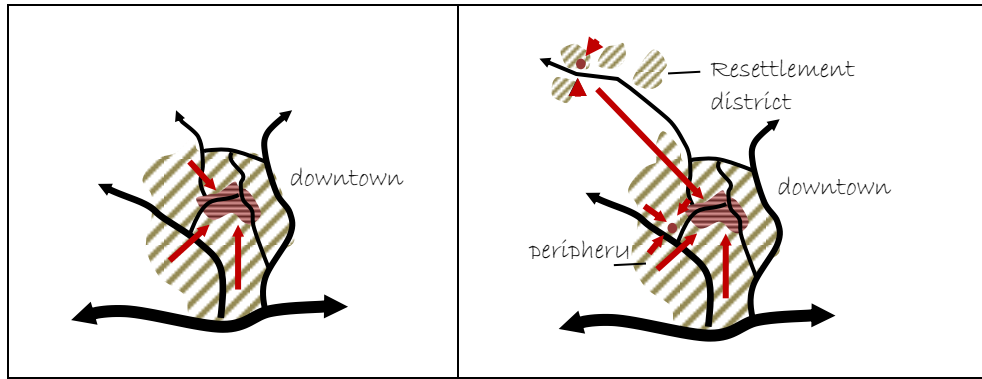


Figure 6.30. Location of firms and employees in pre-disaster period (left) and post-disaster period (right)

To sum up, there are a number of factors affecting the location choices of the businesses. These factors rather are closely related to the internal characteristics of the firms, their response capacity to disasters, the extent of damage caused by disaster, and the spatial dimensions of the business components. Up to this point, we have analyzed the characteristics of the businesses that were relocated after the disaster. Next part deals with the factors those influencing the location choices of businesses. Before conducting the statistical model, we present the descriptive statistics of location choices with respect the dependent variables.

In order to understand the factors that influence the location choices of firms, first, we analyze the business size variable with respect to location preferences. We found that small firms are more likely to relocate (Figure 6.31). 35,6% of small firms relocated after the Earthquake, while 14,3% of large percent relocated.

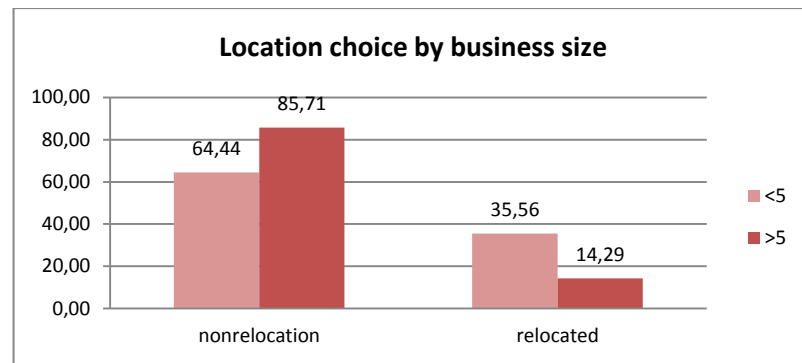


Figure 6.31. Relation between location choice and business size

Next, we analyze the relation between location choice and business sector. We found that the highest relocation percentage is seen among firms in construction sectors (Figure 6.32). That is, firms in construction sector are more likely to relocate than other firms.

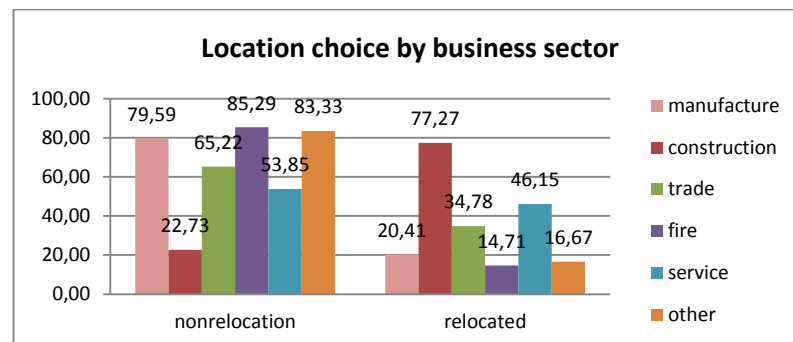


Figure 6.32. Relation between location choice and business sector

Related to pre-disaster economic condition, we found that there is no significant difference in financial terms. We observe that firms with poorest financial conditions are more likely to relocate than other firms (Figure 6.33). In the previous research of Wasileski et al (2011) on Hurricane Andrew, there is evidence showing that firms suffering from financial problems prior to disaster are more likely to relocate. The present research corresponds with the finding.

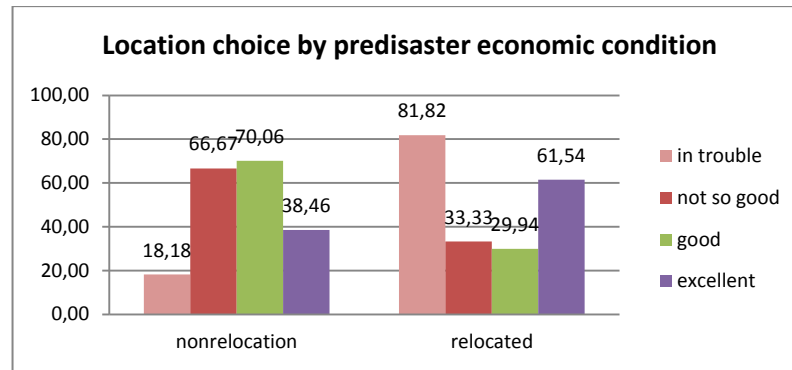


Figure 6.33. Relation between location choice and pre-disaster economic condition

Our study shows that there is a positive relation between relocation and business age (Figure 6.34). This finding is surprising since it is expected that older firms tend to stay in same location. However, we found that older firms are more likely to relocate. Since older firms are more established (Webb, et al, 2002), it was expected that they would stay in the same location.

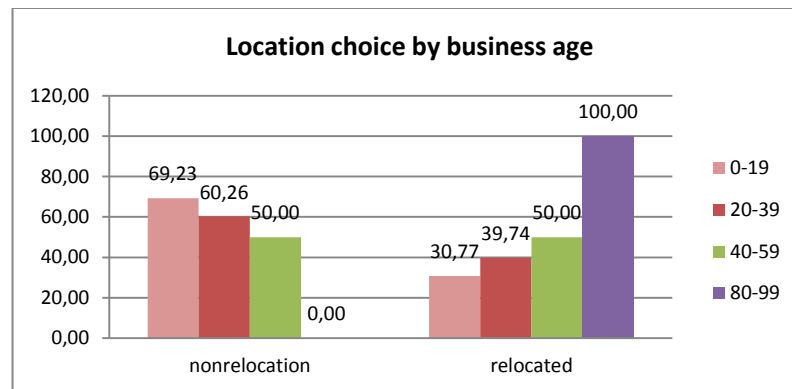


Figure 6.34. Relation between location choice and business age

Related to internal factors, the relation between occupancy status and location choice is analyzed. We found that lease holders are more likely to relocate (Figure 6.35). Therefore, we claim that firms with rented property are more mobile than owner occupied firms. In line with the previous research findings (Wasileski, et al, 2011; Chang and Falit-Baiamonte,

2002), this study confirms that owners occupied firms tend to locate within their pre-disaster locations.

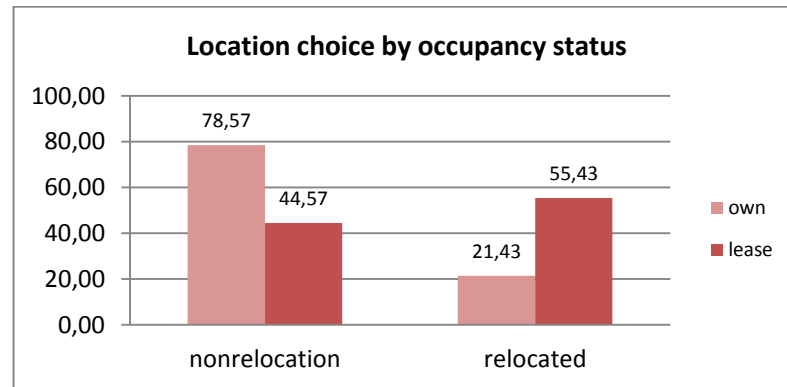


Figure 6.35. Relation between location choice and occupancy status

Another factor is the market range that analyzed with respect to location choice. We observe that there is no significant difference among firms with respect to primary market (Figure 6.36). Among the relocated firms, the highest percent is seen in firms serving at urban scale.

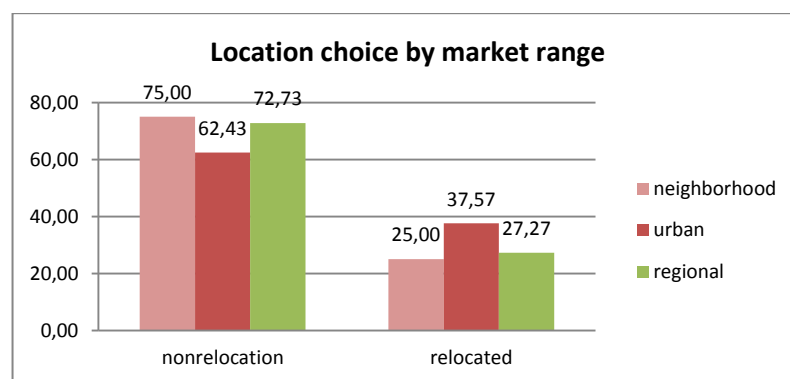


Figure 6.36. Relation between location choice and market range



We analyze the education level with respect to firms' location choices. According to Figure 6.37, we observe that firms with education are more likely to relocate. The highest relocation percentage is seen in firms with a manager or owner having a master or doctorate degree.

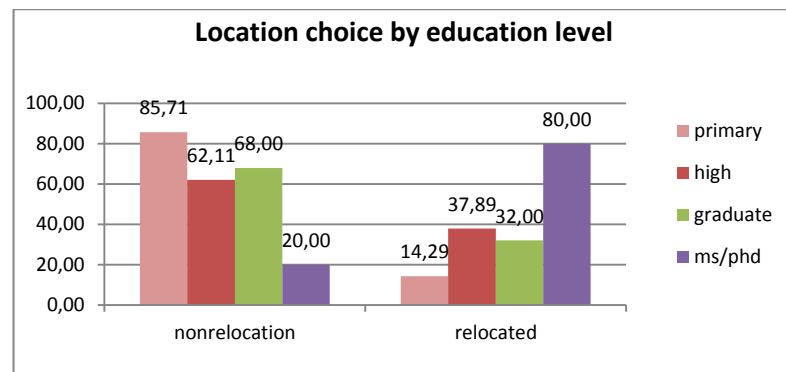


Figure 6.37. Relation between location choice and education level

Response capacity of a firm may influence the location choice of a firm. To start with, previous disaster experience is analyzed with respect to location choice (Figure 6.38). We found that firms without disaster experience are more likely to relocate than those who had experienced a prior disaster.

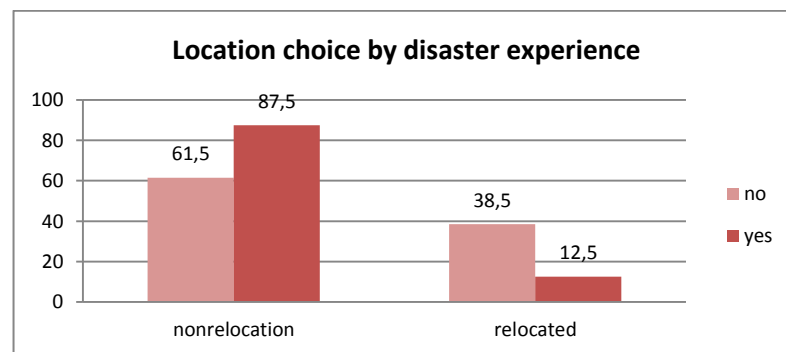


Figure 6.38. Relation between location choice and previous disaster experience

Related to response capacity, the relation between preparedness level and location choice is analyzed. We observe that there is no significant difference among firms with respect to preparedness level (Figure 6.39). Whether or not engaged in any preparedness activity, firms tended to stay in their pre-disaster location.

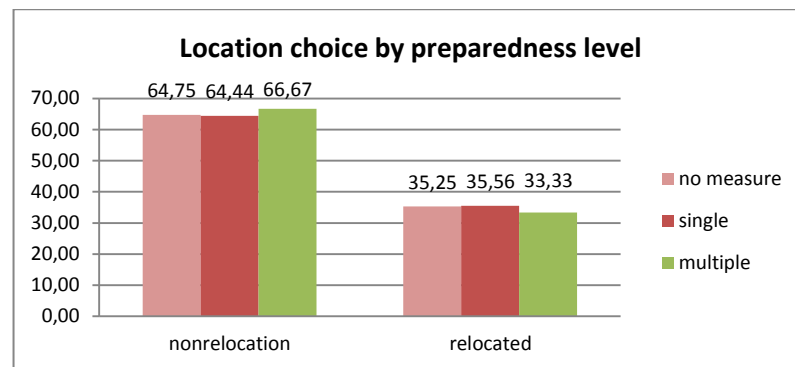


Figure 6.39. Relation between location choice and preparedness level

Another factor indicating response capacity is related to the amount of resources used. We analyze the amount of resource allocation with respect to location choice. Figure 6.40 shows that firms allocated two types of resources are more likely to relocate than others. However, resource allocation variable does not produce significant effect on location choice.

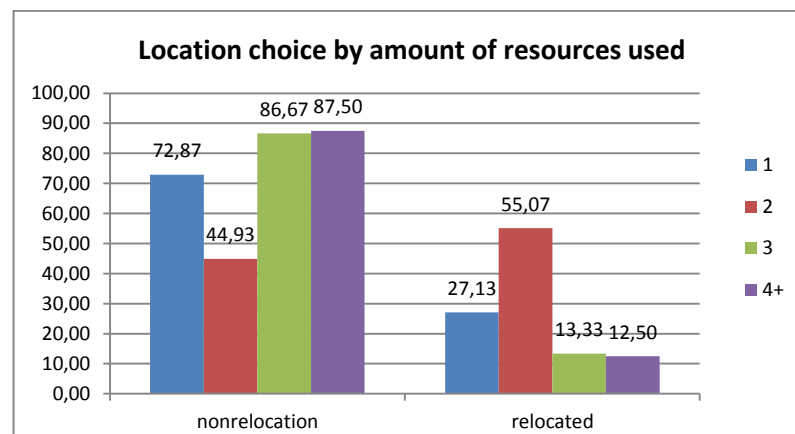


Figure 6.40. Relation between location choice and amount of resources used

In order to identify the extent of damage, the parameters of physical damage and length of business closure are used. First, we analyze the relation between physical damage and location choice. We observe that firms taking heavy damage from the disaster are more likely to relocate than others (Figure 6.41). This finding is consistent with the previous research of Wasileski, et al (2011) who claimed that firms experienced disruptive physical damage are more likely to relocate.

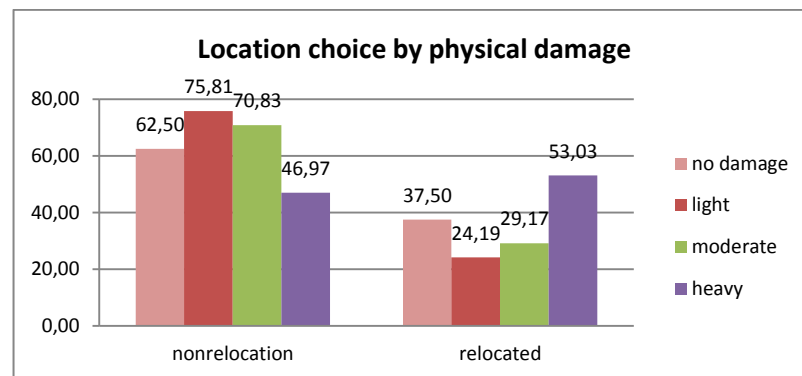


Figure 6.41. Relation between location choice and physical damage

Next, we analyze the relation between length of closure and location choice. We observe that there is not a significant difference among the location choices of firms with respect to business closure (Figure 6.42). Majority of businesses preferred to stay in the same location.

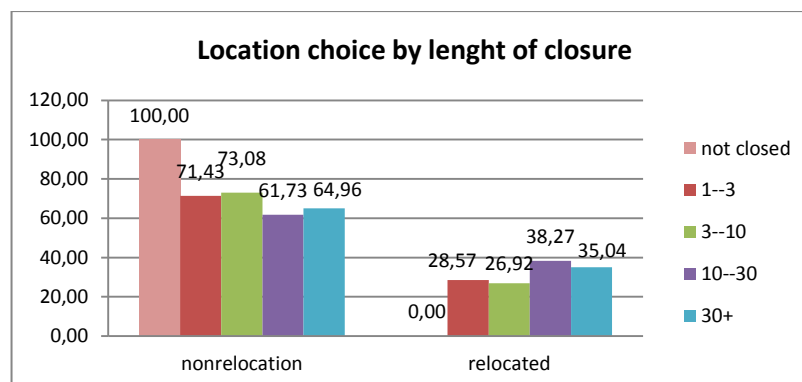


Figure 6.42. Relation between location choice and length of closure

Spatial factor are defined by variables of location of customers and location of employees. The location choices of firms are analyzed, first, with respect to location of customers. As Figure 6.43 shows, we found that firms serving to a wider market area are less likely to relocate. In line with the post-disaster locations of customers, we found that the highest non-relocation scores are seen in firms having customers out of region.

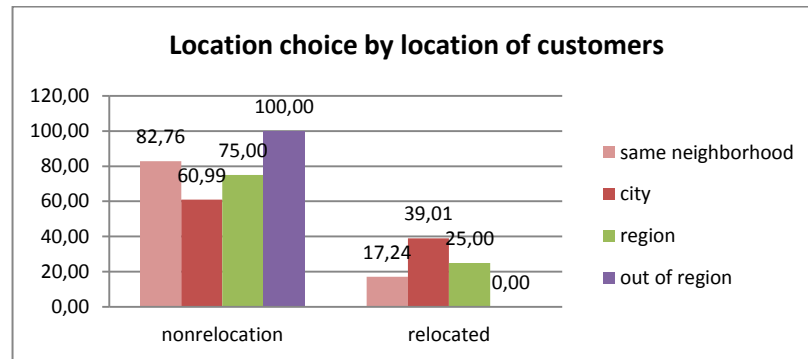


Figure 6.43. Relation between location choice and location of customers

Then, we analyze the relation between location of employees and location choices of firms. According to the post-disaster locations of employees, firms having employees coming out of the city are more likely to relocate than others (Figure 6.44). However, firms having employees residing in Serdivan, resettlement district or within Adapazarı are less likely to relocate.

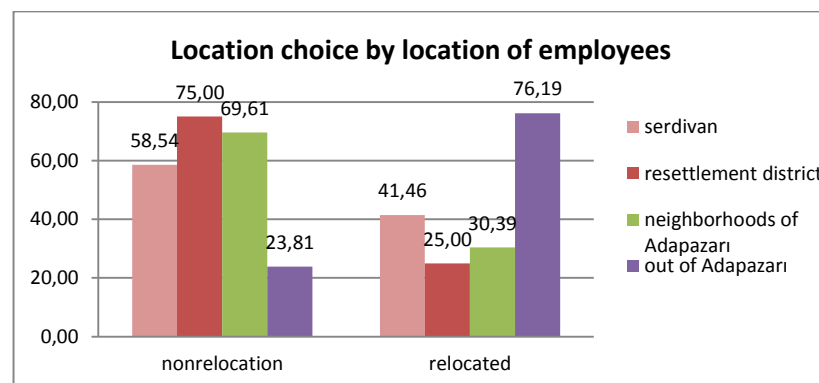


Figure 6.44. Relation between location choice and location of employees

#### **6.2.4. Evaluation of location choices of businesses in recovery period**

This section examines the analytical findings in relation with the second minor research question of the study. In this respect, it presents the factors affecting location choices of the businesses. The hypothesis is connected to the argument related to location choices of the businesses.

**Hypothesis 4.** Internal factors, response capacity, extent of damage, and spatial factors are significant in determining the location choices of the businesses.

According to location variable, first, we predict that firms mobility decrease with the size of firms. That is, firms with large number of employees are less likely to relocate than small-sized firms. Second, we argue that firms in manufacturing and construction sector are less likely to relocate than the firms in other sectors because they have fixed equipment and they are more dependent to transportation facilities and technical infrastructure. Third, we assume that the owner-occupied firms are less likely to relocate since the cost of vacating the property is much higher for owners than renters. Fourth, we hypothesize that older firms are less likely to relocate due to their embedded relations in spatial environment established in a long-term period. Fifth, we forecast that firms having a manager or owner with better education level and a robust economic condition are more likely to relocate safer locations than those with less educated managers or owners and those in financial trouble. Sixth, we expect that firms serving to a wider market area are less likely to move than those serving to local market since firms with narrower market are dependent on local customers and works on familiarity relations. Seventh, we argue that firms witnessing more operational problems are expected to relocate than those which suffered fewer problems. Eighth, we predict that business relocation process associates with the length of closure; i.e. longer the firms stayed close, more likely to relocate due to their pre-disaster concerns about location. Ninth, firms having previous disaster experience and engaging in more preparedness activities and allocated more resources after disaster are more likely to relocate than others. Tenth, we hypothesize that spatial factors would influence the recovery. That is, firms whose customers and employees change location after a disaster are more likely to relocate due to getting advantage of spatial proximity.

After putting forward the hypotheses about the location choice of the firms, we applied the analytical procedure. Factors affecting location choices of the businesses will be analyzed through (1) internal factors, (2) their response capacity, (3) extent of damage, and (4) spatial factors variables.

Binary Logistic Regression analysis is conducted to determine which factors affect business location choices. Here, the logistic regression is the most appropriate statistical technique. It enables us to estimate the certain value of dependent variable. The dependent variable in the model is determined as business location choice. Location choice is transferred into a two-point ordinal scale where '0' indicates 'non-relocation' and '1' indicates 'relocation'.

Then, we analyze the relation between the dependent variable, location choice with independent variables. Table 6.75 shows the results of the Location Choice Model of the businesses.

Table 6.75. Location choices, by internal factors, response capacity, extent of damage and spatial factor

| Internal factors                 |                    | Beta (B) | Std.errors (S.E.) | Significant (Sig.) | Exp(B)         |
|----------------------------------|--------------------|----------|-------------------|--------------------|----------------|
| Number of employees              | 5+                 | -1,348   | 1,793             | ,452               | ,260           |
| Business sector                  | Manufacture        | -,106    | 1,597             | ,947               | ,900           |
|                                  | Construction       | 4,634    | 1,657             | ,005               | 102,969        |
|                                  | Trade              | -,190    | 1,477             | ,898               | ,827           |
|                                  | FIRE               | -,487    | 1,532             | ,751               | ,615           |
|                                  | Service            | 1,392    | 1,488             | ,350               | 4,023          |
| Pre-disaster financial condition | In trouble         |          |                   | ,171               |                |
|                                  | Not so good        | -2,461   | 1,228             | ,065               | ,085           |
|                                  | Good               | -1,942   | 1,213             | ,109               | ,143           |
|                                  | Excellent          | -1,110   | 1,550             | ,474               | ,329           |
| Occupancy                        | Own                | -2,792   | ,548              | ,000               | ,061           |
| Market range                     | Neighborhood       |          |                   | ,175               |                |
|                                  | Urban              | ,450     | ,746              | ,546               | 1,569          |
|                                  | Region             | -2,006   | 1,499             | ,181               | ,135           |
| Education degree                 | Primary school     |          |                   | ,032               |                |
|                                  | High school        | ,686     | 1,404             | ,625               | 1,986          |
|                                  | Bachelor           | ,274     | 1,436             | ,849               | 1,315          |
|                                  | Master/Doctorate   | 5,818    | 2,411             | ,016               | 336,443        |
| Age                              | 14-99 mean         | ,003     | ,029              | ,913               | 1,003          |
| Response capacity                |                    |          |                   |                    |                |
| Having disaster experience       |                    | -4,136   | ,974              | ,000               | ,016           |
| Preparedness level               | No measure         |          |                   | ,449               |                |
|                                  | Single measure     | -,818    | ,669              | ,222               | ,441           |
|                                  | Multiple measures  | -,113    | ,795              | ,887               | ,893           |
| Resources used                   | 0-5 mean           | ,114     | ,269              | ,672               | 1,121          |
| Extent of damage                 |                    |          |                   |                    |                |
| Physical damage                  | No damage          |          |                   | ,003               |                |
|                                  | Lightly damaged    | -,491    | 1,102             | ,655               | ,612           |
|                                  | Moderately damaged | ,529     | 1,168             | ,651               | 1,697          |
|                                  | Heavily damaged    | 2,357    | 1,232             | ,056               | 10,561         |
| Length of closure                | Not closed         |          |                   | ,537               |                |
|                                  | 1-3 days           | 20,451   | 40192,899         | 1,000              | 761763435,414  |
|                                  | 3-10 days          | 20,241   | 40192,899         | 1,000              | 617387716,669  |
|                                  | 10-30 days         | 20,530   | 40192,899         | 1,000              | 823931327,920  |
|                                  | 30+ days           | 21,394   | 40192,899         | 1,000              | 1955849962,093 |

Table 6.75. Location choices, by internal factors, response capacity, extent of damage and spatial factor (cont.)

| Spatial factors       |                       | Beta (B) | Std.errors (S.E.) | Significant (Sig.) | Exp(B)        |
|-----------------------|-----------------------|----------|-------------------|--------------------|---------------|
| Location of employees | Serdivan              |          |                   | ,614               |               |
|                       | Resettlement district | -,067    | ,719              | ,925               | ,935          |
|                       | Downtown              | -,603    | ,636              | ,343               | ,547          |
|                       | Region                | ,124     | ,885              | ,889               | 1,131         |
| Location of customers | Same neighborhood     |          |                   | ,560               |               |
|                       | All around city       | -,928    | ,648              | ,152               | ,395          |
|                       | Region                | -,776    | ,925              | ,401               | ,460          |
|                       | Out of region         | 18,444   | 40192,970         | 1,000              | 102383601,697 |
| Constant              |                       | -19,045  | 40192,899         | 1,000              | ,000          |

Note.  $p < .05$

Variables entered on step 1: age, education, number of employees, manufacture, construction, trade, fire, service, occupancy, market range, disaster experience, preparedness level, physical damage, length of closure, pre-disaster economic condition, resource used, location of employees, location of customers.

According to the result of the analysis, there are three independent variables that lead positive relations with location choice. The first is 'education level'. Firms having a manager or owner with master or doctorate degree are more likely to relocate than those having a manager or owner with primary school degree. The odds of business relocation after the 1999 Earthquake increased by a factor of 336.4 if the manager or owner of the business have masters or doctorate degree in comparison to those with primary school degree ( $p < 0.05$ ).

The second strongest predictor of business relocation is the 'operating in construction sector' variable. For the 1999 Earthquake, businesses operating in construction sector are more likely to relocate than other firms ( $p < 0.05$ ). The odds of business relocation increase by a factor of 102.9 if the firm is in construction compared to ones in other sectors.

In Adapazarı, another significant predictor of business location choice is related to physical damage. Businesses reporting heavy damage are more likely to relocate than those notifying 'no damage'. The odds ratio of relocation increase by a factor of 10.6 if the firm reported 'heavy damage' compared to those 'no damage' ( $p < 0.05$ ). This finding confirms the previous studies of Wasileski, et al, (2011). In line with the results of Wasileski et al (2011) which show that higher levels of disruptiveness accompany to relocation, the present study highlight the positive relation between disruptiveness and relocation.

Among the regressed dependent variables on the business location choices, the parameters of 'property ownership' and 'previous disaster experience' were significantly related to business non-relocation.

The variable which significantly determines business relocation is 'previous disaster experience' ( $p < 0.05$ ). Businesses experiencing a disaster previously are less likely to relocate than those without disaster experience. The odds of business relocation decrease by a factor of 62.6 if the firm experienced any disaster ( $\text{Exp}(B) = .016$ ). The direction of relationship presented in the current research is unexpected. Because, we assume that firms challenged by a previous disaster would respond with a better approach by changing location compared to those who lacked such experience.

Ownership constitutes another significant predictor of non-relocation. Firms in Adapazarı are less likely to relocate if the property in which business operates is owner-occupied ( $p < 0.05$ ). The odds multiplier of business relocating decreased by a factor of 16.4 if the property was owned ( $\text{Exp}(B) = .061$ ). This finding corresponds with the previous research finding of Wasileski, et al (2011) and Chang and Falit-Baiamonte (2002) regarding that renters of property in which businesses operate are more likely to relocate. That is because, renters that take physical damage from disaster tend to recover by changing their locations, while owners of properties also have the chance to rebuild or restore their buildings. Therefore, owners of properties are less likely to relocate; rather they prefer to operate within the same location. This result can be explained by the costs of vacating the space. Property owners are reluctant to replace since cost of vacating is much higher for owners than renters. It is observed that after the earthquake, 20% of lease-holder firms in Adapazarı have shifted to an owner occupied status. Therefore, it is worthwhile to claim that since owner occupied type of firms showed little tendency to relocation, the new structure of occupancy occurred after the earthquake will lead to generation of immobile environment among business community. That is, **the present occupation type of firms will not allow to production of a different urban environment in future.**

We have hypothesized that the characteristics of businesses in terms of business size, pre-disaster economic condition, market range, and age would significantly affect the location choices of businesses. Also, we have predicted the response capacity would influence significantly the likelihood of recovery in terms of preparedness level and amount of resource used. Furthermore, we have expected a significant relation between recovery and extent of damage in terms of length of closure. However, contrary to our expectations, those variables do not show significant impact on business relocation. Those variables used to define relocation are not found statistically significant in explaining business relocation.



Business size, market range, age, and financial condition do not show relation with relocation. Since the 1999 Earthquake hit the most industrialized geography of Turkey, firms serving to regional or national market, having a robust pre-disaster financial condition and having large number of employees and being older do not have a direct impact on business relocation.

Interestingly, it is observed that spatial factors produced no statistically significant effect on business relocation. We expected that firms are more likely to move if their customers and employees were relocated after disaster. However, in the model there is no relation between spatial factors and relocation.

#### 6.2.5. Post-disaster considerations

This section of the study focuses on the post-disaster considerations and evaluations of businesses about their recovery process. Respondents mentioned their expectations beside their self-evaluation on recovery process. Thereby, this section puts forward recovery strategies of the businesses, main problems they faced during the process, number of firms closed after the disaster, evaluation of their present location in terms of market competition and new urbanization regulations, and their future location destinations.

At first, respondents were asked about their strategies after the disaster. 80% of them reported taking financial support (Table 6.76). Another strategy that approximately 35% of the affected firms adopted is relocation to another place to run their businesses.

Table 6.76. Distribution of recovery strategies of firms

| Recovery strategies             | %           | Frequency  |
|---------------------------------|-------------|------------|
| <b>Taking financial support</b> | <b>80,2</b> | <b>186</b> |
| Shrinking the entity            | 20,3        | 47         |
| Enlarging the entity            | 5,2         | 12         |
| Merging the entity              | 1,3         | 3          |
| Changing sector                 | 7,3         | 17         |
| Relocation                      | 34,9        | 81         |
| Other                           | 1,3         | 3          |

7% of the firms had changed their sectors after the disaster. Table 6.77 shows the sectoral distribution of the 17 firms that changed their main field of operation after the disaster. Half the firms changing sector preferred to operate in construction sector after the disaster.

Table 6.77. Distribution of firms that changed their sectors, by sector

| Business sector                    | %    | N |
|------------------------------------|------|---|
| Manufacturing                      | 11,8 | 2 |
| Construction                       | 52,9 | 9 |
| Trade                              | 5,9  | 1 |
| Finance, insurance and real estate | 0    | 0 |
| Service                            | 29,4 | 5 |
| Other                              | 0    | 0 |

Note. The number firms that changed their sector is 17.

Regarding the main problems that firms faced after the disaster, respondents complained mostly about reduction in number of customers (Table 6.78). The problem is followed by financial problems (50%) and continuation of reconstruction activities within the site (27%).

Table 6.78. Distribution of problems faced in business recovery process

| Problems in recovery process              | %           | Frequency  |
|-------------------------------------------|-------------|------------|
| Financial problems                        | 50,0        | 116        |
| Repair permits                            | 12,1        | 28         |
| Relocation from site                      | 11,2        | 26         |
| <b>Reduction of customers</b>             | <b>52,6</b> | <b>122</b> |
| Transportation problems                   | 23,7        | 55         |
| Negative perception of customers          | 14,7        | 34         |
| Continuing reconstruction within the site | 27,2        | 63         |
| Other                                     | 1,3         | 3          |

The respondent firms are asked whether there are any other firms providing similar good or service with you today. Table 6.79 shows the firms reporting the existence of any other firms that provide similar goods or services. Almost 93% of firms reported the existence of a competitive market environment.

Table 6.79. Existence of other firms providing similar goods or service in same area in current situation

| Existence of other firms | %    | N   |
|--------------------------|------|-----|
| Yes                      | 93,1 | 216 |
| No                       | 6,9  | 16  |

Then, the respondents are asked about their opinion about the existence of other firms around them. Here, in the answering sheets we have utilized five-point scale Lykert scoring. As Table 6.88 shows the perception of firms about relocation, firms moving to periphery and industrial district are glad to work with other firms around them. Also, firms moving to resettlement district show a positive attitude to the existence of other firms. However, for firms locating within downtown have negative perspective about the competition.

Table 6.80. Perception of firms about other firms within the same area, by post-disaster location choices of firms (%)

| Business post-disaster location                | Absolutely negative | Negative | No effect on | Positive | Absolutely positive |
|------------------------------------------------|---------------------|----------|--------------|----------|---------------------|
| Staying in the same location (n=151)           | 13,9                | 24,5     | 40,4         | 7,3      | 13,9                |
| Moving to two-storey building in center (n=65) | 10,8                | 6,2      | 46,2         | 29,2     | 7,7                 |
| Moving to resettlement district (n=8)          | 0                   | 25,0     | 37,5         | 37,5     | 0                   |
| Moving to periphery(n=6)                       | 0                   | 0        | 0            | 16,7     | 83,3                |
| Moving to industrial district (n=2)            | 0                   | 0        | 0            | 0        | 100                 |

Firms' perception about urbanization is analyzed with respect to the new urban regulations applied in downtown and the creation of resettlement district. Initially, respondent firms are asked how the creation of the new resettlement district affects their businesses. About half of the respondent firms mentioned the creation of resettlement districts do not affect their businesses (Table 6.81). That is, 50% of the firms are neutral about the creation of resettlement district. Among the rest of the respondents, the share of firms mentioned a positive perception is higher than those with negative perception towards the creation of resettlement districts.

Table 6.81. Effects of new resettlement district on the business

| Effects of new resettlement district | %           | N          |
|--------------------------------------|-------------|------------|
| Absolutely negative                  | 6,0         | 14         |
| Negative                             | 12,9        | 30         |
| <b>No effect on</b>                  | <b>51,8</b> | <b>120</b> |
| Positive                             | 23,7        | 55         |
| Absolutely positive                  | 5,6         | 13         |

Respectively, the effects of resettlement district on businesses are analyzed by sector, as shown in Table 6.82. Almost half of the firms in manufacturing, trade and service sectors mentioned that their businesses were not affected from the creation of new resettlement district. The rest in those sectors commonly have negative attitude against the resettlement district. On the other hand, firms in construction and FIRE sectors have a positive approach about new resettlement district.

Table 6.82. Effects of new resettlement district on the business, by sector (%)

| Effects of new resettlement district | Absolutely negative | Negative | No effect on | Positive | Absolutely positive |
|--------------------------------------|---------------------|----------|--------------|----------|---------------------|
| Manufacturing (n=49)                 | 6,1                 | 22,5     | 49,0         | 18,4     | 4,1                 |
| Construction (n=22)                  | 4,5                 | 9,1      | 22,7         | 50,0     | 13,6                |
| Trade (n=69)                         | 2,9                 | 14,5     | 68,1         | 14,5     | 0                   |
| FIRE (n=34)                          | 8,8                 | 8,8      | 20,6         | 47,1     | 14,7                |
| Service (n=52)                       | 9,6                 | 7,7      | 71,2         | 11,5     | 0                   |
| Other (n=6)                          | 0                   | 0        | 0            | 50,0     | 50,0                |

Additionally, the effects of creation of new resettlement area are analyzed by the post-disaster locations of firms, as shown in the Table 6.83. Nearly half of the firms that stayed in the same location are neutral about resettlement district while the rest of them have relatively a positive perception. Creation of resettlement district has no effect on the businesses of firms moving to two-storey building (51%), moving to resettlement district (83%) and moving to industrial district (100%). For those moving to resettlement district have a more positive attitude than others, while for firms moving to periphery have a more negative opinion.

Table 6.83. Effects of new resettlement district on the business, by post-disaster location of firms (%)

| Business post-disaster location                | Absolutely negative | Negative | No effect on | Positive | Absolutely positive |
|------------------------------------------------|---------------------|----------|--------------|----------|---------------------|
| Staying in the same location (n=151)           | 2,7                 | 14,0     | 50,7         | 28,7     | 4,0                 |
| Moving to two-storey building in center (n=65) | 13,2                | 10,3     | 51,5         | 14,7     | 10,3                |
| Moving to resettlement district (n=8)          | 0                   | 0        | 83,3         | 16,7     | 0                   |
| Moving to periphery (n=6)                      | 16,7                | 33,3     | 33,3         | 16,7     | 0                   |
| Moving to industrial district (n=2)            | 0                   | 0        | 100          | 0        | 0                   |

The second aspect of the relationships between urbanization and businesses is the reduced and restricted development rights in the downtown area. Entrepreneurs of firms are asked about their opinion on the reduced development rights applied in the downtown. Table 6.84 shows the distribution of five-point scale Lykert analysis. Again, 58% of the respondent firms remain neutral about the impacts of reduced development rights. Nearly 32% of the firms reported their negative attitude in total while only almost 10% of them have a positive approach.

Table 6.84. Effects of reduced development rights on the business

| Effects of reduced development rights | %    | N   |
|---------------------------------------|------|-----|
| Absolutely negative                   | 4,7  | 11  |
| Negative                              | 27,2 | 63  |
| No effect on                          | 58,2 | 135 |
| Positive                              | 7,3  | 17  |
| Absolutely positive                   | 2,6  | 6   |

Corresponding to the same question, the effects of reduced development rights are analyzed by sector, as Table 6.85 shows the results. All sectors except FIRE commonly mentioned no effect. For firms in FIRE sector mentioned the negative impacts of reduced rights for their businesses (67%). In addition, among all sectors more firms stated negative perception on reduced rights than positively perceived ones.

Table 6.85. Effects of reduced development rights on the business, by sector (%)

| Effects of reduced development rights | Absolutely negative | Negative | No effect on | Positive | Absolutely positive |
|---------------------------------------|---------------------|----------|--------------|----------|---------------------|
| Manufacturing (n=49)                  | 4,1                 | 24,5     | 59,2         | 6,1      | 6,1                 |
| Construction (n=22)                   | 22,7                | 9,1      | 63,6         | 0        | 4,5                 |
| Trade (n=69)                          | 0                   | 17,4     | 72,5         | 10,2     | 0                   |
| FIRE (n=34)                           | 2,9                 | 67,6     | 20,6         | 5,8      | 2,9                 |
| Service (n=52)                        | 5,8                 | 23,1     | 61,5         | 7,8      | 1,9                 |
| Other (n=6)                           | 0                   | 33,3     | 50,0         | 16,7     | 0                   |

Furthermore, the effects of reduced development rights are investigated with respect to the post-disaster locations of firms as the results could be seen in Table 6.86. More than half the firms in all location choices notified no effect of reduced rights on their businesses. For the rest, particularly, more firms indicated negative perception than positively perceived ones.

Table 6.86. Effects of reduced development rights on the business, by post-disaster location of firms (%)

| Business post-disaster location                | Absolutely negative | Negative | No effect on | Positive | Absolutely positive |
|------------------------------------------------|---------------------|----------|--------------|----------|---------------------|
| Staying in the same location (n=151)           | 5,3                 | 22,7     | 60,0         | 9,3      | 2,7                 |
| Moving to two-storey building in center (n=65) | 4,4                 | 35,3     | 52,9         | 4,4      | 2,9                 |
| Moving to resettlement district (n=8)          | 0                   | 33,3     | 66,7         | 0        | 0                   |
| Moving to periphery (n=6)                      | 0                   | 50,0     | 50,0         | 0        | 0                   |
| Moving to industrial district (n=2)            | 0                   | 0        | 100          | 0        | 0                   |

The last question in this part is on the potential site where the firm is willing to move in future. The expected location of firms are defined as (i) Serdivan, (ii) resettlement districts as Karaman, Korucuk, Camili, (iii) downtown, (iv) other counties of Sakarya province (out of Adapazarı), (v) another province within Marmara Region, and (v) out of Marmara Region, in the question. Table 6.87 shows the distribution of expectations of firms about future location choices. Less than half of the firms informed to stay in the same location (49%), and the rest declared to relocate (51%).

Table 6.87. Distribution of expected location choices of firms in future

| Expected location choice | %           | N          |
|--------------------------|-------------|------------|
| Staying in the same area | 48,9        | 109        |
| <b>Relocation</b>        | <b>51,1</b> | <b>114</b> |

The sites of the potential location choices of the firms are asked to those who stated to be willing to relocate in future where they would like to settle in considering a future disaster. Table 6.88 reveals the results of 114 firms. Surprisingly, nearly 30% firms answered to the question by insisting upon the downtown. Also, 27% of firms indicated their preferences to move to resettlement district and 16% noticed to move to Serdivan in future. It seems that most of the respondent firms do not decide to relocate outside the city (85%). The rest decide to resettle within the region, especially in Kocaeli and İstanbul regarding a disastrous event. Only 2,5% of firms mentioned to move outside the region, by marking somewhere in Aegean Region.

Table 6.88. Potential sites of firms in future

| Expected destinations                                 | %           | N         |
|-------------------------------------------------------|-------------|-----------|
| Serdivan                                              | 15,6        | 19        |
| Resettlement district (Karaman, Korucuk, Camili)      | 27,0        | 33        |
| <b>Downtown</b>                                       | <b>29,5</b> | <b>36</b> |
| Other counties of Sakarya province (out of Adapazarı) | 13,1        | 16        |
| Another province within Marmara Region                | 12,3        | 15        |
| Another province out of Marmara Region                | 2,5         | 3         |

Note. The number of firms with a future relocation expectation is 114.

Finally, we have analyzed the expected destinations of the firms by their post-disaster locations. Firms that stayed in the same location would like to move any other neighborhood of Adapazarı at most (28%). Their other alternatives would like to be in resettlement district (22%) and out of Adapazarı (21%). For those moving to two-storey building within center mention to prefer to move to resettlement district (32,5%) and other neighborhoods of Adapazarı (30%) in the future. Firms locating in the Resettlement District would like to locate again within the same area (75%) and to relocate to center (25%). All firms that moved to periphery would like to resettle within any neighborhood of Adapazarı whereas all firms that moved to industrial district would like to relocate out of Adapazarı.

Table 6.89. Expected location choices of firms in future, by post-disaster location of firms

| Business post-disaster location         | Serdivan | Resettlement district | Within Adapazari | Out of Adapazari | Region | Out of region |
|-----------------------------------------|----------|-----------------------|------------------|------------------|--------|---------------|
| Staying in the same location            | 14,5     | 22,4                  | 27,6             | 21,1             | 13,2   | 1,3           |
| Moving to two-storey building in center | 12,5     | 32,5                  | 30,0             | 7,5              | 12,5   | 5,0           |
| Moving to resettlement district         | 0        | 75,0                  | 25,0             | 0                | 0      | 0             |
| Moving to periphery                     | 0        | 0                     | 100              | 0                | 0      | 0             |
| Moving to industrial district           | 0        | 0                     | 0                | 100              | 0      | 0             |

Note. The number of firms with a future relocation expectation is 114.

### 6.3. CONCLUSION

In analyzing the factors that affect the restoration performance of the firms in the long-term period after disaster, we have used a Business Recovery Model. The model includes three sets of variables, namely internal factors, response capacity and extent of damage. Our hypothesis was that success of firms in recovery period depends on these factors. **Internal factors** include the variables of business size, sector, age, pre-disaster economic condition, market range, occupancy tenure, and education level. The results of the Logistic Regression analysis show that recovery processes differ with respect to internal factors.

The most notable impact on business recovery is related to operating in finance, insurance and real estate (FIRE) sector variable. That is, firms in FIRE sector are more likely to recover than others. Firms dealing with finance, insurance and real estate have shown better performance in recovery. The success of the firms in FIRE sector might depend on increasing sales and consumer's spending on insurance and real estate after the disaster.

Related to internal factors, this study also showed that firms in trade and service sector are less likely to recover than other firms. Although further research is necessary in this area, these sectors might be affected from being small businesses, lease-holders, and local economic conditions. That is, we observe from the case study that firms in trade and service sector seem to be small firms operating within a local market as renters. These characteristics of the firms might force them in recovery period. Additionally, the variable related to pre-disaster economic condition is found significant in explaining business recovery process. We have found that firms that were 'not doing well' before the disaster are less likely to recover than those reporting financially 'in trouble'.

This study shows that the **response capacity** of businesses against disasters is low in Adapazari in terms of preparedness level, previous disaster experience and the amount of



resource used. We have found that a vast majority of businesses had little preparedness before the earthquake. Despite the fact that preparedness contribute to resilience of businesses against disasters, more than half of the firms do not engage in any preparedness activities. Only 20 per cent of businesses took a single measure before the earthquake. The most common type of the preparedness is taking insurance in which only 30 per cent of the businesses invested before the earthquake. This study also found that age is a significant predictor of preparedness. Older firms tend to engage in preparedness activities.

Businesses are less likely to invest in insurance. Since firms could not benefit from the insurance after disaster, they try to obtain loans or credits to recover their businesses. This study shows that using resources after a disaster relates with occupation status. That is, owner-occupied type of firms tends to allocate more resources than renters. We interpret the finding as owners of properties could access loan and invest insurance more than tenants. Therefore, renters seem more vulnerable than property-owners and they require special measures in recovery. In case of disasters, firms tend to allocate personal savings or business reserves to assist recovery which could be used to further business investments. With respect to the **amount of resources used** variable, this study put forward that the resource allocation relates with business size and occupancy tenure. That is, consistent with the previous findings (Chang and Falit-Baiamonte, 2002), we found that large firms are more likely to allocate resources after a disaster than small firms. Additionally, we contributed to literature by showing that owner-occupied firms are more likely to allocate resources than their counterparts with rented-property. Also, we found that 80 per cent of firms applied to individual savings to restore their businesses. That may result in substantial economic losses which could be used in further investments. Therefore, in order to generate a sustainable development for businesses, risk reduction measures should be engaged by firms.

For the **extent of damage** variable, this study found that the disruptiveness of the damage had a significant impact on business recovery. That is, firms taking more damage from the disaster are less likely to recover than those taking less damage from disaster. Related to this variable, the results of the study show that disaster-induced problems such as direct physical damage, operational problems and length of closure may disturb business viability in long-term.

We found that almost all businesses were affected from the earthquake. The disruptiveness of damage does not necessarily vary with respect to the variables related to business sector and business size. The damage ranges from collapse of building to loss of utility, furniture, machinery, stock, infrastructure, and labor. Therefore, businesses had to be closed

temporarily or permanently after the disaster. For those experiencing temporary business closures, the most frequently mentioned reason of closure is clearance of damage to interior and contents of building. Other reasons for business closure are lifeline losses, loss of customers, and inability to pay employees. In addition to damage related to building in which firms operate, they suffer from those external problems.

In relation to **lifeline outages**, we have found that all types of businesses are dependent on electricity and all of them had faced with electricity interruption. Particularly, manufacturing firms reported electricity interruption was very disruptive on their businesses. Similarly, the most negatively affected sectors from water interruption were manufacturing and service sectors. Disruptions in sewage system were heavily affected the operations of manufacturing and service sectors. Phone service outages were critically affected the firms in FIRE sector.

It is necessary to emphasize that there are other factors which are not verified in the model, but may play an important role in their recovery in other cases. To illustrate, small firms are less likely to recover than their larger counterparts across disasters. Also, firms with different market ranges have revealed diverse recovery performance. The age, occupancy tenure, previous disaster experience, preparedness level, the amount of resources used, and length of closure would also affect the recovery process.

According to the responses of firms, this study found that businesses are notified being worse off according to their pre-disaster conditions in terms of number of employees, number of customers, profit level and present state of business. Their recovery levels in the long-term seem to be on the average in comparison to previous studies (Tierney, 1997; Webb, et al, 2002; Wasileski, et al, 2011; Dietch and Corey, 2011).

In the second part of the study, we argue that firms are willing to keep their existing opportunities obtained by spatial configurations. In terms of location choice model, it is obvious that the majority of firms prefer to locate in downtown.

In the empirical study, we have found the answers to the following questions related to their post-disaster location choices; Where did the businesses locate before the earthquake? What type of location decisions do the businesses make after disaster? What affects location choices of businesses? What are the consequences of their location choices on urban spatial structure?

In pre-disaster period, firms have located in the downtown. Central district of Adapazari was occupied by all types of sectors. In this period, firms in manufacturing sector have settled in industrial districts, and there have been some firms in construction and manufacturing sectors in Serdivan district. Only 34 per cent of firms had an alternative location for their businesses. The alternative locations were generally in downtown area.

After the earthquake, we have found that 60 per cent of the respondent firms stayed in their pre-disaster locations. Among the relocated firms, 28 per cent located within downtown again, 3.4 per cent moved to resettlement district, and 2.6 per cent moved to periphery.

In our **location choice model**, the most notable impacts on business relocation relates to the education level, operating in construction sector and extent of damage variables. This study shows that a manager or owner of a firm with a master or doctorate degree is more likely to relocate than those with primary school degree.

Another finding of the study is that firms in construction sector are more likely to relocate. The relation between construction sector and relocation could not be directly explained. According to the reasons of relocation of construction firms, we found that 50 per cent of relocated firms reported the destruction of building. This may explain the reason behind the mobility of construction firms. Since half the respondents mentioned destruction of building and since we found taking more damage positively relates with relocation, then we claim that construction firms are more likely to relocate.

Additionally, the firms taking more damage from disaster are more likely to relocate. This finding corresponds with the previous researches (Tierney, 2006; Wasileski, 2011). The results of the present research put forward that firms taking more damage are more likely to relocate than those taking fewer damage.

We also found that firms with disaster experience are less likely to relocate than those without any experience. This finding is surprising because it was expected that firms experiencing any disaster before the earthquake, would show more willingness to relocate to escape further risks. However, our finding is inconsistent with the expectation.

One of the significant relations with relocation is seen with the variable of occupation status. According to our findings, ownership of property decreases the mobility of firms. This finding of the study confirms the previous studies of Wasileski, et al (2011) and Chang and Falit-Baiamonte (2002). We have found that owner-occupied firms are less likely to relocate than

lease-holders. Since businesses with rented property are more mobile than owner-occupied firms, lease holders could be directed to safer locations.

In our Location Choice Model, the variables related to size, pre-disaster economic condition, market range, age, preparedness level, amount of resources used, length of closure, location of employees and location of customers do not produce significant effect on location choices of businesses. It should be emphasized that those variables would play a significant role in other cases, so that further studies should take these factors into account.

We have found that firms still tended to locate within the existing center by staying in their pre-disaster locations and by relocating within the downtown. The most frequently mentioned reasons for staying in the same location are occupancy status, difficulty of relocation and dependency to customers. According to the results, we have stated that firms would like to benefit from the established relations by keeping their locations. This shows that business relations are embedded in space. On the other hand, the main reasons of relocation are reported as destruction of building, need to be close to customer base and business agglomeration. Firms relocated within downtown explained their reason to relocate with respect to the spatial proximity to customers. It could be interpreted as (1) downtown still holds the majority of customers, (2) business relations are embedded in space, and (3) despite the competition firms prefer to the central area to run their businesses.

According to the answers of respondent firms, it is observed that firms are unwilling to relocate once again. That is consistent with the number of replacement of firms which is mostly seen once in the Adapazarı case. In other words, relocation decision is permanent for Adapazarı. Also, expected destinations of firms give clues about desired locations. Among the respondent firms considering relocation, the most frequently mentioned choice is downtown. Downtown is followed by resettlement districts and Serdivan. The least scored choice is other counties of Sakarya, and another province within or out of the Marmara Region. It is surprising to see that firms are reluctant to move to resettlement district in future. Even, firms do not see the resettlement district as a potential destination. Therefore, ***it can be concluded that the expectation patterns do not seem to change the existing urban structure of the Adapazarı city in the future. We expect the continuation of the fragmented urban structure in the long-term period.*** The current structure of the Adapazarı city comprising of a downtown with a strong center, a residential district 12 km away from downtown and an adjacent district with a newly emerging central facilities is likely to be continued. We argue that the possible developments seem to occur in Serdivan, in right of the expected relocation destinations. Therefore, urban growth seems to take place in western parts of the downtown in the short-term. Also, urban

sprawl seems to appear towards the resettlement district, to the northern periphery of the city unless restriction decisions are taken. Although the northern part of the existing city presents a highly productive agricultural land and inappropriate ground for settlement, urban development might be permitted in order to connect the downtown and resettlement district. However, considering the disaster risks, such a northern development should be decided carefully. Since there emerged some urban facilities along with the motorway connecting downtown and resettlement district, it is possible to state that this area is under the pressure of development, despite the disaster risks. In physical and spatial aspects, one could argue that it is required to permit development for northern part in order to connect downtown and resettlement district and to generate a business environment within resettlement district. However, with respect to disaster risks, policy makers and planners should be aware of the consequences of development of northern part. It is obvious in Adapazarı urbanization history that urban growth on agricultural area has resulted in destruction and irretrievable losses. Permitting development on northern part would be resulted in similar consequences. The gap between downtown and resettlement district could be achieved through carefully designed policies which enhance the spatial and life quality of resettlement district, consist with the requirements of mitigation, and be respective to open spaces and productive lands of city.

Finally, we have investigated the present locations of the firms. Figure 6.45-50 illustrate the post-disaster locations of the firms according to their sectors. The colored points show present locations of the firms that change according to sectors. According to the figures illustrating location choices of the firms, the downtown has still been the major business district. The agglomeration of points displays the location of businesses as well as the borders of the center. Figure 6.51 shows that the downtown holds the variety of sectors within itself. On the other hand, periphery holds mainly specialized type of businesses such as manufacturing and retail trade.

Furthermore, according to the Figure 6.52, a vast majority of firms have tended to locate in downtown irrespective of their sectors. Even the firms took relocation decision have preferred to locate in downtown rather than moving to geologically safer districts. This tendency is controversial with the movements of households which preferred to live in resettlement districts and safer periphery of Adapazarı.

To sum up, vast majority of firms affected from the earthquake and relocated in the recovery process prefer to reorganize their businesses within downtown. They have not moved to resettlement district, rather they sustain to settle within central district of Adapazarı. Despite the central area planned within the resettlement district and assigned to

right owners whose firms have heavily damaged after the earthquake, firms have been reluctant to relocate. Therefore, the resettlement district has failed to attract the business function from downtown (see Table 6.90).

Table 6.90. Sample quotations for refusing relocation in resettlement district

"Although central district was designed within the resettlement district, commercial activities have not initiated within these areas. Because these plans suggest that commercial activity could be run in buildings which were dedicated only for businesses. That is, commerce was pulled into certain structures. Street trade was not considered at first, which constitutes the main mistake. Initially, trade and housing could be decided together. Urbanization does not mean the separation of functions, rather it requires the mixed uses. Plans could allow to generate a central district organized with street trade.

Today, in this case, nobody prefers to do business in these districts."

(City planner, municipality)

"Commercial units constructed in resettlement district were designed as office blocks. Although these blocks have benefits in terms of technological aspects such as automatic gates, lightening, infrastructure, these blocks are not sufficient with the needs of businesses which were affected from the earthquake and became right owner in these areas. To illustrate, a store in the third floor of the block could be assigned to a hairdresser or to a grocery. Therefore, upper floors of the blocks commonly left empty which are either for sale or for rent."

(Local journalist, Yenihaber Newspaper)

"Government office has been in operation since 2009 in Camili. Before the government office has moved, the business blocks were almost neglected and in bad situation. Afterwards, with the opening of a few firms, these blocks have improved. However, there have still been rooms for sale and for rent in upper floors. Only rooms are hiring which are on street and on the ground-floor. Some of the firms preferring these block turn to downtown due to lack of operation."

(Lawyer, Camili)

"A unit was assigned to each business owner whose firm was destructed in the earthquake. Firms picking a room in upper floors of blocks as a result of the raffle have not moved to new area. I had a firm in the downtown which was run by my tenant. It was collapsed and I gained the right of a new unit in the resettlement district. That was on the upper floor and it is still for rent. Nobody want to hire, and also I do not pay the maintenance cost. This is because citizen of Sakarya do not prefer to shop in upper floors. Therefore, that place has to be abandoned. However, new streets in downtown have vitalized. New places have opened. Because, customers have turned back to downtown. for this reason, commercial activity of downtown does not relocate to resettlement district."

(Jewelry, Downtown)

Beside the central district of downtown, Serdivan district has begun to draw businesses with respect to proximity advantages to downtown. While the downtown sprawled to south towards E-5 highway, after the earthquake with the development of Serdivan district downtown begun to sprawl towards western slopes. The reason behind the western development occurred in Serdivan is that the district provides both residential areas and sub-center consisting of business concentration. As a new settlement district, the periphery becomes one of the most preferred locations for businesses due to its close location to downtown and the infrastructure opportunities it provides (see Table 6.91).

Table 6.91. Sample quotations for relocation to Serdivan

"It is needed large lots for manufacturing furniture. We benefit from the space provided in this district in spite of the small areas of downtown. We prefer Serdivan due to its close location to downtown, customer base and due to the large space provided in the district. However, the resettlement district is left only to residential function. Generating centrality is not possible unless there have been commercial developments."  
(Furniture manufacturing, Serdivan)

"We have also been in downtown before the earthquake, locating in the collapsed five-story Municipality's block... Despite the heavy losses, the reason behind the recovery could be explained by the characteristic of the good we provide. We could begin to operate when we picked up because we have not lost the stock, namely the gold... you need to make a leap forward in the subsidence otherwise you would not recover. Now, we have thirteen branches within three locations. One of them is Serdivan, and the rest locates in several locations of downtown. The reason to prefer these locations relates that these areas have economic viability and brightness. Customers have turned these areas to shop."  
(Jewelry store, Downtown)

Apart from the new business developments occurred in resettlement district and Serdivan district, city center has been restructuring after the earthquake. Immediately after the earthquake when the areas including central functions were damaged, the land prices were reduced and demand for those areas was not generated in the short term. However, after the revitalization of central district with the reconstruction activities run in downtown, the prices of and demand for land, housing and businesses have begun to increase. Besides,

pedestrianization and reduced development rights would lead to generation of business activities on some streets within downtown (see Table 6.92).

Table 6.92. Sample quotations for relocation in downtown

“Although Çark Street and Sedat Kirtetepe Street were residential streets of the city where upper income group prefer to settle, after the earthquake citizens were reluctant to reside in. These regions were inhabited by tenants coming outside of the city. These areas showed a decline in land prices at first. During this period, land collectors bought plots of land cheaply from these locations. But eventually, with pedestrianization of Çark Street and with arrival of chain stores and factory outlet stores here, land and rent prices began to rise again. Today, those who bought lands cheaper would be the most profitable ones after the earthquake. On the other hand, pedestrianization of Çark (Street) led to the opening of new business districts. For example, businesses were occurred on the Bosna Street after the earthquake.”  
(Local journalist, Yenihaber Newspaper)



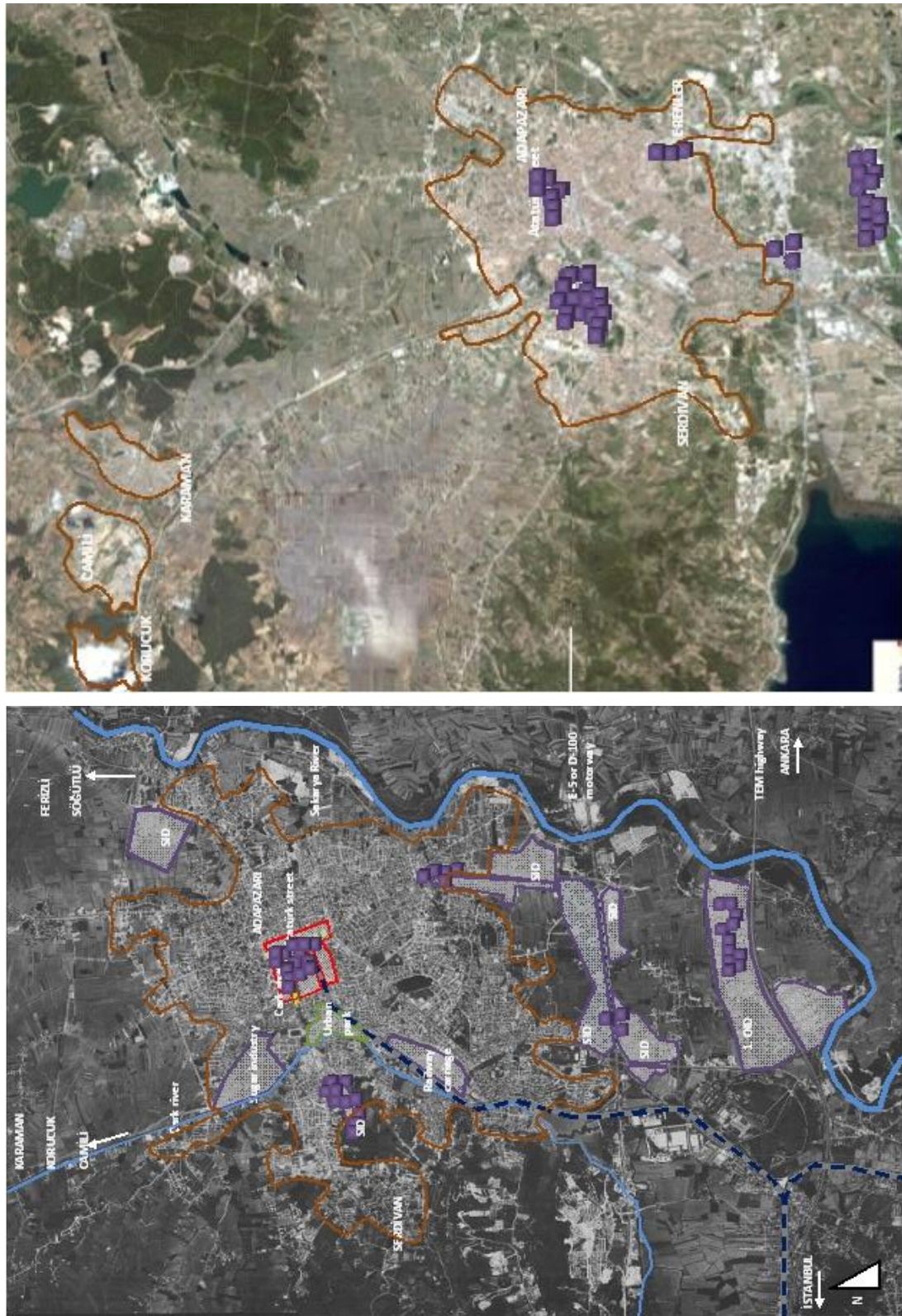


Figure 6.45. Pre-disaster (below) and present (above) locations of firms in Sector1- Manufacturing



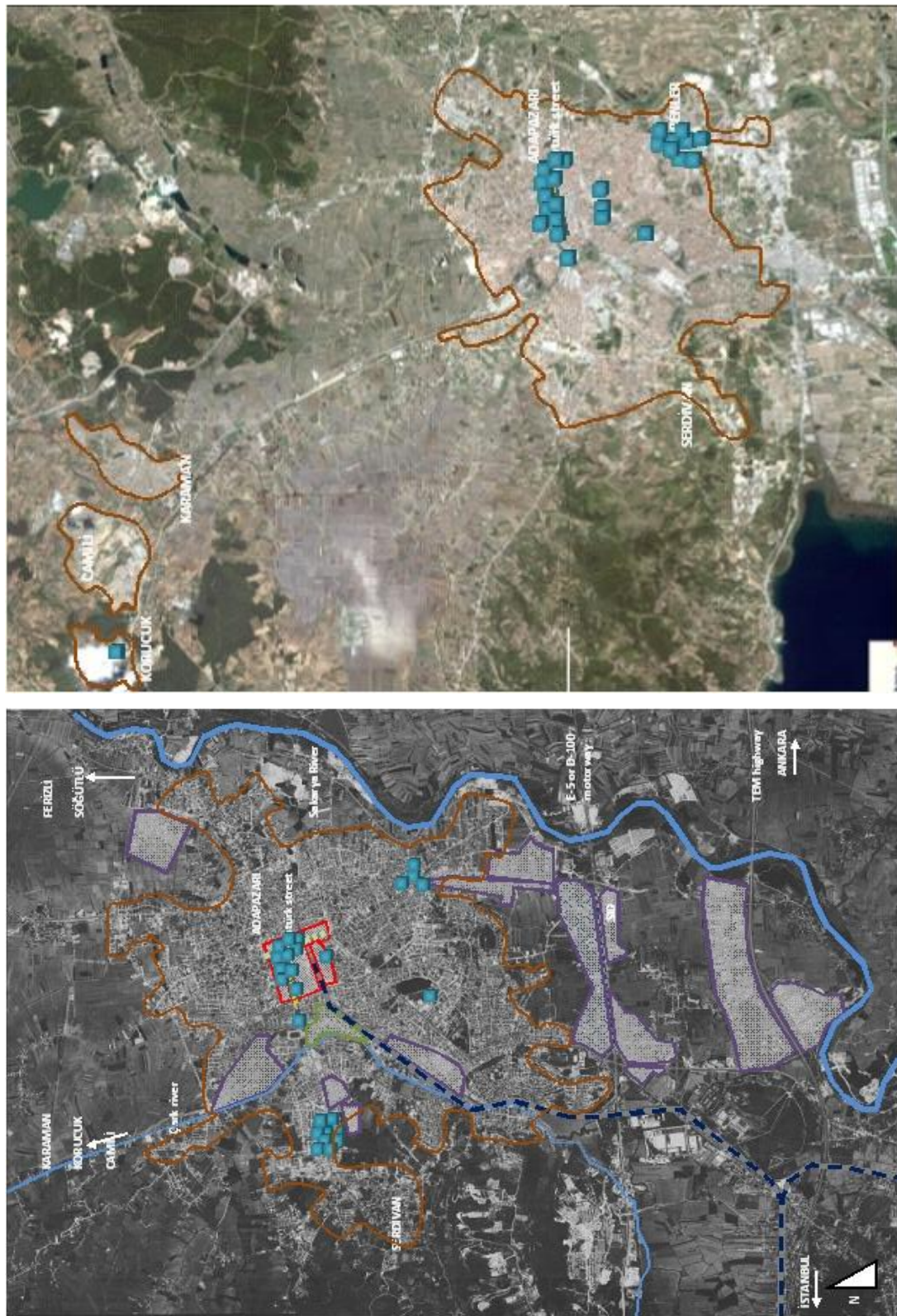
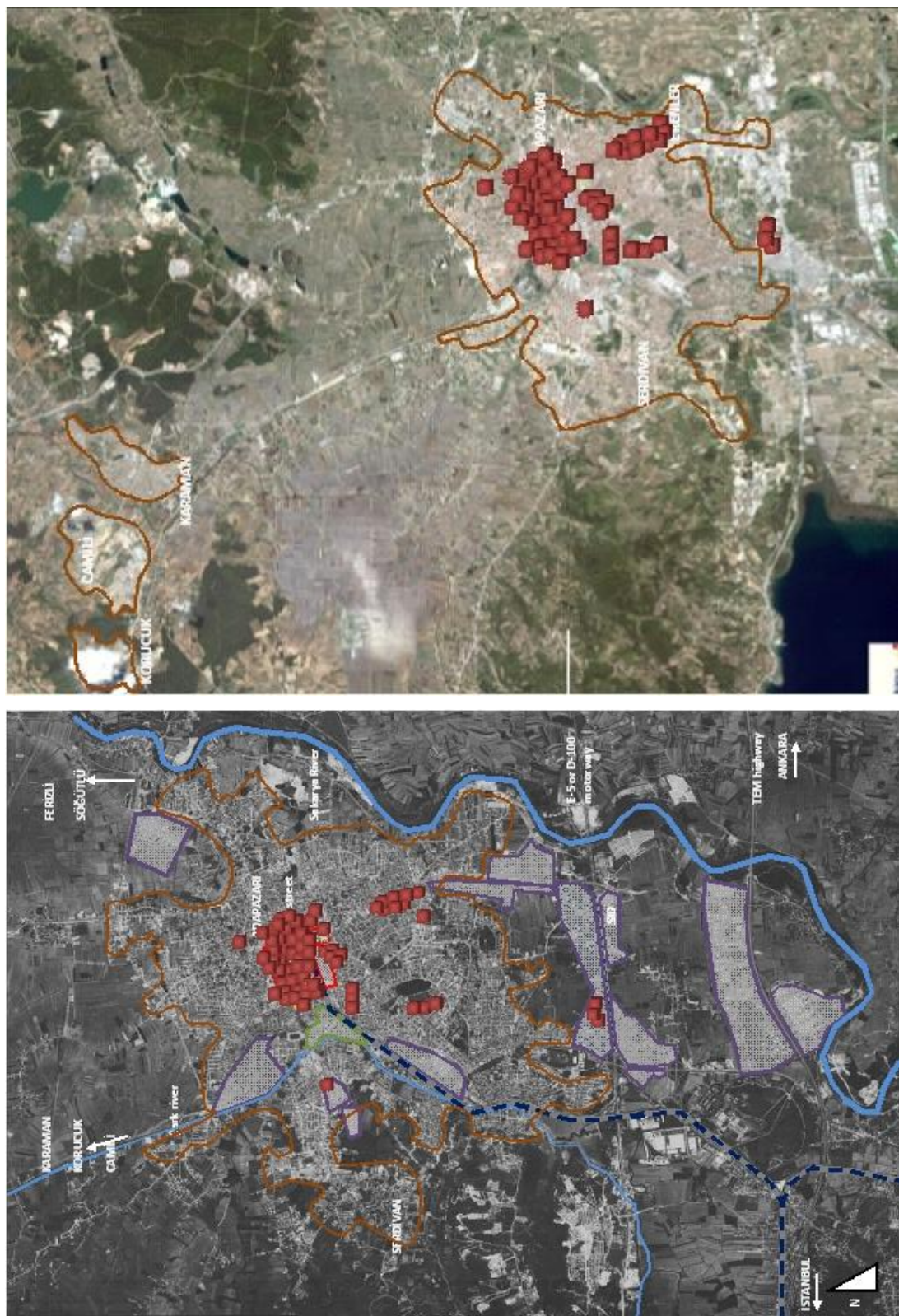


Figure 6.46. Pre-disaster (below) and present (above) locations of firms in Sector2-Construction







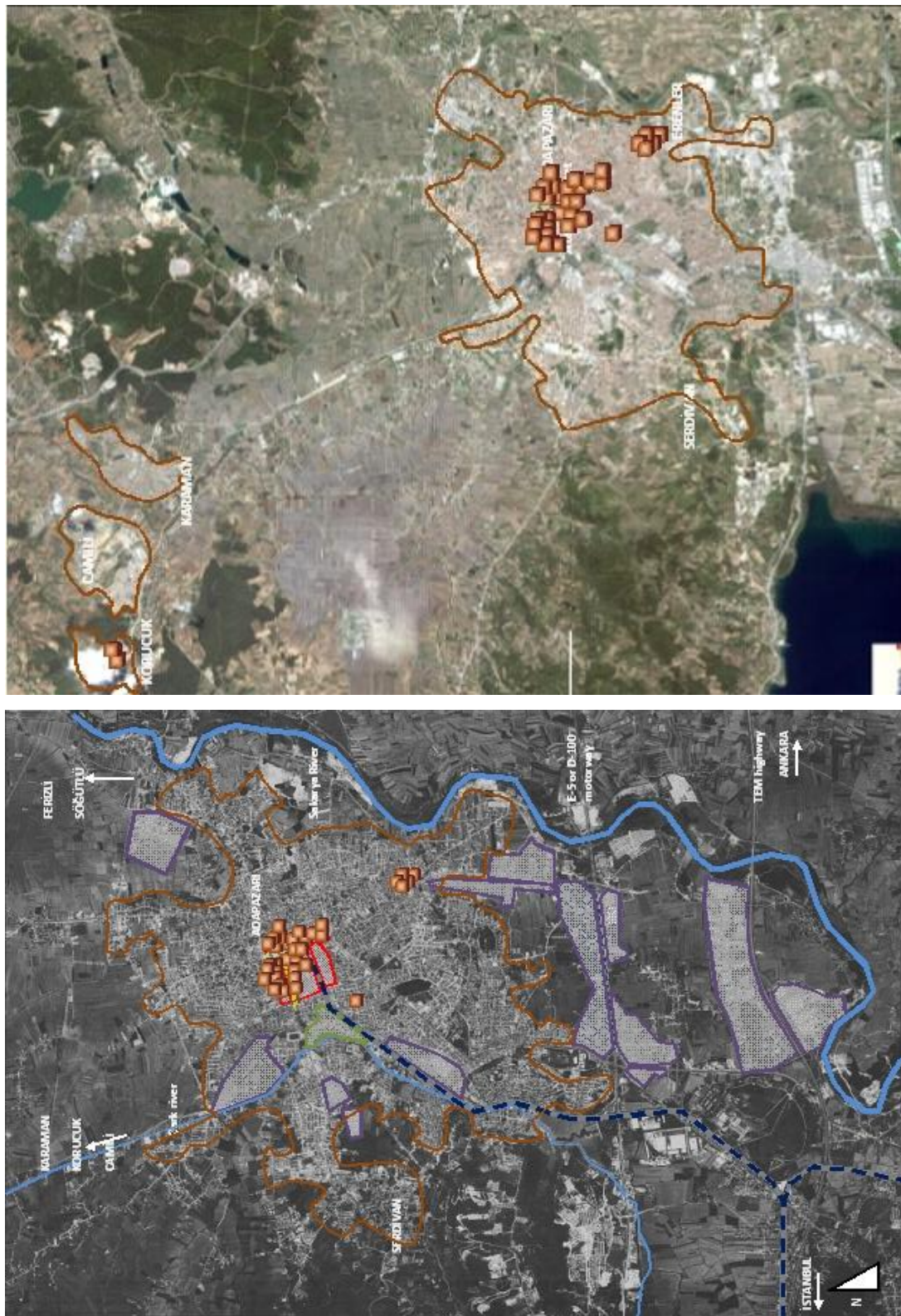
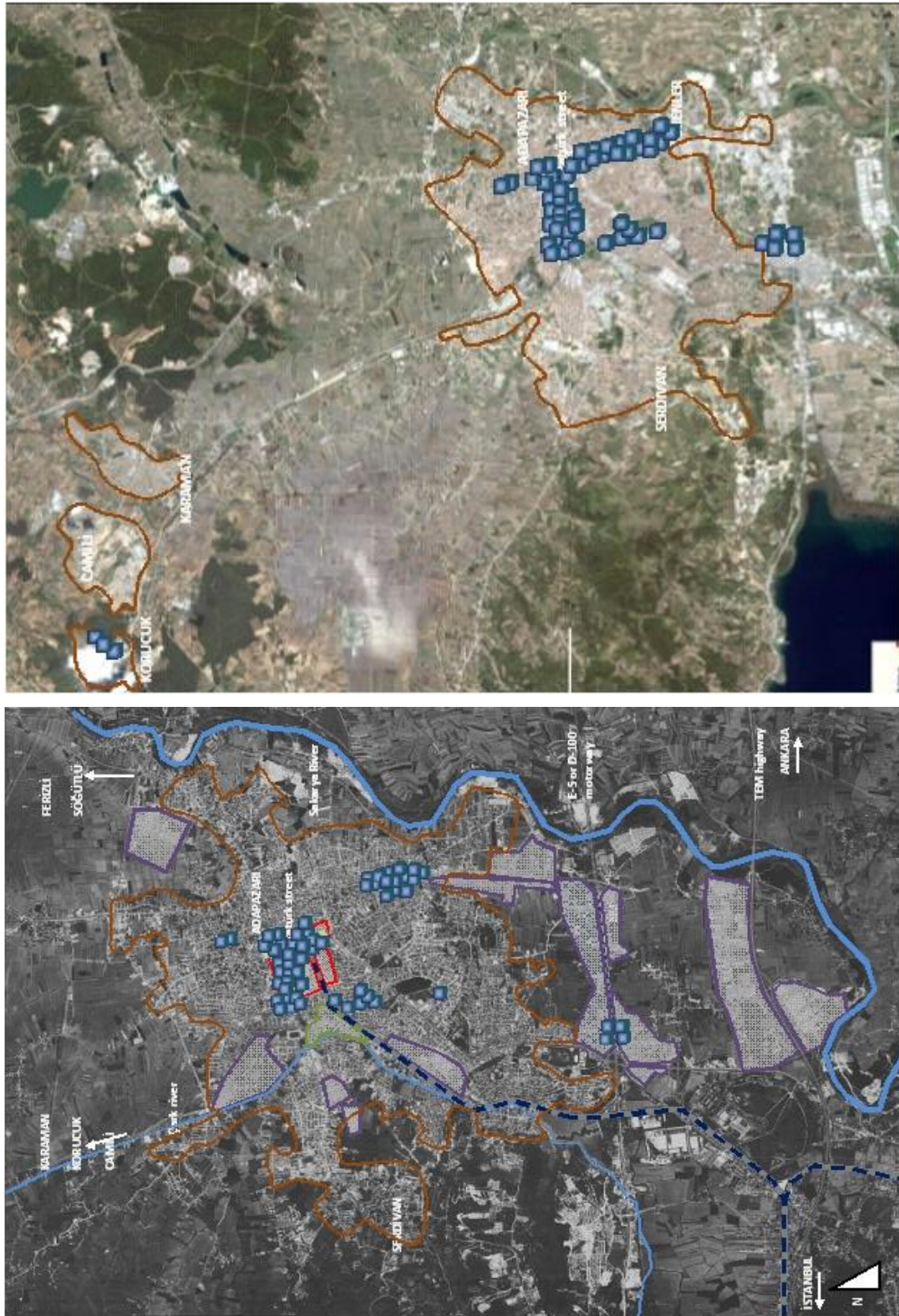


Figure 6.48. Pre-disaster (below) and present (above) locations of firms in Sector4- FIRE







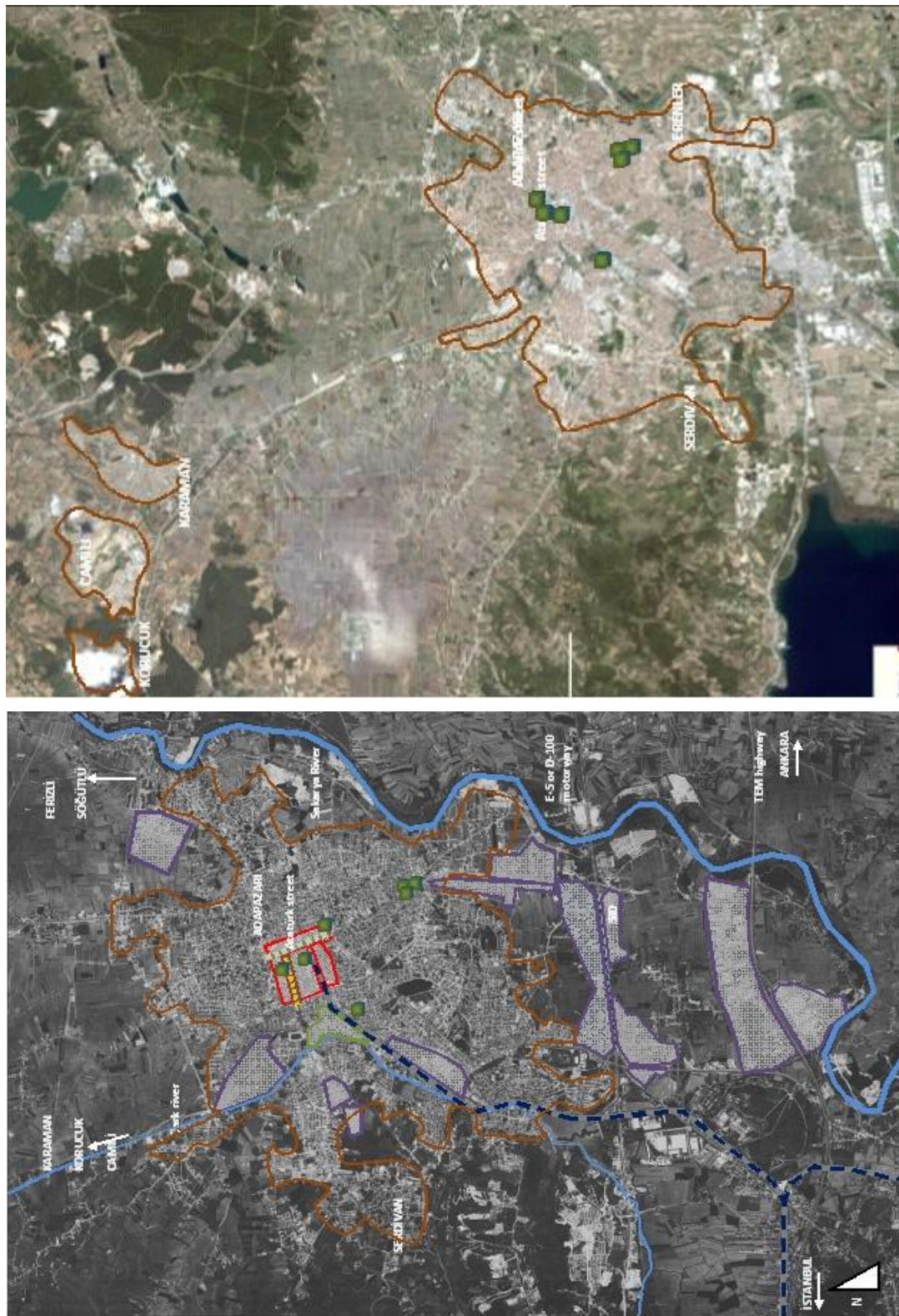


Figure 6.50. Pre-disaster (below) and present (above) locations of firms in Sector6- Other



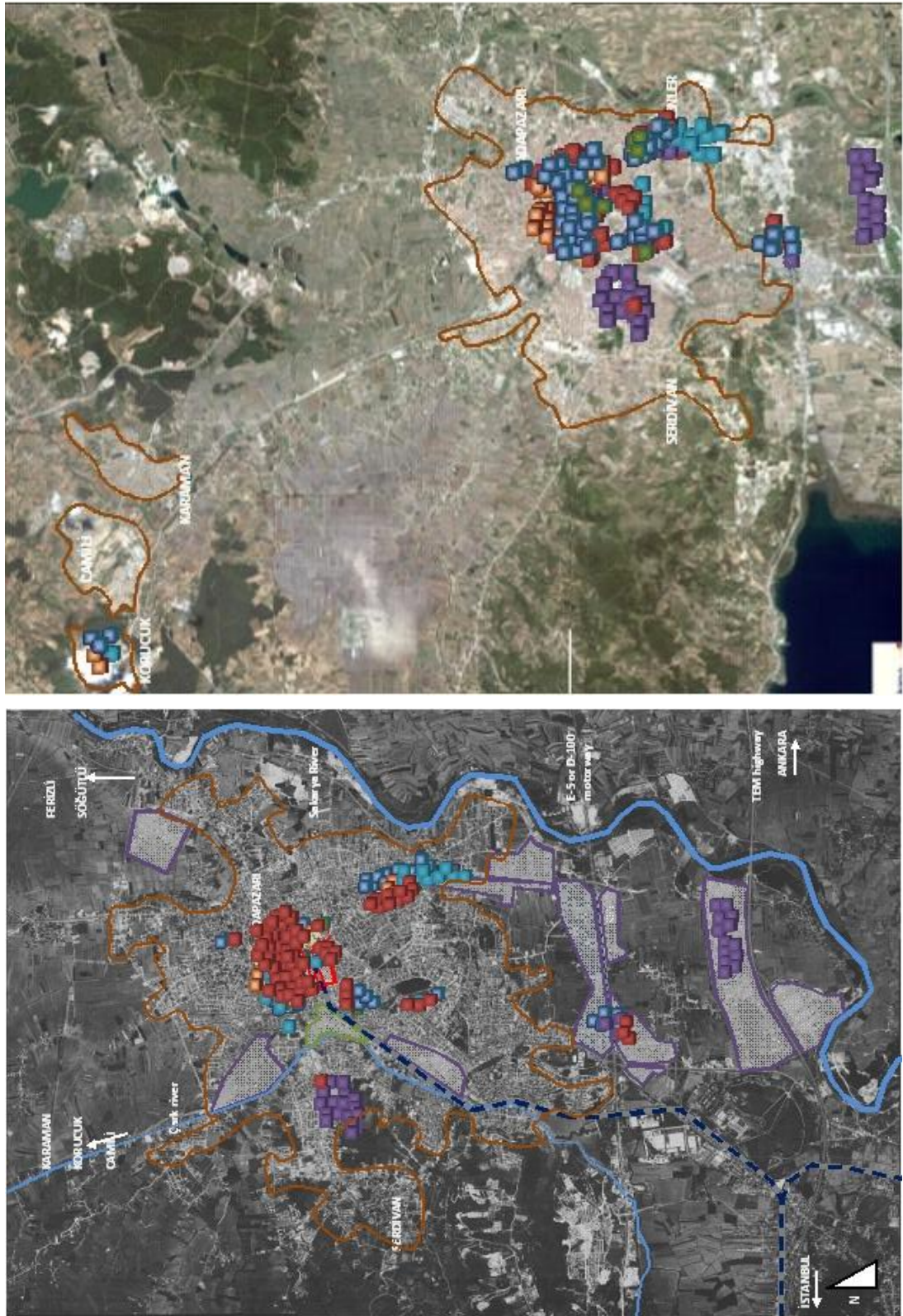


Figure 6.51. Pre-disaster (below) and present (above) locations of firms in entire sectors



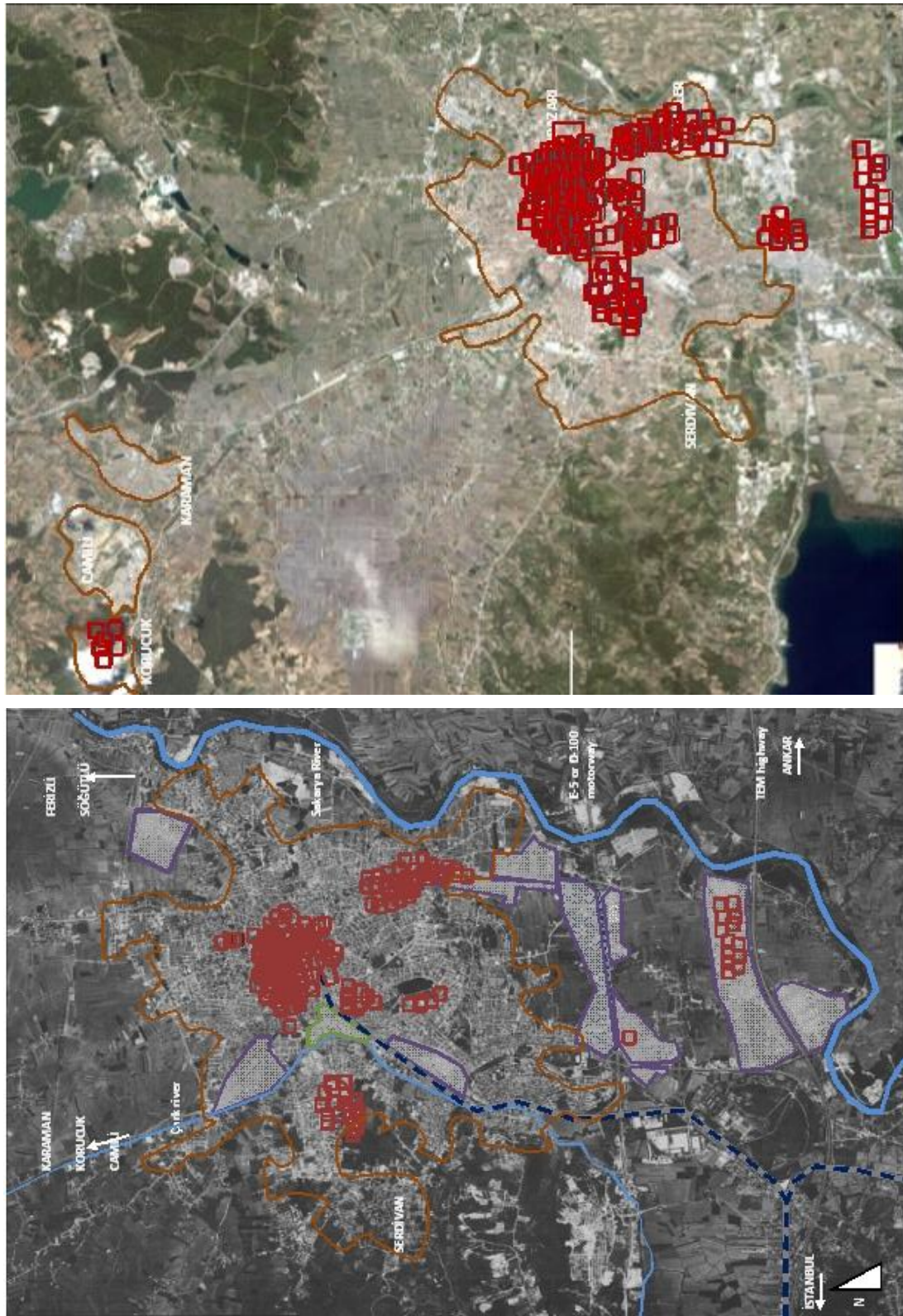


Figure 6.52. Pre-disaster (below) and present (above) locations of all respondent firms



## CHAPTER VII

### CONCLUSION

This dissertation has focused on the long-term business recovery process and location choices produced within this process. The aim of the study is to find out the underlying factors which determine the recovery process and location decisions of the firms.

Reviewing theoretical explanations, planning history and applied policies, the Adapazarı city suffered from the recovery processes, that is the problems of a fragmented urban space. Departing from our findings related to the spatial structure, we claimed that **the businesses isolated from the household recovery process and disregarded in spatial policies, make their own location choice which would not be consistent with the initial recovery goals.**

Around the hypothesis, we have asked the following research question: "How does the urban space restructure after a disaster with respect to location choices of businesses?". Respectively, this study addressed three minor questions. First, the study attempted to find out the factors affecting business recovery. Second, the study examined the factors that would affect the location choices of the businesses during the recovery process. Third, with reference to the location choices of the businesses, the study assessed the urban spatial restructuring in the post-disaster recovery period.

- 1) Which underlying factors determine business recovery after a disaster?
- 2) What factors affect the location choices of businesses in the recovery period?
- 3) How does business recovery affect the urban spatial structuring?

Departing from these questions, this thesis implemented a survey in the city of Adapazarı. The city which suffered from the diverse impacts of the 1999 Earthquake is still experiencing a recovery period. In the case study area, we have applied questionnaires to 232 businesses that have been operating since the earthquake. The questions addressed to business recovery story, are related to (1) internal factors, (2) their response capacity, (3) the extent of damage caused by disaster, (4) their dependence on lifeline systems, (5) their recovery strategies, and (6) location choices in pre- and post-disaster periods.

In predicting the factors that determine the successes of the firms in the post-disaster period and the factors that explain their location choices, we have applied a Business Recovery Model. In line with **the first research question**, we aimed to put forward the business recovery model and the factors that affect the recovery process. The findings of the study show that businesses differentiate from one another in the recovery process. Parallel to the previous studies, this research indicates that businesses show different recovery patterns. Since "businesses are atypical" (Tierney, 1997), their vulnerability to and recovery from disasters show variations.

This variety comes from internal factors, response capacity and extent of physical damage. We hypothesized that long-term fates of businesses are linked to the internal characteristics of businesses, their response capacity to disasters, and the extent of damage that the disaster could cause. Findings of the Binary Logistic Regression Analysis showed that the most notable impact on business recovery positively associates with 'operating in finance, insurance and real estate (FIRE) sector' variable and negatively correlates with 'operating in trade sector', 'operating in service sector', 'being financially in trouble', and 'taking more damage' variables.

Along with the **second research question**, we have developed a location choice model for businesses and put forward the factors that affect their decisions. In our Location Choice Model, the most notable impacts on business relocation positively relates to the 'education level', 'operating in construction sector' and 'extent of damage' variables; and negatively correlates with 'having previous disaster experience', and 'owner-occupation' variables.

The **third research question** of the thesis was related to the impacts of recovery process on the urban spatial structure. Our findings showed that firms changed their addresses one or two times after the disaster. The limited number of replacement shows that all the replacements are permanent. That is, post-disaster location choices of the firms determine the new structure of the city. Also, as the second research question showed, owner-occupied firms do not relocate as much as businesses with rental property so that property owners continue to preserve their locations irrespective of the seismic risks. Moreover, we have found that after the earthquake, there was an increase in the property ownership among business owners. Hence, it is our argument that since the property ownership increased in the city, the present structure of urban space seems less likely to change in the future. Since post-disaster location choices are permanent and since number of owner-occupied firms has increased, it can be concluded that ***the expectation patterns do not seem to change the existing urban structure of the Adapazarı city in the future.***

***We expect the continuation of the fragmented urban structure in the long-term period.***

Application of these models includes some **limitations**. Firstly, this study is limited with a number of recovered businesses, and it ignored the failed ones. Since it is virtually impossible to access failed firms, this study is based on data obtained from businesses that have revealed a long-term survival. Therefore, it provides an optimistic approach about the recovery of private sector entities. Another objection could be applied to the inadequacy of the factors in explaining the recovery process. Businesses could be affected from broader economic trends within the long-term period. However, we intend to identify the factors which are related to their disaster experience. Therefore, a number of factors that determine the destiny of businesses are ignored. Furthermore, since this research is based on a case study, the results obtained from the case study are open to the dangers of generalization of the results of the study over other disaster events and other localities. Although the sample reflects the case in Adapazarı, the relations found in this study are not to be generalized in other cases. This study develops a methodological framework for business recovery which could be applied in this field of inquiry and shed light on empirical studies.

In line with the findings of the Business Recovery Model and Location Choice Model, this chapter presents contributions of the study to develop a policy guideline and a discussion of the research within a theoretical framework, and concludes with a number of questions for further studies.

### **7.1. IMPLICATIONS OF THE STUDY**

In order not to experience adverse consequences of resettlement policies such as fragmentation in Adapazarı, reformulating the policy frame of disaster management system is needed. Therefore, this section provides the implications of the study. It aims at presenting policy guidelines both in urban planning and public administration fields, according to the literature review and findings of analytical procedure of the study. Table 7.1 summarizes the policy recommendations for business recovery.

Table 7.1. Policy recommendations for business recovery process

| Independent variables   |                                           | Policy recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Internal factors</i> | Business size                             | <ul style="list-style-type: none"> <li>- concern small firms in recovery in financial aspects</li> <li>- provide assistance in relocation of small firms in recovery</li> <li>- generate disperse commercial environments of small firms in line with the demands of local customers</li> <li>- provide business districts for large firms in safer districts</li> </ul>                                                                                                                                                                                                                                                                                        |
|                         | Business sector                           | <ul style="list-style-type: none"> <li>- regulate the businesses from regional to urban scale decisions</li> <li>- avoid to locate industries in seismic sensitive zones</li> <li>- locate manufacturing firms in safer locations which have principal links with transportation, infrastructure, and other businesses</li> <li>- consider the disaster risks of sites of industrial districts which limits the relocation of firms</li> <li>- propose vehicle routes and infrastructure systems to locate businesses in safer districts</li> <li>- regard each sector necessity of infrastructure and use lifeline systems as a tool for relocation</li> </ul> |
|                         | Business age                              | <ul style="list-style-type: none"> <li>- encourage young firms to locate safer district before embedded their business relations into space</li> <li>- benefit from the young firms' small-sized profile in relocating them into safer areas</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                         |
|                         | Financial condition prior to the disaster | <ul style="list-style-type: none"> <li>- decentralize the density of businesses from a single central area to sub-centers in order to reduce competition and reduce disaster risks</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                         | Occupancy tenure                          | <ul style="list-style-type: none"> <li>- design business districts for renters which are the most mobile groups according to their necessities</li> <li>- consider the renters and small-sized firms</li> <li>- provide assistance to renters to access financial resources</li> </ul>                                                                                                                                                                                                                                                                                                                                                                          |
|                         | Market range                              | <ul style="list-style-type: none"> <li>- propose new locational arrangements for firms which depend on neighborhood scale market range</li> <li>- plan neighborhood centers to reduce the business agglomeration of and dependency to central area</li> <li>- propose suitable locations for firms having regional or national market range</li> </ul>                                                                                                                                                                                                                                                                                                          |
|                         | Education level                           | <ul style="list-style-type: none"> <li>- increase the awareness of business owners and managers with low education level</li> <li>- provide assistance to be aware of recovery plans</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

Table 7.1. Policy recommendations for business recovery process (cont.)

| Independent variables    |                              | Policy recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Response capacity</i> | Previous disaster experience | <ul style="list-style-type: none"> <li>- create a public memory</li> <li>- inform all businesses about the possible consequences of disasters, especially those without previous experience</li> </ul>                                                                                                                                                                                                                                                   |
|                          | Preparedness                 | <ul style="list-style-type: none"> <li>- increase participation of business entities in urban mitigation plans</li> <li>- inform businesses about their vulnerability</li> <li>- integrate businesses into community recovery plans</li> <li>- plan alternative locations for businesses</li> <li>- inform businesses about the necessity of insurance</li> <li>- consider all types of disaster apart from earthquake such as fire and flood</li> </ul> |
|                          | Amount of resources used     | <ul style="list-style-type: none"> <li>- provide safer locations for businesses rather than allocating direct financial support</li> <li>- regulate the allocation of funding and donations in line with the recovery plan decisions</li> <li>- use financial support as a means of realization of recovery plans</li> </ul>                                                                                                                             |
| <i>Extent of damage</i>  | Physical damage              | <ul style="list-style-type: none"> <li>- use infrastructure and transportation as an instrument for relocation of businesses to safer districts</li> <li>- develop codes for infrastructure safety</li> <li>- foster relocation of firms that were heavily damaged at first</li> <li>- transform the heavily damaged areas into open spaces</li> <li>- provide alternative locations for businesses with single locations</li> </ul>                     |
|                          | Length of time closed        | <ul style="list-style-type: none"> <li>- take measures for shorter business closures</li> <li>- retrofit lifeline systems for business operability</li> <li>- increase the accessibility of inner city by developing alternative routes</li> <li>- retrofit the main roads on which businesses depend</li> </ul>                                                                                                                                         |

Table 7.1. Policy recommendations for business recovery process (cont.)

| Independent variables  |                       | Policy recommendations                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Spatial factors</i> | Location of employees | <ul style="list-style-type: none"> <li>- provide accessibility by all public transport means and by bicycles and on foot</li> <li>- locate businesses according to the new residential units of employees</li> <li>- keep households in employment through providing safer locations for them</li> </ul>                                                                                                                                                                          |
|                        | Location of customers | <ul style="list-style-type: none"> <li>- locate businesses within mixed use environment</li> <li>- locate firms close to busy pedestrian and vehicle routes</li> <li>- provide a variety of businesses within neighborhood level</li> <li>- consider the density of business agglomeration and decentralize the business districts according to the new locations of customers</li> <li>- keep households in local shopping through providing safer locations for them</li> </ul> |

#### **a. Reorganization of businesses**

In line with Business Recovery Model and Location Choice Model, we have found that Adapazarı center was occupied by the firms with small-sized, rental property and local market range, before the 1999 Earthquake. This profile was maintained after the disaster with an exception in occupation status. Previous studies put forward that the most vulnerable private sector entities are the firms which are small, lease-holding, and those serving to local market. This research confirms the previous findings about the vulnerability of businesses due to internal factors in the Adapazarı city. In the post-disaster period, due to the existence of small-sized and local market oriented firms, we argue that the businesses located within the city are still vulnerable to possible disasters. Additionally, previous studies show that the most mobile types of businesses are small-sized ones and firms with property on rent. Therefore, although the characteristic of being a small sized firm reduces the probability of recovery, this attribute increases the firm's mobility. This adaptive capacity, i.e. relocation, employed in recovery period may explain the survival chance of small firms. Therefore, benefiting from their mobility in space policies should be designed for small firms to increase their chance of recovery.

Similarly, businesses with rental property may show worse recovery performance. However, due to their mobility, they could arrange their works in another location which helps to increase their chance of recovery. From this point of view, despite the vulnerability of property renters and small-sized firms, policies addressing to those firms in spatial terms may increase their recovery success.

Another vulnerable firm type is those serving to a local market. We have found that different from size and occupancy status, this characteristics of firms reduces their mobility. Local market range limits firms' mobility since these firms are dependent on customers. This makes them sensitive to location choices of customers. If firms with local market range lose their customer base, they have to relocate in order to recover. However, we have found out that although their customers change their locations, they can not relocate. Thus, they are constraint within the location in which they have been operating for recovery. In Adapazarı, recovery policies were inadequate to keep the consumers in local shopping, so it seems that small firms operating at local market range are the most vulnerable type of businesses.

Firms in trade and service sector are less likely to recover than other firms. These firms are commonly small size firms operating in a highly competitive market. Since especially small size ones are dependent on local shopping, they are vulnerable to site problems. Those achieved to survive after the disaster could suffer from the disruption of business district. Concentration of the damage in certain areas may reduce the economic viability in the area. Loss of customers due to damage or ongoing reconstruction process may reduce business revenue. Therefore, it is needed to design policies for the most vulnerable sites.

Five conclusions are drawn from the findings of this study. First, a financial instrument is needed to be designed to assist firms in recovery period. Second, business viability is to be achieved through legal arrangement which ensure the rights of both the property owners and tenants. Third, business environment is to be sustained by local planning efforts. Fourth, intervention of the most vulnerable business environment requires a prioritization to use resources efficiently. All these recommendations made here aim at increasing the resilience of firms and making them financially robust against disasters. These policies require reorganization of businesses in face of disasters. Fifth, a systematic monitoring should be directed for business recovery to understand the reflections of businesses in the process.

According to the remarks, **financial policies** should be designed for businesses in disaster-prone cities. At central level, KOSGEB (Small and Medium Enterprises Development Organization) should support the small size businesses in disaster-prone cities through providing loans and credits to increase their recovery capacity as much as their larger

counterparts. Also, such financial assistance could be directed to locate small businesses in safer districts. Apart from the monetary support, KOSGEB should provide technical assistance to SMEs in terms of staff, information and equipment to inform them about their vulnerabilities and mentoring them after a disaster.

Furthermore, a **legal arrangement** is needed to support another vulnerable type, the tenants. As our study showed that since renters are less likely to recover than owner-occupied firms, a legal arrangement to protect the tenants is essential. Firms operating in a rental property have limited rights over the property. The disruption of the building forces tenants to relocate. The loss of the property in which firms operate interrupts businesses until the affected firms find a place to restore their businesses. Therefore, a new legal regulation is needed to protect the tenants in case of disasters, such as providing a store for free for a limited period. Such a regulation could take place in Condominium Law (Act no.634; 1965) or in local government laws, i.e. Municipal Law (Act no.5393; 20005) or Law on Metropolitan Municipalities (Act no. 5216; 2004). Additionally, this arrangement should entitle tenants the right to foster property owners to take measures for their property which is rented for business purposes.

In addition to the financial and legal tools of central government, local level initiatives could help to recovery of businesses through spatial strategies. Generation of **sub-centers** is one of the spatial policies that the planning discipline could develop. Sub-centers, such as neighborhood centers could reduce the pressure on the heavily built and vulnerable city center. This dispersal of business environment may serve as focal points at neighborhood level which reduce the competitiveness of market and create local consumption districts. Therefore, policies arranging the hierarchy of centers may encourage firms to replace them in accordance with the location choices of customers during the recovery period.

Determination of the vulnerable sites requires development of a **prioritization** model. Development of such a model helps to highlight the disaster prone areas and identify policies to reduce the vulnerability of the area with appropriate resources. By this way, businesses located in highly vulnerable areas could be oriented to take measures to increase their ability to adopt the post-disaster situation, i.e. retrofitting of building, making redundancy, or relocation.

It may seem that national or regional economy of Turkey may tolerate the long-term consequences of disaster. Despite the official figures drawing a recovering performance for businesses in the affected region, we saw that, according to the personal evaluation of business owners, firms do not achieve their pre-disaster conditions. Therefore, we concluded



that economic costs are much higher than the officially reported data. The “hidden economic costs of disasters” are needed to be investigated after a disastrous event, because economic consequences of disasters could be higher than the documented costs (Chang and Falit-Baiamonte, 2002; 69). These costs should be considered in order to assess mitigation investments as well as business losses. To do so, a systematic data gathering process should be organized under the responsibility of Turkish Statistical Institute. This enhances a *monitoring* system for businesses that experience a long-term recovery process.

#### **b. Mitigating the disaster risks**

The low levels of preparedness found out in this research shows that policies are needed to increase the resilience of businesses. The respondent firms are aware of the risk of earthquake; yet they show little willingness to engage in preparedness and mitigation activities. They even do not increase their preparedness after the 1999 Earthquake. As businesses do not voluntarily involve in preparedness activities, mandatory actions at both local and central levels are required. These mandates should foster businesses to take measures individually with respect to monetary, physical and spatial aspects. In addition, special strategies should be oriented towards the businesses which are less likely to engage in preparedness activities. Since the least prepared businesses are shown as tenants and small businesses, it is required to support these firms by local and central governments. However, individually developed preparedness and recovery strategies are not enough to enable business continuity.

Disaster awareness has increased after the 1999 Earthquake among the community. Particularly, local governments take care of disaster risks and invest in preparedness activities such as the Earthquake Master Plan of İstanbul (Balamir, 2004). However, to be effective, additional measures targeting business preparedness should be taken at policy level. Four consequences could be addressed according to findings of the thesis. First, preparedness activities of businesses are required to be supported by financial measures. Second, pre-disaster planning is to be an outcome of participatory process. Third, a disaster insight is needed to be created in all units of community. Fourth, businesses need to get prepared effectively for disasters through educational campaigns.

As the present study findings reveal that businesses are less likely to invest in insurance, they try to obtain loans or credits to recover their businesses after the disaster. Firms tend to allocate personal savings or business reserves to assist recovery which could be used to further business investments. That may result in substantial economic losses which could be used in further investments. Therefore, in order to generate a sustainable development for

businesses, measures that would increase their investments in insurance should be engaged by firms.

One of the financial policy tools in the ***investment incitement code*** that support firms in taking insurance and preparedness measures. The code firstly initiated in 2004 (Act no. 5084) could foster businesses by providing advantages such as tax relief, energy provision and free land provision for investments (Acar and Çağlar, 2012). Such an incitement code could increase the investment and employment opportunities of businesses located in disaster prone areas as well as their response capacity against disasters. The priority in incitement codes should be given to cities with higher disaster risks to make their business environment resilient against disasters. Here, the responsible mechanism is the Ministry of Science, Industry and Technology at central level.

Additionally, this study finds that small size firms and those with rental property are less likely to access resources after a disaster. The priority in providing monetary support should be given to the firms that are small in size and tenants. Therefore, their response capacity could be increased against disasters.

Pre-disaster planning is a process aiming to increase community resilience. The process unlike the post-disaster period could be handled through the participation of the all community units. The ***participatory environment*** allows decision makers to consider the different expectations of community components, i.e. households, businesses, public organizations, local governments, etc. During the preparation of mitigation plans, on the one hand, businesses could be informed about their vulnerabilities, and on the other hand, policy makers regard the needs and expectations of businesses. By this way, the plan would be a final product accepted by the both sides. More significantly, the proposed business districts would be designed according to the perceptions of firms, leading to efficient use of resources.

Businesses, as the basic units of urban environment, suffer from the adverse effects of disaster. However, this study puts forward that even after the 1999 Earthquake the mean number of preparedness measures is slightly higher than the scores before the disaster. In order to increase preparedness for future disasters, the perception of the disaster should be kept alive. Disaster awareness could be enhanced through ***creation of a public memory***. An urban memorial contributes to inspiration of disaster risks and their losses, especially for firms without disaster experience. Particularly in the long-term, therefore, creation of a disaster memory may raise the willingness in engaging in preparedness activities.

Our study revealed that the variable of education level plays a significant role in relocation decisions. Therefore, managers or owners of firms with worse education levels are required to inform about their vulnerability to disasters. The disaster mitigation should be concerned in the curriculum. ***Lessons about disaster mitigation*** should be designed at each level of education. Starting from primary school, students should be informed about disaster risks and the ways to cope with them. By this way, business owners and employees could gain an insight during the compulsory education years. Apart from these lessons, relevant institutions such as universities, Ministry of Disaster and Emergency, Ministry of Education could organize campaigns to increase the awareness about disaster risks of businesses.

### **c. Community-level recovery**

The self-evaluations of the respondent firms showed that financial support made after the disaster to recover the affected businesses is not sufficient to reach their pre-disaster levels. Businesses in Adapazarı are vulnerable to earthquake. The reason behind the vulnerability comes not only from the susceptibility of buildings, but also their reliance on infrastructure, transportation, consumer and employee. In other words, business operation is not an independent process; rather it presents a component of an entire system including production, consumption and trade. Despite the general assumption that physical exposure determines the recovery performance, we have found that structural solutions will not be adequate for recovery. This does not mean that we oppose to these efforts; yet, we argue that structural solutions are not enough to overcome the problems emerging in the recovery period. Therefore, business vulnerability assessments and recovery plans must consider the wider picture behind the single business operation.

Direct physical damage caused by earthquake was widespread among the city, so business experienced severe losses. Disruption is not limited with the structures housing the businesses; business losses, but also, related with community and neighborhood related problem which affect their recovery performance. Problems caused by getting or delivering supplies, input or output, loss of customers, loss of machinery, stock, equipment, and inventory, and inability to pay for workers appear critical in business interruption. Particularly, this study found that lifeline outages play a crucial role in business discontinuity. The wide extent of damage is significant to enlarge our perception of business vulnerability to community and site-related problems.

Since more businesses were affected from lifeline service interruptions than direct effects of earthquake, measures should be developed against the losses caused by the secondary effects. Although business owners could cope with the primary effects of disasters, they

could not resolve operational problems on an individual basis. Parallel to the argument of Alesh et al (2002;1) stating “stronger buildings do not ensure organizational recovery”, we argue that building retrofitting is not an adequate attempt to enhance business continuity in the face of a disaster. Besides, it is required to improve protection for lifeline systems in order to keep businesses in operation. Economic discontinuity due to lifeline losses, loss of customers, inability of workers getting to work, difficulties in getting suppliers or materials and in delivering products, and site recovery is a collective problem which is beyond the capability of any individual firm. In addition to physical damages, local administrators and business owners or managers should take into account the community-related and built environment-related problems. Therefore, codes dealing with lifeline systems safety and demand creation measures should be developed other than building safety. Besides, engagement of businesses into decision-making process in pre-disaster period could raise solutions to mitigate for community-wide disaster impacts. By this way, reduced indirect economic losses could be achieved.

With respect to the community-level recovery, planning must be done to keep businesses in operation. The outcomes of the thesis related to an aggregate recovery are summarized as (1) business operations are to be ensured by sustaining infrastructure systems; (2) business operability is decided with the possible changes in consumption patterns, that is, business recovery plans should cover both demand and supply sides; and (3) community-level policies are needed to lessen business closure.

Although a firm may escape the direct losses caused by a disaster, it could be challenged by extensive disruption due to lifeline outages. In order to keep businesses in operation, single measures to make the property structurally secure are not adequate. Rather, macro-level and aggregate measures have to be considered to maintain the continuity of businesses, community and local economies. Obviously, maintenance of the ***continuity of lifeline systems*** would be one of the principal parts of this strategy. In order to sustain the lifeline systems in disaster prone areas, firstly, the type of infrastructure according to firms’ reliance is to be determined. Then, the relevant lifeline service is to be strengthened in order to keep serving for business operation. As this study shows that electricity is the most crucial lifeline service that almost all businesses rely on. However, inadequacy of other services does not necessarily affect all type of businesses, such as trade sector is not influenced as much as service sector in case of water interruption. Therefore, business districts should be determined to supply relevant infrastructure in accordance with the needs of firms in different sectors.

Similarly, another macro-level strategy to keep the sustainability of business environment is reconsidering the changes in consumption patterns. Alesh, et al, (2001; 87) say that oversimplification of business recovery to firm-specific solutions in public policies is misleading. The business recovery and their response capacity require consideration of the consumers, in other words the demand side. Pre-disaster planning should consider the case of decrease in demand or ***changes in consumption patterns*** in the affected area. The choices of consumers in terms of residential areas would affect the success of businesses in recovery. Therefore, businesses particularly depending on local consumption, i.e. serving to a local market range should be oriented towards the new consumption zones. That is to say, appropriate location should be planned for businesses serving to a local market together with the proposed residential areas. Also, during the process, these firms should be supported in monetary terms to adopt themselves to the new conditions.

Similarly, in order to sustain business viability, households as consumers should be provided a safer residential environment. The Act no. 6306 aiming to renew areas under disaster risks provides an ***urban renewal*** opportunity for households. Such a pre-disaster intervention to increase resilience could contribute to community resilience. Businesses located in vulnerable areas, together with households for which they are serving, are to be taken into consideration in the transformation process. Therefore, a solid urban environment could be achieved by both providing safer residential areas and considering businesses within household recovery.

Another policy considered at aggregate level is to reduce the community level problems to reduce the length of business closure. The community-related reasons for business closure mentioned in this study are loss of customers, inability to pay employees, and transportation and infrastructure problems. The policies expressed above may provide solutions to the problems related to customers, financial difficulties and infrastructure. Particularly, for transportation, business continuity depends on their accessibility in accordance with their sectors. Firms, locating in central area of dense built environment, are dependent on vehicle and foot traffic. For those areas, alternative routes should be designed to increase the accessibility of firms. Also, for the firms whose input-output relation relies on motorways, ports or airlines, convenient engineering solutions are required to retrofit these connections in order to maintain business viability.

#### **d. Spatial strategies**

Recovery process after the 1999 Earthquake has been monitored first by central government, and soon after by local governments. The resources mobilized for recovery

were used to resettle the affected population in line with the traditional mitigation approaches (Beatley and Berke, 1992). The main concern of the recovery was to resettle households in the geologically safer districts, hence creating safer urban area in those areas. During this recovery process, the households' opinions were not considered. Having been taken just after the catastrophe, resettlement decisions were not produced in a collaborative environment.

Implication of the resettlement decision was followed by some additional recovery policies. Apart from the central government's efforts, local governments engaged in new regulations. The affected districts of cities were handled in terms of ownership, legal status, function in land-use, development rights, etc. at local level.

Recovery phase in Adapazarı included both the resettlement and reconstruction policies. The affected households in the city were moved to resettlement districts after the completion of permanent housing district which was nearly 12 km away from the center. Besides, the damaged downtown began to be reconstructed according to the reduced development rights, in 2003. During this process, the western periphery of the city began to develop because of the geologically safer slopes.

Although the development process of Adapazarı has been structured by the initial recovery goals, nearly after a decade, the picture of the city does not reflect the desired case. In the long-term period after the disaster, the case of urban development in Adapazarı is that it would not be possible to create a city in the new resettlement district, while the damaged downtown still maintains its functions. Respectively, the resettlement district is inhabited by households, whereas the downtown still serves as a center for residential, commercial and industrial purposes. That is to say, the damaged downtown still plays its central role within its province.

In the post-disaster recovery period, planners aimed at building a safer living environment for residents. In Turkish practise, in the absence of recovery plans, the idea of creation of safer districts for affected population was directed by geologists. The determination of geologically safer districts affected the urban macroforms. The outcome of this practise is to build permanent residential units without any consideration on urban development. The relocation of households to geologically safer districts irrespective of the other urban components is the basis of fragmentation problem. During the recovery of households, businesses whose aim is to maximise their profits, develop a different rationale to adopt the new circumstance.

The recovery practices, therefore, applied in Adapazarı lead to **fragmentation** of the urban spatial structure. On the one hand, the affected downtown continues to hold the unique central functions, on the other hand, households began to settle in resettlement area. The plans even prepared soon after the earthquake remained inadequate to solve the fragmentation problem, rather they served to consolidate the fragmented urban form. The master plans prepared in 2006 and 2009, made no recommendation about the alternatives for integration of the two urban parts. Moreover, the plans proposed additional population and industrial development which might lead to reproduction of urban vulnerabilities through macro-level decisions as observed in the consequences of Eastern Marmara Plan of 1963.

Consequently, decisions taken in the recovery period have significant impacts on urban spatial structure. The policies applied to recover the effects of 1999 Earthquake have played a major role in restructuration of the affected urban areas. The policies encouraged households to live in the resettlement districts, and thus change the macro form and spatial structure of cities. Adapazarı is one of the case experienced the resettlement policies after the earthquake. Steps were taken immediately after the earthquake in Adapazarı which have not considered businesses and their recovery properly. Both community and public administration allocate time and resources to recover households ignoring businesses. Since there was neither a strategy to facilitate business recovery nor downtown rehabilitation according to a plan, **downtown of Adapazarı was restructured by merely the location choices of businesses**. Therefore, the pre-disaster space seems to be restructured once again. But this time, location choices of firms play a significant role in restructuring of cities and their central districts. Along with their location choices, now firms seem to determine the fate of cities in the face of disasters.

The unregulated location choices of businesses in post-disaster period could obstruct the realization of initial recovery goals. The deviation of location choices of businesses from households may result in attraction of households and housing development in a long-term period towards business agglomeration. This agglomeration may reproduce the vulnerability of the city.

In sum, the supply side has not changed its location as a result of the factors explored in this study. While the demand side had to move far away the business concentration, the businesses were less likely to move to the resettlement districts where resources were mobilized to generate a safer built environment. Despite the investments to build a resettlement district created by central government, businesses prefer to keep their locations in the downtown. Therefore, the resources allocated to create a new city become redundant due to the location choices of firms. Since they keep residing in downtown, the resettlement

districts remain as residential districts and these areas could not achieve to be a living environment, or a city. Firms do not only leave the resources residual by their location choices, but also ignore a number of factors that directly affect their businesses due to the disaster. Businesses stay in their pre-disaster location to the expense of the location of their customer base, the location of their employees, low rents offered in the resettlement district, and settling in a safer geography.

Hence, policies considering the spatial aspects of business recovery are needed. This study addresses three main conclusions respectively. First, macro-scale policies determining the economic structure of cities take into account disaster risks of the target areas. Second, urban planning is to be proposed appropriate land-use decision according to the given schema of macro-scale decisions. Third, businesses and households are to be regarded together in recovery process in public policy, especially in spatial strategies such as mixed land-use decisions.

Development plans made at regional scale and regional plans have influences on the economic structure of the city. The economic development scenarios determine the location of investments made for the city. These plans and scenarios do not only refer to the investments and economic models but also estimate their reflections on city having various dimensions such as population distribution, urban macro form, infrastructure requirement, transportation systems, etc. As we observe the consequences of such macro-scale decisions in 1963 Eastern Marmara Development Plan, regional plans do not necessarily serve for the safer urban development. Regional development plans irrespective of disaster risk may not lead to sustainable urban developments. Therefore, **macro-level decisions** should take into account the vulnerability of urban settlement. In disaster prone areas investment decisions should consider the possible negative consequences of proposed development strategies. Also, these plans are to be served for the risk reduction by generating value added through investments which in turn, used for mitigation activities.

Regional plans make also decisions about the locations of new investments. In order to avoid risks and reduce vulnerabilities, these plans are to be made appropriate **location choices for the investments**. Also, the socio-economic impacts of the probable investments are needed to be considered. Increase in population and its possible consequences are to be estimated and this additional population should not exceed the carrying capacity of vulnerable settlements.

Similar to the regional plans, recovery plans prepared at urban scale, i.e. master plan, development plan, should regard the disaster risks. In doing so, first and foremost, the



recovery plans should ***integrate the business recovery into household recovery***. One of the most frequently mentioned reason for business closures after the disaster is the loss of customers. However, our findings show that businesses did not consider the spatial proximity to customers in making decision about their location. Similarly, we have found that businesses did not take the location choices of employees into consideration. This leads to an increase in transportation costs for employees and eventually, to the attraction of workers to reside nearby the businesses. Therefore, firms which stay in the seismic sensitive areas seem to force employees to reside such areas. In other words, in case of Adapazarı, firms staying in downtown area may attract the residential locations of employees and thus contribute to the continuation of risk environment. Moreover, the rents in resettlement district are lower than the damaged downtown area. Although the lower rents of the stores help to reduce their costs of operation, firms do not prefer to move the resettlement district. Despite the location choices of households after the disaster, firms do not move to safer locations, which contribute the vulnerability of downtown in turn. As this study showed the problems caused by isolating business recovery from household recovery in Adapazarı case, decision makers should consider this relation in preparation of recovery plans.

Also, in making decisions about locations of businesses, it must be regarded the factors that affect their relocation decisions. This study examines the factors which increase and reduce firms' mobility. One of the factors that contribute to relocation is related to the ownership of businesses. We argue that due to the limited mobility of owner-occupied firms, their post-disaster locations determine the spatial structure. If they were oriented properly after the earthquake, then they would locate along with the initial recovery goals. Yet, due to the inadequacy of recovery policies for businesses, the least mobile type of businesses made their location choices without any planning approach. Thus, the urban space is structured more rigidly as a result of the location choices of increase number of owner occupied businesses. This seems to result in the continuation of the present form of the city in case of disasters that are likely occur in future. Therefore, the location choices of owner-occupied firms should be well designed and some restrictions should be developed for avoiding to settle in high risk zone. This could be achieved through ***land-use decisions, building codes and retrofitting efforts***.

In addition to ownership status, decision-makers may take into account the reliance of businesses on infrastructure. As this study shows that firms with respect to their sectors are dependent on certain infrastructure types for business continuity. Therefore, in order to orient businesses in safer locations, decision-makers could benefit from lifeline supply. Using the ***infrastructure provision as a tool***, firms' location in high risk areas could be prevented.

Recovery plans should also consider the post-disaster urban restructuring through settling heavily damaged firms in safer modes and through generating more open spaces for public uses. Such a regulation could be possible via appropriate land-use decisions. In the post-disaster period, reduced development rights could be applied as exemplified in Adapazarı. In addition, new areas could be planned for commercial purposes in different locations within the city. Such a policy is expected to serve for generation of sub-centers in neighborhood units and for functioning of businesses with households in those areas. This ***mixed-use*** approach enhances the interconnectedness between business and household recovery. Particularly, firms serving at neighborhood or urban level could be directed to sub-centers. Such a regulation could also meet the location choice criteria of firms in terms of proximity to consumers, proximity to employees, and proximity to business agglomeration.

Additionally, community could benefit from open spaces in case of emergencies as well as in daily routine in forms of gathering places, and reserve areas for temporary shelters, so that land-use decisions of recovery plans should consider generating ***open spaces***.

Furthermore, urban recovery plans are to be provided the households safer residential areas. Because, households engage the business system as consumers and employees. This study shows that businesses are vulnerable to both loss of employees and customers. In order to maintain business viability, urban recovery plans are to kept households in local shopping and employeeed.

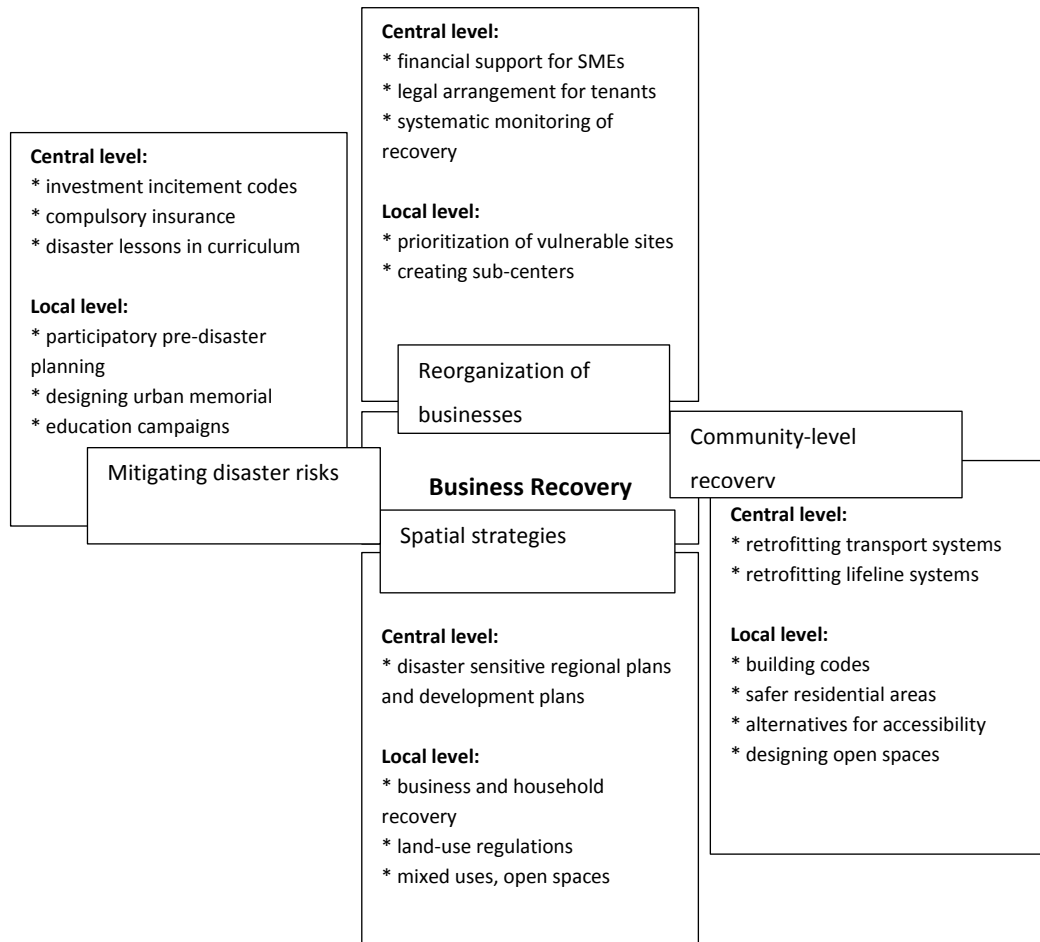


Figure 7.1. Summary of the proposed recovery policies

In conclusion, initial recovery policies mobilized high amount of resources to create a safer urban development and realized permanent housing policies. However, ignorance of businesses due to several reasons would leave the development in downtown into an uncontrollable way. The reasons of exclusion of business recovery from public policies could be explained by; (1) limited knowledge about business recovery and its impact on urban space in the practice of public administration and urban planning, (2) unpredicted consequences of applied policies (i.e. resettlement policies), (3) having a traditional disaster management approach dealing only physical impacts of disasters and most vulnerable groups (i.e. households), (4) inadequate capacity to cope with disperse impacts of earthquake, (5) piecemeal and inadequate planning approach in vulnerable cities to initiate mitigation planning before a disastrous event, and (6) lack of risk reduction perspective among the public administrators, planners, community organs, and businesses.

## 7.2. DISCUSSION OF THE RESEARCH IN LIGHT OF THEORETICAL FRAMEWORK

Theoretical framework of the thesis is based on the conflict of the two theoretical discussions. These discussions are the traditional and contemporary disaster approaches. The conflict between traditional and contemporary approaches has three dimensions in the context of the main argument of the thesis. *First* one derives from the relation between disaster management phases. Traditional approaches focus on the issues and phases of mitigation, emergency, and recovery as independent from one another. Thus, these make individual inquiries for each phase. On the contrary, contemporary approaches suggest that there are interrelations between the phases of disaster management. *Second* one relates with the main concerns of the approaches. Traditional approaches focus on the direct impacts of disasters, i.e. physical impacts. The aim of efforts for traditional approaches is to reduce losses. Controversially, contemporary approaches deals with the multi-dimensional impacts of disaster, such as social, economic, spatial and political. The main aim of the contemporary approaches is risk reduction. *Third* one is about the basic component to deal with in the disaster management process. Traditional approaches highlight the household recovery since the approach considers that the direct impact of disaster is principally seen on households. Contrary to this view, contemporary approaches accept the interconnectedness between community elements and equally emphasize on each vulnerable aspect of community.

This study argued that in the case of Adapazarı, fragmented urban structure was a result of the recovery process. Recovery process has **gaps in the Turkish disaster management system**. We claim that the gap is related to inappropriate adaptation of contemporary approach into disaster policies. The traditional approach which is still dominant in the Turkish system allows us to observe its conflict with the long-term practices of the contemporary approach. The case of Adapazarı is one of the examples to examine the conflict in the city's spatial structure. In the context of the theoretical framework, the fragmented structure of the city as an output of recovery policies is resulted from (1) insistence of keeping disaster management phases independent of each other, (2) the biased focus on physical impacts of disasters, and (3) the malpractices of isolating businesses from the household recovery. The three conflicts between the theoretical background lead problems in practice as in Adapazarı.

In detail, it is worthwhile to refer each point in order to explain the fragmented spatial structure in Adapazarı. Firstly, in Turkish disaster management system what was disregarded before the earthquake is the pre-disaster process. There have been little efforts spent in pre-disaster phase such as collecting data, determination of risk areas, calculating vulnerability,

allocating resources, intervening to most vulnerable zones, developing codes, policies and land-use regulations, proposing new settlement areas in case of emergencies, etc. Despite the sensitive approaches of 1957 and 1985 Plans of the city and despite the previous disaster experiences of the city, there were no any policies towards reducing the seismic risks and preparing the city and community for a major earthquake. Hence, there is a lack of connection between mitigation and recovery phases in Turkish disaster policies.

Secondly, after the earthquake the direct physical losses of the catastrophe were defined and respectively, resources were mobilized to overcome these direct effects. Yet, the earthquake also led to social, demographic, economic, spatial, and politic consequences within the region. The consequences of disaster were severe and widespread, and created multi-dimensional effects beyond the affected area as well. The whole country suffered from the earthquake, in terms of additional taxes, loss of employment, decreases in added value and production, overall economic recession, and inflation. All these aspects constituted major problems to deal with, yet it was difficult to generate solutions and to predict their long-term impacts. Particularly, policies applied in the recovery period would lead to spatial consequences in the long-term. For a country without preparedness or recovery plans, it would impossible to make proper decisions considering their social, demographic, and spatial consequences. Therefore, in the Turkish disaster management system, linked to the first argument, indirect impacts of disasters and consequences of policies are not taken into account due to inadequate preparedness on the dimensions of the disaster.

Thirdly and finally, after the earthquake, in the panic environment, policies were directed to provide shelter to affected population. In the face of urgent need to produce new and safer housing, the government efforts were directed to find geologically safer locations. Parallel to first argument, the consequences of policies are not considered and as mentioned in the second argument, indirect impacts of disasters are not taken into account. One of the policies was creation of permanent housing districts away from the risky areas, and the other was allocating fiscal resources and aids to businesses to recover. Here, application of both policies was resulted in isolation of businesses from household recovery. While households were moving to the resettlement districts, businesses preferred to stay in downtown. Maintaining their locations, businesses did not only lead to the survival of the existing center, but also limited the creation of a sub-center within the resettlement district. Therefore, resettlement area has been used solely as a residential or dormitory district, whereas downtown has been still occupied by residential, commercial, administrative, and industrial purposes. Thus, there occurs a one-way relation between the resettlement district and downtown. The primate position of downtown and subordination of resettlement district has introduced a fragmented spatial structure. In one sense, the Turkish disaster

management system in the case of Adapazarı has isolated the business recovery process from the household recovery.

All in all, the outcome of the thesis is that if the business recovery is isolated from household recovery, then the urban space comes to be restructured out of the initial recovery goals.

Despite its limitations and the limited extent of sample, this study provides a systematic approach on understanding business recovery which constitutes a gap in disaster management policy, particularly in Turkey. This research shows that recovery process of businesses does not only depend on the direct impacts of disasters, but also is affected from internal factors, response capacity and community-level factors. Interruption of lifeline services, damage of locality, and loss of input-output relations, customers and employees would affect the success of businesses in recovery period. Although business owners could cope with the primary effects of disasters, they could not solve operational problems on an individual basis. Therefore, **business recovery presents a collective problem** which is beyond the capability of any individual firm. Thus, it is closely related to the public benefits.

Hence, this research aims to contribute to the creation of a safer urban development through considering businesses and their recovery processes. Since there has not produced any strategy to facilitate business recovery, urban areas restructured itself through the location choices of businesses, despite the allocation of large amount of public resources. Regarding the business recovery, this research aimed to address a planning framework and policy guideline to rationalize the allocation of resources used to recover urban areas.

In the long-term period after the earthquake, decision-makers put little effort on the businesses and their vulnerability problem. If mitigating the earthquake risks is a target for both local and central governments, then it is required to enhance affordable and attractive instruments for designing a resilient business environment, as presented in this thesis.

### **7.3. RETHINKING THE 'PLANNING'**

This research illustrates the recovery strategies of businesses with a particular attention to their location choice. The study discusses the necessity of fixing the 'business recovery' concept in the public policy and planning literature. By the way, this study aims to enhance the achievement of recovery policies across city planners, academicians, decision-makers and urban managers. The findings of the thesis are intended to contribute to development

of guidelines for the planning of vulnerable cities and assessment of vulnerability in a broader aspect. Additionally, this thesis seeks to contribute to literature, by conceptualizing the findings of the study. These conceptualizations reflect the theoretical framework of the study and aim to integrate the debates of contemporary disaster approaches into urban planning.

Planning for avoiding uncertainty (Integration of recovery practices and mitigation): The planning approach to intervene risks necessitates considering the uncertain conditions. Such a planning schema does not necessarily reflect the perfect calculation and control, as advocated by Dahl (1970). Since perfect calculation and consequentialist control are not possible, the planning paradigm can not produce absolute solutions for risks. Since prediction is not possible, the consequences could be not controlled completely. Therefore, there occurs *uncertainty* in planning. The aim to maximize the achievements and to control the overall community could not define the planning process any more. Directing the community in line with the predetermined goals could no longer be realistic in such a planning approach. The planning approach in intervening risks should take the uncertainty into account. Planning can avoid, share and reduce risks against calculable threats. Therefore, it is required to broaden the perspective to pre-disaster periods and undertake the recovery practices by integrating their consequences to risk mitigation.

What should be done in the affected region is to integrate mitigation measures into recovery process. Mitigation policies include structural and nonstructural measures ranging from macro to micro scale interventions. Policies should be designed through regional strategies, strategic urban plan decisions, development rights, emergency plans, insurance and education campaigns as well as recovery plans before a disastrous event. If governments invest in community resilience, the expenses to recovery decreases, and the surplus could be used in development. Hence, they could save time and resources. Plans, prepared before a disastrous event for risk reduction, serve for the community recovery as well as sustainable development. The positive impacts of mitigation on recovery are obvious and widely accepted. The missing point in practice is that recovery policies are applied without considering their contributions to mitigation. If the aim is risk reduction, then, in all phases of disaster management, capabilities for risk reduction should be increased. The goal of recovery should aim community resilience and the implications during the period should serve in light of this goal. The recovery practices should not hamper the mitigation efforts through their permanent and long-lasting consequences. Why the relation between recovery and mitigation is important is that their practices have both permanent and tangible effects of community and urban space. Therefore, the steps taken in recovery period could affect

mitigation capacity in a positive or negative way. Planning should play a role in disaster management system that predict the uncertainty and prepare the city against disaster risks.

Planning the secondary (Assessment of indirect impacts): Planning has a dynamic and flexible structure to consider the impacts of critical decisions which is neither calculable nor controllable. That is, planning is a process that considers the development dynamics and potentials of community as well as threats. In such an environment, long-term estimations and pure positivist methods become inadequate in planning framework. It is required to develop a flexible structure in case of *contingencies*. Since it is not possible to know and control these contingencies, it is difficult to assess the consequences of implications in different aspects. Therefore, being prepared for uncertainties could increase the probability of achievement of plans. Planning, by this way, could develop actions for *secondary* to reduce their vulnerabilities.

Central and local governments concentrates on the direct physical impacts of disasters. Given the scenario of any type of disasters, planners used to focus on disaster prone areas with an aim of reducing casualties. The engineering approach to disasters focuses on predicting the casualties, and therefore provides solutions to reduce them. The most prominent one is retrofitting. This approach, dominant in traditional disaster arguments, excludes the indirect impacts such as economic, ecologic, spatial, social, political aspects. Planning could go one step further if it achieves to consider the multi-dimensional impacts of disaster. Disaster management systems which refresh themselves with a pre-disaster focus, could find the opportunity of thinking about the other dimensions of disasters. By this way, local and central governments would assess the possible consequences of their policies in a broader extent. Here, the role of planning would be to evaluate the alternative development strategies and their impacts on spatial structure. The urban development proposals should be assessed in terms urban vulnerability and economic, social, and spatial impacts in addition to the susceptibility of structures. Different from engineering approach on disaster's primary impacts, planning should take the secondary impacts into consideration. Hence, planning could be able to criticize the implications, and provide solutions to probable disaster impacts.

Planning comprehensively (Integration of business recovery into household/community recovery): Risk reduction and effective recovery could be ensured by the *negotiation* and *consensus* of different community units in public space. That is, the city should be accepted as a phenomenon that is shaped with the negotiations of all urban components. The resilience of a city depends on the *common sense* of components. Therefore, the planning approach should accept the interconnectedness of different components in decision-making



process and consider the participatory practices among these units. Such a consensus could be possible with the interaction of actors, which requires a *communicative rationality* among urban components and decision-makers. In this environment, planners gain the *facilitator* role in addition to their technical knowledge. By this way, the solid future of the city could be drawn through the communicative rationality and participation of actors in critical position. *Public benefits* could be determined and collective actions could be taken to achieve a resilient community. Therefore, *piecemeal approaches* could be transformed into a *comprehensive* one to cover all vulnerable community units.

Local governments show little interest on businesses and continuity of functions. Although location choices of households are controlled strictly and directed, businesses are disregarded in the recovery process. However, as this thesis shows, household recovery is essential but not enough to generate a community recovery. Due to this reason, planning should take the rest of community elements into consideration. The basic one of them is businesses which structure the city and its center by their location choices. In addition to their space-determinant position, they function as a part of economic structure which use materials and infrastructure, supply products and services to customers, benefit from the employees. In recovery period, policies for businesses are inadequate to guarantee their functionality. Individual efforts of businesses are essential but not enough to overcome the problems occurring during the recovery process. Strategies at community level are required to maintain business viability. In line with this aim, macro-scale policies should be designed for businesses. Policies should consider components of business continuity, such as lifeline systems, consumers, and employees. As this thesis study has shown the operational problems are one of main source of business interruption, policies should include individual businesses, community element and built environment which aggregate the whole business sector.

#### **7.4. FURTHER RESEARCH**

This thesis has put forward a scientific approach to the recovery field of disaster literature which is in its infancy. The debate took place in the present inquiry can be carried further with following researches. Findings of this thesis suggest a number of inquiry areas for further researches. There occur possible questions during this study that shed light to the following researches.

Additional research is required to develop a more robust model. In line with the method drawn in this study, researches could be applied to a broader extent to verify the statistically

significant determinants of business recovery and location choice models. The model could be strengthened with a larger sample size. Also, it is needed to ask which other factors, particularly community-related ones, affect the recovery process of businesses. Community and neighborhood-related factors make the research more powerful in understanding the impacts of site. The sites of businesses give clues in exploration of recovery patterns and location choice (e.g. renewal of site, service provision, community recovery).

Such a methodology could be used in comparative studies. Since this study focus on a developing country case, the findings of the thesis could be used to undertake a comparison with other developing and developed country cases. The question is how the socio-economic conditions of cities affect the recovery process? Similarities and differences of the results of other cases may help researchers to identify the context-dependent structure of disasters.

The variety of impacts the hazard is likely to produce need to be determined. This helps to understand what is at risk. In other words, this enables to identify the community elements under disaster risks. Also, it is required to determine how other disaster types affect the economic activity of a disaster-stricken city. This thesis study has focused on the earthquake and its consequences. Similarly, additional research is required to assess the consequences of different hazard types. By this way, related codes and policies could be developed to reduce disaster risks and keep businesses in operation.

Another possible field of research is to examine how the lessons from the 1999 Earthquake could be applied to Turkish disaster management system and following disasters. Critiques of the resettlement policies in spatial terms may be employed for following disasters to create safer cities with a more prospective approach. The awareness of the consequences of separating household and business recovery is demonstrated in the present study. Further studies may undertake other malpractices which take place in ongoing systems to enhance the disaster management.

For the further study a longitudinal research would better demonstrate the recovery process of businesses. Business survival and deaths would be better observed with a longitudinal approach. Instead of a snapshot study, further researches may follow the dynamic process of recovery and its dimensions. Follow-up studies have critical importance in understanding the recovery process of business. Beginning in the short-term, researches contribute to practice to observe changes in time and critical points of businesses. This provides an insight in policy-development and in enhancing business capacity against disaster.

We, as city planners, must consider the problems that occur during the recovery period and recognize the short-comings of policies before a disaster strike an urban area in order to maintain resources and keep business operationality. To do that, additional information is required on what type of assistance do really ensure business viability and which spatial decisions reduce vulnerability at aggregate level in order to enhance the quality of practice in the domain of business disaster management,.

They seem to be significant questions to be explored. All the answers of these questions and this thesis might contribute to the development of a rational and contemporary disaster management approach which has still gaps in Turkish case.

## REFERENCES

Acar, O. And E., Çağlar, 2012, Yeni Teşvik Paketi Üzerine bir Değerlendirme, Politika Notu, TEPAV (Economic Policy Research Foundation of Turkey).

Adapazarı Municipality, 1999, Report of Municipality, Sakarya.

Adams, J., 1995, *Risk*, UCL Press: London.

AİGM, 2008, *22 Ağustos 2000 Tarihi İtibariyle Geçici (prefabrik) Konutların Sayısı*, Ankara.

AİGM, 2008, *Marmara Depremleri'nden Etkilenen On İlde Kesin Hasar Tespit Sonuçları*, Ankara.

AİGM, 2008, *Finansman Kaynağına Göre Elde Edilen Kalıcı Konut Sayısı*, Ankara.

AİGM, 2008, *2006 Yılı EYY, Orta Hasarlı Konut ve İşyeri Kredisinden Yararlandırılan Hak sahibi Sayısı*, Ankara, 2008.

AİGM, 2008, *Hazır Konut Kredisİ İmkanlarından Yararlanan Hak sahibi Sayısı*, Ankara.

AİGM, 2008, *Marmara Depremleri Nedeniyle Hazır Konut Kredisİ İmkanları İle Edilen Konutların Yıllara Göre Ödemeleri*, Ankara.

Albala-Bertnard, J.M., 1993, *The Political Economy of Large Natural Disasters: With Special Reference to Developing Countries*, Calerendon Press Oxford, New York.

Albala-Bertrand, 2003, Urban Disasters and Globalization, in *Building Safer Cities: The Future of Disaster Risk*, p.75-82.

Alesch, D.J., Holly, J.N., Mittler, E., and R., Nagy, 2000, When Small Businesses and Non-Profit Organizations Collide with Natural Disasters, preliminary report, published by the Public Entity Risk Institute.

Alesch, D.J., Holly, J.N., Mittler, E., and R., Nagy, 2001, Organizations at Risk: what Happens when Small Businesses and Non-for-Profits Encounter Natural Disasters, Small Organizations Natural Hazards Project, First Year Technical Report, University of Wisconsin-Green Bay: the Public Entity Risk Institute, Fairfax, Virginia, USA.

Alexander, J.C., 1996, Critical Reflections on Reflexive Modernization, *Theory, Culture and Society*, vol.14, .133-138.

Altun, A., Taşdemiroğlu, M., Barut, Z., Arar, R., Şipal, H., İlkelen, A., Özdemir, A., Kara, F., Çeler, H., Semercioğlu, M., 1967, *Sakarya Depremleri*, Işık Basımevi, Adapazarı.

Anderson, M.B., 1990, Which Costs More: Prevention or Recovery?, *Strategic Issues*.

Arnold, C., 1993, Reconstruction after Earthquakes: Issues, Urban Design and Case Studies, Report to National Science Foundation, Building Systems Development, Inc., San Mateo, California.

Balamir, M., 2004, İstanbul Deprem Master Planı Çalışmalarının Kapsam ve Niteliği, *Mimarist*, vol.3, no.9, p.47-54.

Balamir M. (2006) Seismic Mitigation Efforts in İstanbul: ISMEP Projects Short of Mitigation Planning, paper presented at IIASA-DPRI Meeting 13-17 August 2006, İstanbul.

Balamir M. (2007a) Afet Politikası, Risk ve Planlama, *Afet Sempozyumu Bildiriler Kitabı*, TMMOB.

Balamir M. (2007b) Risk Yönetimi ve Yerel Yönetimler, *Afet Risk Yönetimi: Risk Azaltma ve Yerel Yönetimler*, Marmara Üniversitesi ve Dünya Bankası.

Balamir, M., 2009, Safety in Cities: The Need for Urban Mitigation Planning, in Gülkan, P. and B.B., Başbuğ Erkan, *Perspectives in Disaster Management*, METU Press: Ankara.

Balamir, M., 2010, Contemporary Crises and Approaches to Disaster Risk Reduction (DRR) in Urban Areas, paper presented at 24th AESOP Annual Conference, Finland, 7-10 July 2010.

Bank of Provinces Archive, 2011, 1/25,000 Scale Master Plan of Adapazarı, 1985 authored by Berksan, Bulent.

Bankoff, G., 2004, Introduction: Mapping Vulnerability, in G. Bankoff, G. Frerks and D. Hilhorts (ed.), *Mapping Vulnerability: Disasters, Development and People*, Earthscan, London.

Babbie, E.R., 1989, *The Practice of Social Research*, 5th edition, Belmont CA: Wadsworth.

Bates, F.L., 1982, Recovery, Change and Development: A Longitudinal Study of the 1976 Guatemalan Earthquake.

Bates, P.L. and C., Pelanda, 1994, An Ecological Approach to Disasters, in R.R., Dynes and K.J., Tierney (eds), *Disasters, Collective Behavior and Social Organization*, University of Delaware Press: Newark.

Bayhan, F., 2010, Impacts of Planning Decisions in an Earthquake Vulnerable City: The Case Study of Adapazarı, Master of Science in City and Regional Planning Department, Middle East Technical University, Ankara.

Beatley, T. and P. R. Berke, 1992, Time to Shake-Up Earthquake Planning, *Issues in Science and Technology*, winter 1992-1993, p.82-89.

Beck, U., 1992, *Risk Society: On the Way to an Alternative Modernity*, Sage: Thousand Oaks.

Beck, U., 1998, Politics of Risk Society, in J., Franklin (eds), *The Politics of Risk Society*, Polity Press: Cambridge, UK.

Beck, U., 1999, *World Risk Society*, Polity Press: Cambridge, UK.

Belda, A.Ş., 2006, 1/25,000 Ölçekli Adapazarı Nazım İmar Planı Raporu, 28.09.2006.

Benson, C. and E.J., Clay, 2004, Understanding the Economic and Financial Impacts of Natural Disasters, *Disaster Risk Management Series*, no.4, The World Bank, Washington D.C.

Berke, P. R., 1998, Reducing Natural Hazard Risks through State Growth Management, *APA Journal*, winter 1998, p.76-87.

Berke, P. R., and T. J. Campanella, 2006, *Planning for Post-disaster Resiliency*, The ANNALS of the American Academy of Political and Social Science, vol. 604, p.192-207.

Berke, P., Kartez, J., and D., Wegner, 1993, Recovery after Disaster: Achieving Sustainable Development, Mitigation and Equity, *Disasters*, vol.17, no.2, p. 93-109.

Bibbee, A., Gönenç, R., Jacobs, S., Konvitz, J., and R., Price, (2000) Economic Effects of the 1999 Turkish Earthquakes: An Interim Report, OECD Economics Department Working Paper no. 247, An Interim Report, OECD Publishing.

Blaikie, P.C.T., Davis, I., and B., Wisner, 1994, At Risk: Natural Hazards, People's Vulnerability and *Disasters*, Routledge, New York.

Bolin, R. and L. Stanford, 1998, *The Northridge Earthquake: Vulnerability and Disaster*, Routledge.

Bolin, R., 1993, *Household and Community Recovery After Earthquakes*, Institute of Behavioral Science, University of Colorado, Boulder, CO.

Bolin, R., and L., Stanford, 1991, Shelter, Housing and Recovery: A Comparison of U.S. Disasters, *Disasters*, vol.15, no.1, p.24-34.

Bolin, R.C. and L., Stanford, 1998, The Northridge Earthquake: Community-based Approaches to Unmet the Recovery Needs, *Disasters*, vol.22, p.21-38.

Bolin, R.C., 1982, *Long-term Family Recovery from Disaster*, Boulder, CO: Institute of Behavioral Science, University of Colorado.

Bolin, R.C., and P., Bolton, 1986, *Race, Religion and Ethnicity in Disaster Recovery*, Boulder, CO: Institute of Behavioral Science, University of Colorado.

Brauch, H. G., 2003, Urbanization and Natural Disasters in the Mediterranean: Population Growth and the Climate Change in the 21st Century, in *Building Safer Cities: The Future of Disaster Risk*, p.149-164.

Castells, M., 1977, *The Urban Question: A Marxist Approach*, Edward Arnold (Publishers) Ltd, London: UK.

Chang, S.E. and A., Falit-Baiamonte, 2002, Disaster Vulnerability of Businesses in the 2001 Nisqually Earthquake, *Environmental Hazards*, vol.4, p.59-71.

Chang, S.E., 2000, Disasters and Transport Systems: Loss recovery and Competition at the Port of Kobe after the 1995 Earthquake, *Journal of Transport Geography*, vol.8, p. 53-65.

Chang, S.E., 2010, Urban Disaster Recovery: A Measurement Framework and its Application to the 1995 Kobe Earthquake, *Disasters*, vol. 34, no.2, p. 303-327.

Chapin, F.S., 1968, Activity Systems and Urban Structure: A Working Schema, *Journal of the American Planning Association*, vol. 34, issue 1, p. 11-18.

Charveriat, C., 2000, *Natural Disasters in Latin America and Caribbean: An Overview of Risk*, Inter American Development Bank, Washington.

Clausen, L., P. Conlon, W., Jager, and S., Metreveli, 1978, New Aspects of the Sociology of Disasters: A Theoretical Note, *Mass Emergencies*, vol.3, p.61-65.

Cloke, P., Cook, I., Crang, P., Goodwin, M., Painter, J., and C., Philo, 2004, *Practicing Human Geography*, Sage Publications: London.

Cochrane, H., 2004, Economic Loss: Myth and Measurement, *Disaster Prevention and Management*, vol.13, no.4, p.290-296.

Cross, J.A., 2001, Megacities and Small Towns: Different Perspectives on Hazard Vulnerability, *Environmental Hazards*, vol.3, p. 63-80.

Cutter, S.L., 2003, GI Science, Disasters and Emergency Management, *Transactions in GIS*, vol.7, no. 4, p.439-445.

Dahl, R., 1970, *After the Revolution? Authority in a Good Society*, New Haven and London, Yale UP.

Dahlhamer, J.M., and K.J., Tierney, 1998, Rebounding from Disruptive Events: Business Recovery Following the Northridge Earthquake, *Sociological Spectrum*, vol.18, p. 121-141.

Dahlhamer, J.M., and M.J., D'Souza, 1995, Determinants of Business Disaster Preparedness in Two U.S. Metropolitan Areas, Newark, DE: University of Delaware, Disaster Research Center, Preliminary paper no. 224.



Delica-Willison, Z., and R., Willison, 2004, Vulnerability Reduction: A Task for the Vulnerable People Themselves, in G. Bankoff, G. Frerks and D. Hilhorts (ed), *Mapping Vulnerability: Disasters, Development and People*, Earthscan, London.

Dietch, E.A., and C.M., Christy, 2011, Predicting long-term business recovery four years after Hurricane Katrina, *Management Research Review*, vol.34, no.3, p.311-324, Emerald Group Publishing Limited.

Drabek, T., and W., Key, 1984, *Conquering Disaster: Family Recovery and Long-term Disaster*, New York, Irvington Publishers.

Durkin, M., 1984, The Economic Recovery of Small Businesses after Earthquakes: The Coalinga Experience, in International Conference on Natural Hazards Mitigation Research and Practice, New Delhi, India.

Elliot, D., Harris, K., and S., Baron, 2005, Crisis Management and Services Marketing, *Journal of Services Marketing*, vol. 19, no.5, p. 336-345.

Elliott, A., 2002, Beck's Sociology of Risk: A Critical Assessment, *Sociology*, vol.36, p. 293-315.

EMI, 2007, Urban and Megacities Risk – What is at stake and what should be done?, in Global Platform for Disaster Risk Reduction by UN/ISDR, Geneva, Switzerland, June 2007.

Erkan, E.A., 2010, Afet Yönetiminde Risk Azaltma ve Türkiye’de Yaşanan Sorunlar, State Planning Organization, Ankara.

Erten, M. G., 2004, Property Problems in Post-Earthquake Urban Redevelopment Process: A Case Study in City of Adapazarı, Master Thesis METU, Ankara.

Freeman P., L. Martin, R. Mechler and K. Warner, 2004, A Methodology for Incorporating Natural Catastrophes into Macroeconomic Projections, *Disaster Prevention and Management*, vol. 13, no. 4, p.337-342.

Friedmann, B., 1998, *The Research Tool Kit: Putting it all Together*, Wayne State university, Brooks/ Cole Publishing Company, USA.

Gedikli, B., 2004, Urbanization and Land-use Planning in Adapazarı (Turkey) Reconsidered After the 1999 Earthquake, *Journal of Housing and the Built Environment*, 2005, vol. 20, p. 79-91.

Giddens, A., 1998, Risk Society: The Context of British Politics, in J., Franklin (eds), *The Politics of Risk Society*, Polity Press: Cambridge, UK.

Godschalk, D. R., 2003, Urban Hazard Mitigation: Creating Resilient Cities, *Natural Hazards Review*, August 2003, v.4:3, p.136-143.

Governor of Sakarya, 2004, Sakarya'nın Rekabet Gücünün Belirlenmesi ve Geliştirilmesi, Sakarya.

Gulersoy Zeren, N., Turkoglu, H., Tezer, A., Yigiter, R., 2003, Evaluation of Post Disaster Permanent Housing Areas According to Urban Planning Principles, A Book Dedicated to Prof. Dr. Yücel ÜNAL, ITU Faculty of Architecture, Urban and Regional Planning Department, Istanbul, pp. 55-63

Haas, J.E., Kates, R., and M., Bowden (ed.), 1977, *Reconstruction Following Disaster*, MIT Press, Cambridge.

Hayır, M., and M., Akyol, 2008, Disaster Housing and Effects on the Development of the Adapazarı City, *Eastern Geographical Review*, vol.22, p.125-145.

Hewitt, K., 1983, *Interpretations of Calamity: From the Viewpoint of Human Ecology*, Allen and Unwin: London.

Hewitt, K., 1983, The Idea of Calamity in a Technocratic Age, in K. Hewitt (ed.), *Interpretations of Calamity*, Allen and Unwin: Boston.

Hewitt, K., 1995, Excluded Perspectives in the Social Construction of Disaster, *International Journal of Mass Emergencies and Disasters*, vol.13, no.3, p.317-340.

Hewitt, K., 1995, Sustainable Disasters? Perspectives and Power in the Discourse of Calamity, in J. Crush (ed.), *Power of Development*, Routledge, London and New York.

Hewitt, K., 1997, *Regions of Risk: A Geographical Introduction to Disasters*, Addison Wesley Longman Limited, Essex, England.

Hilhorst, D., 2004, Complexity and Diversity: Unlocking Social Domains of Disaster Response, in G. Bankoff, G. Frerks and D. Hilhorst (eds), *Mapping Vulnerability: Disasters, Development and People*, Earthscan, London.

Horlick-Jones, T., 1995, Modern Disasters as Outrage and Betrayal, *International Journal of Mass Emergencies and Disasters*, vol.13, p. 305-316.

Houts, P.S., Cleary, P.D., and T., Hu, 1988, *The Three Mile Island Crisis: Psychological, Social and Economic Impacts on the Surrounding Population*, The Pennsylvania State University Press: Pennsylvania, USA.

Hunt, N., and Tyrrell, S., 2001, Stratified Sampling, Webpage at Coventry University, last achieved July 2012.

Inam, A., 2005, *Planning for the Unplanned: Recovering from Crises in Megacities*, Routledge: New York.

Inta-Spaceturk, 2003, Adapazarı Aerial View.

Johnston, R. J., 2000, Questionnaire, in Johnston, R.J. (eds), *The Dictionary of Human Geography*, 4th edition, Blackwell Publications: Oxford.

Kahraman, Z.E, 2008, The Relationship between Squatter Housing Transformation and Social Integration of Rural Migrants into Urban Life: A Case Study in Dikmen, PhD Thesis submitted to Middle East Technical University, Ankara.

Kentmap, 2009, 1/100,000 Ölçekli Sakarya Çevre Düzeni Planı,

Keskinok, Ç., 2001, *Kentleşme Siyasetleri*, Kaynak Yayınları: İstanbul.

Kreps, G.A. and T.E., Drabek, 1996, Disasters are nonroutine social problems, *International Journal of Mass Emergencies and Disasters*, vol. 14, p. 129-143.

Lefebvre, H., 1992, *The Production of Space*, Basil Blackwell, Oxford.

Lindell, M. K. and C. S. Prater, 2003, Assessing Community Impacts of Natural Disasters, *Natural Hazards Review*, vol. 4, no.4, p.176-185, November 2003.

Luhmann, N., 1993, *Risk: A Sociological Theory*, Walter de Gruyter: New York.

Lupton, D., 1999, *Risk*, Routledge: London and New York.

McEntire, D. , Corker, C.G. and E., Peters, 2010, Addressing Vulnerability through an Integrated Approach, *International Journal of Disaster Resilience in the Built Environment*, vol.1, no.1, p.50-64.

Mestan, Ç.C., 2005, Deprem Zararlarının Azaltılmasında Fiziksel Planlamanın Rolü: Adapazarı Örneği, Master thesis submitted to Gazi University, Ankara.

Miles, S.B., and S.E., Chang, 2006, Modeling Community Recovery from Earthquakes, *Earthquake Spectra*, vol.22, no.2, p.439-458, Earthquake Engineering Research Institute.

Miller, G. and J.A., Holstein (eds), 1993, *Constructivist Controversies: Issues in Social Problems Theory*, Aldine de Gruyter: New York.

Miller, K.S., and J.M., Nigg, 1993, Event and Consequence Vulnerability: Effects of the Disaster Recovery Process, paper presented at the annual meeting of the Eastern Sociological Society, Boston, Massachusetts.

Ministry of Reconstruction and Resettlement, 1963, *Eastern Marmara Region Plan*, İstanbul.

Mythen, G., 2004, *Ulrich Beck*, Pluto: London.

National Research Council, 2007, Improving Disaster Management: The Role of It in Mitigation, Preparedness, Response and Recovery, National Academy of Sciences, USA.

Nigg, J.M. and K.J. Tierney, 1993, Disasters and Social Change: Consequences for Community Construct and Affect, Newark, DE: University of Delaware, Disaster Research Center, Preliminary paper no. 195.

Nigg, J.M., 1995, Business Disruption due to Earthquake-Induced Lifeline Interruption, Newark, DE: University of Delaware, Disaster Research Center, Preliminary paper no. 220.

Nigg, J.M., 1995, Disaster Recovery As A Social Process, University of Delaware, Disaster Research Center, Preliminary Paper no.219.

OECD, 2003, *Large-Scale Disasters: Lessons Learned*.

Oliver-Smith, A., 2004, Theorizing Vulnerability in a Globalized World: A Political Ecological Perspective, in G. Bankoff, G. Frerks and D. Hilhorts (ed), *Mapping Vulnerability: Disasters, Development and People*, Earthscan, London.

Olshansky, R.B., 2005, How do Communities Recover from Disaster? A Review of Current Knowledge and an Agenda for Future Research, presented at 46th Annual Conference of the Association of Collegiate Schools of Planning, Kansas City, October 27, 2005.

Orhan, E., 2009, Afet Planlamasında Kaynak Kullanımının Siyasetinde Planlamanın Rolü, *Planlama*, 2010/1, no. 48, p. 69-81.

Özbudak, M., 2000, 17 Ağustos 1999 Marmara Depreminin Sakarya İli Ekonomisi Üzerindeki Etkileri, Master thesis submitted to Sakarya University, Sakarya.

Peacock, W.G., B.H., Morrow and H., Gladwin (eds), 1997, *Hurricane Andrew: Ethnicity, Gender and the sociology of Disasters*, Routledge: London.

Pearce, L., 2003, Disaster Management and Community Planning, and Public Participation: How to Achieve Sustainable Hazard Mitigation, *Natural Hazards*, vol.28, p.211-228.

Perry, R. W., M. K . Lindell, and M.R., Greene, 1981, *Evacuation Planning in Emergency Management*, Lexington, Mass.: Lexington.

Perry, R.W., 1998, Definitions and the development of a theoretical superstructure for Disaster Research, in Quarantelli, E.L. (ed.), *What is A Disaster? Perspectives on the Question*, Routledge, New York, NY, p.197-215.

Philips, B.D. and M., Fordham, 2010, Introduction, in Philips, et al. (ed.), *Social Vulnerability to Disasters*, CRC Press, Boca Raton.

Philips, B.D., D.S.K., Thomas, A., Fothergill and L., Blinn-Pike (ed.), 2010, *Social Vulnerability to Disasters*, CRC Press, Boca Raton.

Pine, J.C., 2009, *Natural Hazard Analysis: Reducing the Impact of Disasters*, CRC Press, Boca Raton.

Powell, F. and Harding, A., 2009, Business Recovery and the Rebuilding of Commercial Property, Proceedings of 'Shaken Up' a workshop on recovery following the Gisborne Earthquake, held in Wellington on 7 December 2009.

Prater, C. S. and M. K. Lindell, 2000, Politics of Natural hazards, *Natural Hazards Review*, vol.1, no.2, May 2000, p.73-82.

Prime Ministry Crisis Center, 2000, *Depremler 1999*, T.C. Başbakanlık Yayınları, Ankara.

Quarantelli, E.L., 1989, Conceptualizing Disasters from a Sociological Perspective, *International Journal of Mass Emergencies and Disasters*, vol.5, p. 285-310.

Quarantelli, E.L., 1999, The Disaster Recovery Process: What do We Know and do not Know from Research, Newark, Delaware: Disaster Research Center, University of Delaware.

Quarantelli, E. L., 2003, Urban Vulnerability to Disasters in Developing Countries: Managing Risks, in *Building Safer Cities: The Future of Disaster Risk*, p.211-229.

Reddy, S.D., 2000, Factors Influencing the Incorporation of Hazard Mitigation During Recovery from Disaster, *Natural Hazards*, vol.22, p.185-201, Kluwer Academic Publishers, Netherlands.

Rubin, C.B, Saperstein, M.D., and D.G., Barbee, 1985, *Community Recovery from a Major Natural Disaster*, University of Colorado, Institute of Behavioral Science.

Rubin, C.B., and D.G., Barbee, 1985, Disaster Recovery and Hazard Mitigation: Bridging the Intergovernmental Gap, *Public Administration Review*, vol.45, Special Issue: A Challenge for Public Administration, p.57-63, Blackwell Publishing and American Society for Public Administration.

Runyan, R.C., 2006, Small Business in the Face of Crisis: Identifying Barriers to Recovery from a Natural Disaster, *Journal of Contingencies and Crisis Management*, vol.14, no.1, p. 12-26.

Sakarya Metropolitan Municipality, 2008, *Düinden Bugüne Adapazarı*, Sakarya.

Sakarya Sanayi ve Ticaret İl Müdürlüğü, 2008, *Küçük Sanayi Sitelerinin İstatistikî Bilgileri*, Sakarya.

SATSO, 2009, *2009 İktisadî Raporu*, Sakarya.

Scanlon, J., 1988, Winners and Losers: Some Thoughts about the Political Economy of Disaster, *International Journal of Mass Emergencies and Disasters*, vol. 6, no.1, p.47-63.

Schnaiberg, A., 1980, *The Environment: From Surplus to Scarcity*, Oxford University Press: New York.

Schwab, J. (ed.) 1998, Planning for Post-Disaster Recovery and Reconstruction, *Journal of American Planning Association*, Planning Advisory Service Report 483/484, Chicago, Illinois.

Sengezer, B. and E. Koç, 2005, A Critical Analysis of Earthquakes and Urban Planning in Turkey, *Disasters*, vol. 29, no. 2, p. 171-194.

Skoufias, E., 2003, Economic Crisis and Natural Disasters: Coping Strategies and Policy Implications, *World Development*, vol.13, no.7, p. 1087-1102, 2003, Elsevier Science Ltd.

Smith, K. and D. N. Petley, 2009, *Environmental Hazards: Assessing Risk and Reducing Disaster*, Fifth Edition, Routledge.

Smith, S. K., 1996, Demography of Disaster: Population Estimates after Hurricane Andrew, *Population Research and Policy Review*, vol.15, p. 459-477, December 1996, Kluwer Academic Publishers.

Smith, S. K., and C. Mccarty, 1996, Demographic Effects of Natural Disasters: A Case Study of Hurricane Andrew, *Demography*, vol.33, no.2, May 1996, p.265-275.

Spector, M. and J.I., Kitsuse, 1987, *Constructing Social Problems*, Aldine de Gruyter: New York.

SPO, (1996a) İllerin Sosyo-Ekonomik Gelişmişlik Sıralaması, DPT Yayınları, Ankara.

SPO, (1996b) İlçelerin Sosyo-Ekonomik Gelişmişlik Sıralaması, DPT Yayınları, Ankara

SPO, 1999, *Depremın Ekonomik ve Sosyal Etkileri, Muhtemel Finansman İhtiyacı, Kısa ve Uzun Vadede Alınabilecek Tedbirler*, Eylül 1999, Ankara.

SPO, (2002a) İllere ve Bölgelere Göre Çeşitli Göstergeler, DPT Yayınları, Ankara.

SPO, (2002b) İller ve Bölgeler itibarıyla Gayri Safi Yurtiçi Hasıladaki Gelişmeler, 1987-2000, DPT Yayınları, Ankara.

SPO, (2003) İllerin ve Bölgelerin Sosyo-Ekonomik Gelişmişlik Sıralaması Araştırması, DPT Yayın no. 2671, Ankara.

SPO, (2004) İlçelerin Sosyo-Ekonomik Gelişmişlik Sıralaması, DPT Yayınları, Ankara.

SPO, 2008, Orta Vadeli Program 2009-2011, *2008 Yılı Yatırım Programı*, Ankara.

Stallings, R. A., 1984, Evacuation Behavior at Three Mile Island, *International Journal of Mass Emergencies and Disasters*, vol. 2, p. 11-26.

Stallings, R.A., 1988, Conflict in Natural Disasters: A Codification of Censusus and Conflict Theories, *Social Science Quarterly*, vol.69, p. 569-586.

Stallings, R.A., 1991, Disasters as Social Problems? A Dissenting View, *International Journal of Mass Emergencies and Disasters*, vol. 9, p. 69-74.

Stallings, R.A., 1995, *Promoting Risk: Constructing the Earthquake Threat*, Aldine de Gruyter: New York.

Stephonson, R.S., and C., DuFrane, 2005, Disasters and Development: Understanding and Exploiting Disaster-Development Linkages, University of Wisconsin, Disaster Management Center.

Taylor-Gooby, P. and J.O., Zinn, 2006, *Risk in Social Science*, Oxford University Press.

Tekeli, İ., 2008b, *Türkiye’de Bölgesel Eşitsizlik ve Bölge Planlama Yazıları*, Tarih Vakfı Yurt Yayınları: İstanbul



Tierney, K.J., 1989, Improving Theory and Research on Hazard Mitigation: Political Economy and Organizational Perspectives, *International Journal of Mass Emergencies and Disasters*, vol.7, p. 367-396.

Tierney, K.J., 1994, Business Vulnerability and Disruption: Data from the 1993 Midwest Floods, 41st North American Meetings of the Regional Science Association International, Niagara Falls, Ontario, November 16-20,1994.

Tierney, K.J., 1995, Impacts of Recent US Disasters on Businesses: The 1993 Midwest Floods and the 1994 Northridge Earthquake, Newark, DE: University of Delaware, Disaster Research Center, Preliminary paper no. 230.

Tierney, K.J., 1997, Business Impacts of the Northridge Earthquake, *Journal of Contingencies and Crisis Management*, vol.5, no.2, p.87-97.

Tierney, K.J., and G.R., Webb, 2001, Business Vulnerability to Earthquakes and Other Disasters, Newark, DE: University of Delaware, Disaster Research Center, Preliminary paper no. 320.

Tierney, K.J., and J.M., Dahlhamer, 1995, Earthquake Vulnerability and Emergency Preparedness among Businesses in Memphis/Shelby County, Tennessee, Newark, DE: University of Delaware, Disaster Research Center, Preliminary paper no. 233.

Tierney, K.J., and J.M., Dahlhamer, 1997, Business Disruption, Preparedness and Recovery: Lessons from the Northridge Earthquake, Newark, DE: University of Delaware, Disaster Research Center, Preliminary paper no. 257.

Tierney, K.J., and J.M., Dahlhamer, 1998, Business Disruption, Preparedness and Recovery: Lessons from the Northridge Earthquake, in NEHRP Conference and Workshop on Research on the Northridge, California Earthquake of January 17, 1994 Richmond, CA.

Tierney, K.J., M.K., Lindell and R.W., Perry, 2001, *Facing the Unexpected: Disaster Preparedness and Response in the United States*, Joseph Henry Press: Washington DC.

Tobin, G. A. and B. E. Montz, 1997, Natural Hazards: Explanation and Integration.

Tobin, G.A., 1999, Sustainability and Community Resilience: The Holy Grail of Hazards Planning?, *Environmental Hazards*, vol. 1, p.13-25, Elsevier Science Ltd.

Tunç, G., 2003, Transformation of Public Space: The Case of Migros Akköprü Shopping Center, Master Thesis, Department of Urban Policy Planning and Local Governments, METU, Ankara.

TurkStat, 1980, *General Census of Industry and Business Establishments*, DİE Matbaası, Ankara.

TurkStat, 1985, *General Census of Industry and Business Establishments*, DİE Matbaası, Ankara.

TurkStat, 1992, *General Census of Industry and Business Establishments*, DİE Matbaası, Ankara.

TurkStat, 2000, *Genel Nüfus Sayımı: Nüfusun Sosyal ve Ekonomik Nitelikleri - Sakarya, Kocaeli, Bilecik, Bolu, Bursa, Düzce 2000*, DİE Matbaası, Ankara.

TurkStat, 2001a, *Statistical Yearbook of Turkey*, DİE Matbaası, Ankara.

TurkStat, 2001b, The Report on the Survey Conducted between the Dates of 4-11 October 1999 to Determine the Impact of the Earthquake Zone that a Severe Earthquake Occurred on 17 August 1999, Turkish Statistical Institute, Ankara.

TurkStat, 2002, *General Census of Industry and Business Establishments*, DİE Matbaası, Ankara.

TurkStat, 2007, *Address Based Population Registration System*.

TurkStat, 2008, *Bölgesel Göstergeler*, DİE Matbaası, Ankara.

TurkStat, 2010, *Address Based Population Registration System*.

Türkoğlu Önge, S., 2007, Spatial representation of Power: Making the Urban Space of Ankara in the Early Republican Period, Clloh-World, [http://www.clohworld.net/onlread/3/TURKOGLU\\_Spatial.pdf](http://www.clohworld.net/onlread/3/TURKOGLU_Spatial.pdf), last visited on 9th October, 2010.

Tyler, M.B., O'Prey, K., and K., Kristiansson, 2002, Redevelopment after Earthquakes, Portola Valley, California: Spangle Association.

Uluğ, H., 2004, Yeni başkentler, Tasarım ve Siyasi İktidar, *Planlama*, vol.1, no.27, Ankara.

UN/ISDR, 1994, Yokohama Strategy and Plan of Action for a Safer World Guidelines for Natural Disaster Prevention, Preparedness and Mitigation, World Conference on Natural Disaster Reduction Yokohama, Japan, 23-27 May 1994.

UN/ISDR, 2004, *Living with Risk: A global review of disaster reduction initiatives*.

UN/ISDR, 2004, Review of the Yokohama Strategy and Plan of Action for a Safer World, for consultation of World Conference on Disaster Reduction, December 2004.

UN/ISDR, 2005a, Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters, World Conference on Disaster Reduction: Kobe, Japan, 18-22 January 2005.

UN/ISDR, 2005b, Hyogo Declaration, in World Conference on Disaster Reduction: Kobe, Japan, 18-22 January 2005.

UN/ISDR, 2005c, Words into Action, in World Conference on Disaster Reduction: Kobe.

UN/ISDR, 2007a, Disaster Risk Reduction: 2007 Global Review.

UN/ISDR, 2007b, Guidelines: National Platforms for Disaster Risk Reduction.

UNDP, 1994, Disasters and Development, Disaster Management Training Program, 2nd Edition.

UNDP, 2004, A Global Report Reducing Disaster Risk: A Challenge for Development.

UNDP, 2004, *Reducing Disaster Risks: A Challenge for Development*, UNDP Bureau for Crisis Prevention and Recovery, New York: USA.

Vale and Campanella, 2005, *The Resilient City: How Modern Cities Recover From Disaster*, Oxford University Press, New York.

Van Der Veen, A., 2004, Disasters and Economic Damage: Macro, Meso, and Micro Approaches, *Disaster Prevention and Management*, vol. 13, no. 4, p.274-279.

Wasileski, G., Rodrigues, H., and D. Walter, 2011, Business closure and relocation: a comparative analysis of the Loma Prieta earthquake and Hurricane Andrew, *Disasters*, vol. 35, no. 1, p. 102-129.

Waugh, Jr. W.L., and R.B., Smith, 2006, Economic Development and Reconstruction on the Gulf after Katrina, *Economic Development Quarterly*, vol.20, no.3, p.211-218.

Webb, G.R., Tierney, K.J., and J.M., Dahlhamer, 1999, Businesses and Disasters: Empirical Patterns of Unanswered Questions, Newark, DE: University of Delaware, Disaster Research Center, Preliminary paper no. 281.

Webb, G.R., Tierney, K.J., and J.M., Dahlhamer, 2002, Predicting Long-term Business Recovery from Disaster: A comparison of the Loma Prieta Earthquake and Hurricane Andrew, *Environmental Hazards*, vol.4, p.45-58.

Wisner, B., 2004, Assessment of Capability and Vulnerability, in G. Bankoff, G. Frerks and D. Hilhorts (eds), *Mapping Vulnerability: Disasters, Development and People*, Earthscan, London.

Wisner, B., P. Blaikie, T. Cannon and I. Davis, 2004, *At Risk: Natural Hazards, Peoples Vulnerability and Disasters*, Second Edition, Routledge.

Yıldız, E.B., Sivri, U., and Berber, M., Türkiye’de İllerin Sosyo-Ekonomik Gelişmişlik Sıralaması 2010, Karadeniz Technical University, Trabzon.

Zenn, J.O. (eds), 2008, *Social Theories of Risk and Uncertainty: An Introduction*, Blackwell Publishing: Oxford, UK.

Zhang, Y., Lindell, M.K., and C.S., Prater, 2004, Modeling and Managing the Vulnerability of Community Businesses to Environmental Disasters, Hazard Reduction and Recovery Center, Texas A&M University.

Zhang, Y., Lindell, M.K., and C.S., Prater, 2009, Vulnerability of Community Businesses to Environmental Disasters, *Disasters*, vol. 33, no.1, p. 38-57.

#### WEB SOURCES

Arkitera web page, 2011, <http://www.arkitera.com/>, last achieved on 14<sup>th</sup> June, 2011.

Google Earth web page, 2011, <http://www.google.com/intl/tr/earth/index.html>, last achieved on 10<sup>th</sup> May, 2011.

PLANAT web page, 2011, <http://www.planat.ch/index.php?userhash=50462134&l=e&navID=5>, last achieved on 10<sup>th</sup> May, 2011.

Sakarya Governorship web page, 2011, <http://www.sakarya.pol.tr/ilcelerimiz/ilcelerimiz.asp>, last achieved on 10<sup>th</sup> May, 2011.

Sakarya University web page, 2011, <http://www.sau.edu.tr/>, last achieved on 10<sup>th</sup> May, 2011.

Social research methods web page, 2011, <http://www.socialresearchmethods.net/>, last achieved on 10<sup>th</sup> May, 2011.

TurkStat web page, 2011, <http://www.tuik.gov.tr/>, last achieved on 10<sup>th</sup> May, 2011.

Wikipedia web page, 2011, <http://www.wikipedia.org/>, last achieved on 10<sup>th</sup> May, 2011.

## APPENDIX A

### ETHICAL COMMISSION REPORT



1956

Orta Doğu Teknik Üniversitesi  
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5 Aralık 2011

Gönderilen: Doç. Dr. Çağatay Keskinok

Şehir ve Bölge Planlama Bölümü

Gönderen : Prof. Dr. Canan Özgen

Uygulamalı Etik Araştırma Merkezi Başkanı

İlgi : Etik Onayı hk.

Etik Kurul izni için sunmuş olduğunuz "Adapazarı Örneğinde İşyerlerinin Afet Sonrası İyileşme Sürecinde Aldıkları Yer Seçim Kararları" isimli Tübitak projesi başvurunuz ODTÜ "İnsan Araştırmaları Etik Komitesi" tarafından uygun görülerek etik onayı verilmiştir.

Bilgilerinize sunarım.

Prof. Dr. Canan Özgen  
UEAM Başkanı

Prof. Dr. Canan Sümer  
Etik Komitesi Üyesi

Prof. Dr. Ayhan Sol  
Etik Komitesi Üyesi

Prof. Dr. Mehmet Utku  
Etik Komitesi Üyesi

Doç. Dr. Emel Aközer  
Etik Komitesi Üyesi

## APPENDIX B

### TABLES

**Table B.1. Distribution of property damage among counties of Sakarya**

Source. Özbudak, 2000; 68 and Mestan, 2005; 111.

| County     | Heavily damaged |             | Moderately damaged |             | Lightly damaged |             | Undamaged    |              |
|------------|-----------------|-------------|--------------------|-------------|-----------------|-------------|--------------|--------------|
|            | Housing         | Businesses  | Housing            | Businesses  | Housing         | Businesses  | Housing      | Businesses   |
| Adapazarı  | <b>21414</b>    | <b>4715</b> | <b>13873</b>       | <b>2933</b> | <b>27834</b>    | <b>2865</b> | <b>64540</b> | <b>10235</b> |
| Akyazı     | 1024            | 204         | 860                | 165         | 1613            | 219         | 866          | 73           |
| Ferizli    | 24              | 11          | 45                 | 13          | 262             | 20          | 439          | 37           |
| Geyve      | 616             | 37          | 790                | 59          | 834             | 39          | 509          | 20           |
| Hendek     | 641             | 40          | 698                | 86          | 1693            | 76          | 1060         | 47           |
| Karapürçek | 96              | 13          | 144                | 12          | 313             | 53          | 146          | 7            |
| Karasu     | 306             | 45          | 858                | 256         | 752             | 101         | 767          | 41           |
| Kaynarca   | 20              | 0           | 16                 | 3           | 144             | 1           | 704          | 43           |
| Kocaali    | 232             | 30          | 706                | 183         | 840             | 221         | 1247         | 230          |
| Pamukova   | 8               | 0           | 53                 | 3           | 136             | 5           | 382          | 16           |
| Sapanca    | 256             | 51          | 33                 | 51          | 584             | 32          | 560          | 65           |
| Söğütli    | 37              | 0           | 60                 | 0           | 230             | 5           | 342          | 29           |
| Taraklı    | 4               | 0           | 17                 | 0           | 117             | 1           | 97           | 3            |
| Total      | 24678           | 5146        | 18406              | 3764        | 27991           | 2924        | 24486        | 3828         |

**Table B.2. Distribution of buildings, housing units, business premises and population among neighborhoods**

Source. Adapazarı Municipality, 1999; TurkStat, 2000.

|    | Neighborhood  | Number of lightly damaged buildings | Number of moderately damaged buildings | Number of heavily damaged buildings | Number of undamaged building | Total building stock | Number of total housing units | Number of total business premises | Total damage | Total damage/ total building(%) | Estimated damaged housing unit | Estimated damaged business premises | Population    |
|----|---------------|-------------------------------------|----------------------------------------|-------------------------------------|------------------------------|----------------------|-------------------------------|-----------------------------------|--------------|---------------------------------|--------------------------------|-------------------------------------|---------------|
| 1  | AKINCILAR     | 163                                 | 75                                     | 20                                  | 292                          | 550                  | 1115                          | 87                                | 258          | 46,9                            | 523                            | 41                                  | 2400          |
| 2  | BEŞÖPRÜ       | 85                                  | 23                                     | 7                                   | 733                          | 848                  | 2016                          | 236                               | 115          | 13,6                            | 273                            | 32                                  | 3498          |
| 3  | CUMHURİYET    | 233                                 | 194                                    | 70                                  | 255                          | 752                  | 2140                          | 2560                              | 497          | 66,1                            | 1414                           | 1692                                | 2717          |
| 4  | ÇUKURAHMEDİYE | 135                                 | 51                                     | 9                                   | 124                          | 319                  | 660                           | 197                               | 195          | 61,1                            | 403                            | 120                                 | 2524          |
| 5  | DAGDIBİ       | 54                                  | 36                                     | 3                                   | 104                          | 197                  | 351                           | 63                                | 93           | 47,2                            | 166                            | 30                                  | 1318          |
| 6  | GÜLLÜK        | 63                                  | 22                                     | 5                                   | 267                          | 357                  | 656                           | 71                                | 90           | 25,2                            | 165                            | 18                                  | 2524          |
| 7  | HIZIRTEPE     | 212                                 | 66                                     | 9                                   | 945                          | 1232                 | 3238                          | 343                               | 287          | 23,3                            | 754                            | 80                                  | 8786          |
| 8  | İSTİKLAL      | 167                                 | 150                                    | 36                                  | 177                          | 530                  | 1330                          | 248                               | 353          | 66,6                            | 886                            | 165                                 | 1303          |
| 9  | KARAOĞMAN     | 141                                 | 105                                    | 34                                  | 214                          | 494                  | 1065                          | 208                               | 280          | 56,7                            | 604                            | 118                                 | 2852          |
| 10 | KURTULUŞ      | 155                                 | 171                                    | 75                                  | 8                            | 409                  | 1228                          | 170                               | 401          | 98,0                            | 1204                           | 167                                 | 2283          |
| 11 | MALTEPE       | 255                                 | 52                                     | 15                                  | 1118                         | 1440                 | 3413                          | 237                               | 322          | 22,4                            | 763                            | 53                                  | 10335         |
| 12 | MİTHATPAŞA    | 549                                 | 170                                    | 36                                  | 1123                         | 1878                 | 4487                          | 386                               | 755          | 40,2                            | 1804                           | 155                                 | 10965         |
| 13 | ORTA          | 121                                 | 102                                    | 61                                  | 305                          | 589                  | 1599                          | 1049                              | 284          | 48,2                            | 771                            | 506                                 | 2629          |
| 14 | OZANLAR       | 206                                 | 201                                    | 24                                  | 236                          | 667                  | 2285                          | 135                               | 431          | 64,6                            | 1477                           | 87                                  | 5219          |
| 15 | PAPUÇÇULAR    | 183                                 | 80                                     | 8                                   | 127                          | 398                  | 1141                          | 328                               | 271          | 68,1                            | 777                            | 223                                 | 2238          |
| 16 | SAKARYA       | 293                                 | 157                                    | 3                                   | 334                          | 787                  | 2133                          | 193                               | 453          | 57,6                            | 1228                           | 111                                 | 4366          |
| 17 | SEMERÇİLER    | 209                                 | 95                                     | 25                                  | 339                          | 668                  | 2150                          | 2380                              | 329          | 49,3                            | 1059                           | 1172                                | 3738          |
| 18 | ŞEKER         | 603                                 | 317                                    | 62                                  | 317                          | 1299                 | 3346                          | 236                               | 982          | 75,6                            | 2529                           | 178                                 | 11078         |
| 19 | ŞİRİNEVLER    | 85                                  | 34                                     | 7                                   | 261                          | 387                  | 1033                          | 148                               | 126          | 32,6                            | 336                            | 48                                  | 2017          |
| 20 | TEKELER       | 159                                 | 145                                    | 1                                   | 239                          | 544                  | 1193                          | 300                               | 305          | 56,1                            | 669                            | 168                                 | 3529          |
| 21 | TEPEKUM       | 128                                 | 29                                     | 9                                   | 796                          | 962                  | 2297                          | 309                               | 166          | 17,3                            | 396                            | 53                                  | 6164          |
| 22 | TİĞÇİLAR      | 149                                 | 142                                    | 26                                  | 61                           | 378                  | 1471                          | 1179                              | 317          | 83,9                            | 1234                           | 989                                 | 1573          |
| 23 | TUZLA         | 104                                 | 58                                     | 11                                  | 238                          | 411                  | 641                           | 202                               | 173          | 42,1                            | 270                            | 85                                  | 2620          |
| 24 | YAĞÇILAR      | 470                                 | 145                                    | 59                                  | 1379                         | 2053                 | 4308                          | 691                               | 674          | 32,8                            | 1414                           | 227                                 | 11668         |
| 25 | YAHYALAR      | 230                                 | 97                                     | 37                                  | 241                          | 605                  | 1826                          | 592                               | 364          | 60,2                            | 1099                           | 356                                 | 3631          |
| 26 | YENİCAMİ      | 66                                  | 18                                     | 3                                   | 146                          | 233                  | 541                           | 78                                | 87           | 37,3                            | 202                            | 29                                  | 1287          |
| 27 | YENİGÜN       | 563                                 | 220                                    | 43                                  | 717                          | 1543                 | 4158                          | 504                               | 826          | 53,5                            | 2226                           | 270                                 | 9221          |
| 28 | YENİDOĞAN     | 114                                 | 75                                     | 8                                   | 144                          | 341                  | 1061                          | 113                               | 197          | 613                             | 65                             | 2109                                |               |
|    | <b>TOTAL</b>  | <b>5895</b>                         | <b>3030</b>                            | <b>706</b>                          | <b>11240</b>                 | <b>20871</b>         | <b>52882</b>                  | <b>13243</b>                      | <b>9631</b>  | <b>46,1</b>                     | <b>24403</b>                   | <b>6111</b>                         | <b>124592</b> |



**Table B.3. Impacts of disaster on manufacturing industry in the affected region**

Source. TURKSTAT, 2001; 24

| Provinces      | Total number of businesses | Number of businesses stopped production | Number of damaged businesses | Number of businesses with insurance | Businesses achieving normal level of production capacity within a month |                | Businesses achieving normal level of production capacity more than a month |                 | Number of businesses with decreasing export | Number of businesses with decreasing import | Number of businesses whose employees affected from disaster |
|----------------|----------------------------|-----------------------------------------|------------------------------|-------------------------------------|-------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------|-----------------|---------------------------------------------|---------------------------------------------|-------------------------------------------------------------|
|                |                            |                                         |                              |                                     | Number of businesses                                                    | Number of days | Number of businesses                                                       | Number of weeks |                                             |                                             |                                                             |
| Bolu           | 233                        | 185                                     | 109                          | 140                                 | 81                                                                      | 18             | 87                                                                         | 14              | 32                                          | 18                                          | 22                                                          |
| Kocaeli        | 690                        | 590                                     | 420                          | 476                                 | 238                                                                     | 14             | 249                                                                        | 19              | 78                                          | 62                                          | 180                                                         |
| <b>Sakarya</b> | <b>218</b>                 | <b>208</b>                              | <b>185</b>                   | <b>26</b>                           | <b>39</b>                                                               | <b>20</b>      | <b>153</b>                                                                 | <b>20</b>       | <b>39</b>                                   | <b>22</b>                                   | <b>115</b>                                                  |
| Yalova         | 45                         | 42                                      | 35                           | 27                                  | 6                                                                       | 15             | 36                                                                         | 19              | 15                                          | 10                                          | 33                                                          |
| Total          | 1186                       | 1025                                    | 749                          | 581                                 | 364                                                                     | 16             | 525                                                                        | 18              | 164                                         | 111                                         | 350                                                         |

**Table B.4. Distribution of affected employees within manufacturing sector according to education level and provinces in the affected region**

Source. TURKSTAT, 2001; 24

| Provinces            | Number of employees before disaster | Number of affected employees | Distribution of affected employees |                  |                  |                    |                    |            | Education level of affected employees |             |            |                    | Number of qualified personnel loss |
|----------------------|-------------------------------------|------------------------------|------------------------------------|------------------|------------------|--------------------|--------------------|------------|---------------------------------------|-------------|------------|--------------------|------------------------------------|
|                      |                                     |                              | Personnel died                     | Severely injured | Slightly injured | personnel migrated | Personnel laid off | Other      | Primary school                        | High school | University | Master - doctorate |                                    |
| Bolu                 | 2033                                | 308                          | 6                                  | 0                | 8                | 27                 | 87                 | 180        | 174                                   | 129         | 5          | 0                  | 85                                 |
| Technical personnel  | 233                                 | 13                           | 3                                  | 0                | 0                | 4                  | 1                  | 5          | 6                                     | 4           | 3          | 0                  | 11                                 |
| Unskilled worker     | 1613                                | 288                          | 3                                  | 0                | 8                | 22                 | 86                 | 169        | 162                                   | 124         | 2          | 0                  | 74                                 |
| Administrative staff | 187                                 | 7                            | 0                                  | 0                | 0                | 1                  | 0                  | 6          | 6                                     | 1           | 0          | 0                  | 0                                  |
| Kocaeli              | 28839                               | 1398                         | 222                                | 61               | 98               | 777                | 78                 | 162        | 921                                   | 290         | 173        | 14                 | 496                                |
| Technical personnel  | 5673                                | 268                          | 60                                 | 6                | 13               | 162                | 4                  | 23         | 101                                   | 132         | 23         | 9                  | 107                                |
| Unskilled worker     | 17705                               | 1032                         | 137                                | 50               | 75               | 580                | 66                 | 124        | 758                                   | 139         | 138        | 0                  | 356                                |
| Administrative staff | 5461                                | 98                           | 25                                 | 5                | 10121            | 35                 | 8                  | 15         | 62                                    | 19          | 12         | 5                  | 33                                 |
| <b>Sakarya</b>       | <b>1546</b>                         | <b>1134</b>                  | <b>73</b>                          | <b>29</b>        | <b>121</b>       | <b>704</b>         | <b>144</b>         | <b>63</b>  | <b>546</b>                            | <b>433</b>  | <b>152</b> | <b>3</b>           | <b>271</b>                         |
| Technical personnel  | 1883                                | 97                           | 20                                 | 2                | 21               | 40                 | 6                  | 8          | 26                                    | 30          | 41         | 0                  | 25                                 |
| Unskilled worker     | 11573                               | 933                          | 33                                 | 24               | 86               | 613                | 128                | 49         | 505                                   | 350         | 78         | 0                  | 226                                |
| Administrative staff | 1950                                | 104                          | 20                                 | 3                | 14               | 51                 | 10                 | 6          | 15                                    | 53          | 33         | 3                  | 20                                 |
| Yalova               | 5983                                | 651                          | 45                                 | 63               | 61               | 306                | 4                  | 172        | 397                                   | 203         | 50         | 1                  | 462                                |
| Technical personnel  | 524                                 | 128                          | 4                                  | 4                | 5                | 77                 | 0                  | 38         | 46                                    | 51          | 31         | 0                  | 93                                 |
| Unskilled worker     | 5000                                | 465                          | 38                                 | 58               | 52               | 219                | 3                  | 95         | 660                                   | 132         | 3          | 0                  | 36                                 |
| Administrative staff | 459                                 | 58                           | 3                                  | 1                | 4                | 10                 | 1                  | 39         | 21                                    | 20          | 16         | 1                  | 8                                  |
| <b>Total</b>         | <b>52261</b>                        | <b>3491</b>                  | <b>346</b>                         | <b>153</b>       | <b>288</b>       | <b>1814</b>        | <b>313</b>         | <b>577</b> | <b>2038</b>                           | <b>1055</b> | <b>380</b> | <b>18</b>          | <b>1314</b>                        |

**Table B.5. External financing for the earthquake (\$ millions)**

Source. OECD, 2000; 42.

| Donor                                       | Type of assistance |                             |                                    |        |        |
|---------------------------------------------|--------------------|-----------------------------|------------------------------------|--------|--------|
|                                             | Program loans      | Project loans               |                                    | Grants | Total  |
|                                             |                    | Managed by PUI (World Bank) | Managed by the implementing agency |        |        |
| <b>IMF</b>                                  | 500                | --                          | --                                 | --     | 500    |
| <b>World Bank</b>                           |                    |                             |                                    |        | 993.8  |
| <b>Import and budget finance</b>            | 252.5              | --                          | --                                 | --     | 252.5  |
| <b>MEER project finance</b>                 | --                 | 505                         | --                                 | --     | 505    |
| <b>Reallocation</b>                         | --                 | 62.5                        | 173                                | --     | 236.3  |
| <b>International Finance Corporation</b>    | --                 | --                          | 50                                 | --     | 50     |
| <b>European Investment Bank</b>             | --                 | 455                         | 152                                | --     | 607    |
| <b>Council of European Development Bank</b> | --                 | --                          | 303                                | --     | 303    |
| <b>Italy</b>                                | --                 | --                          | 18                                 | --     | 18     |
| <b>Spain</b>                                | --                 | --                          | 60                                 | --     | 60     |
| <b>Belgium</b>                              | --                 | --                          | 4                                  | --     | 4      |
| <b>Islamic Development Bank</b>             | --                 | --                          |                                    | --     | 300    |
| <b>Import trade finance</b>                 | 150                | --                          |                                    | --     | 150    |
| <b>Project finance</b>                      | --                 | --                          | 150                                | --     | 150    |
| <b>Gulf Co-operation Council</b>            | --                 | --                          | 400                                | --     | 400    |
| <b>Black Sea Trade And Development Bank</b> | --                 | --                          | 10                                 | --     | 10     |
| <b>Japan</b>                                |                    |                             |                                    |        | 450    |
| <b>Commodity loan</b>                       | 200                | --                          | --                                 | --     | 200    |
| <b>Project finance (SMEs)</b>               | --                 | --                          | 250                                | --     | 250    |
| <b>South Korea</b>                          | --                 | --                          | 30                                 | --     | 30     |
| <b>EU</b>                                   | --                 | --                          | --                                 | 35     | 35     |
| <b>Germany</b>                              | --                 | --                          | --                                 | 12     | 12     |
| <b>Total</b>                                | 1102.5             | 1022.5                      | 1600.8                             | 47     | 3772.8 |

**Table B.6. Annual distribution of additional income sources gathered after the disaster (thousand TL)**

Source. SPO, 2008.

| Type of tax                | 1999           | 2000             | 2001             | 2002             | 2003             | 2004             | 2005             | 2006             | Total             |
|----------------------------|----------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-------------------|
| Additional income tax      | 34,050         | 137,827          | 9,380            | 8,030            | 5,464            | 0                | 0                | 0                | 194,750           |
| Profit tax                 | 8              | 2,364,871        | 557,626          | 53,685           | 490              | 0                | 0                | 0                | 2,976,680         |
| Add. corporate tax         | 47,724         | 284,360          | 5,702            | 3,173            | 2,567            | 0                | 0                | 0                | 343,525           |
| Add. motor vehicle tax     | 66,119         | 97,770           | 8,463            | 4,234            | 19,844           | 0                | 0                | 0                | 196,430           |
| Add. property tax          | 3              | 93,042           | 9,823            | 6,588            | 6,009            | 0                | 0                | 0                | 115,465           |
| Add. communication tax     | 8              | 599,446          | 862,806          | 1,105,888        | 1,288,300        | 2,184,156        | 3,533,153        | 3,977,708        | 13,552,466        |
| Transac-tion tax           | 12,689         | 306,825          | 501,926          | 752,351          | 888,645          | 117,890          | 20,912           | 0                | 2,601,238         |
| Gain from military service | 0              | 406,888          | 0                | 12,976           | 0                | 0                | 0                | 0                | 419,864           |
| <b>Total</b>               | <b>160,602</b> | <b>4,291,029</b> | <b>1,956,726</b> | <b>1,946,924</b> | <b>2,211,319</b> | <b>2,302,046</b> | <b>3,554,065</b> | <b>3,977,708</b> | <b>20,400,419</b> |

**Table B.7. Urban and rural population of Turkey, Sakarya and Kocaeli**

Source. TurkStat, 2000; TurkStat, 2001a; TurkStat, 2010.

| Years | Turkey           |                    |                  | Sakarya          |                    |                  |
|-------|------------------|--------------------|------------------|------------------|--------------------|------------------|
|       | Urban population | Urbanization ratio | Rural population | Urban population | Urbanization ratio | Rural population |
| 1955  | 6.927.343        | 28,79              | 17.137.42        | 74.255           | 24,99              | 222.853          |
| 1960  | 8.859.731        | 31,92              | 18.895.08        | 111.064          | 30,68              | 250.928          |
| 1965  | 10.805.81        | 34,42              | 20.584.60        | 124.936          | 30,92              | 279.142          |
| 1970  | 13.691.10        | 38,45              | 21.914.07        | 152.277          | 33,17              | 306.775          |
| 1975  | 16.869.06        | 41,81              | 23.478.65        | 172.210          | 34,74              | 323.439          |
| 1980  | 19.645.00        | 43,91              | 25.091.95        | 195.069          | 35,55              | 353.678          |
| 1985  | 26.865.75        | 53,03              | 23.798.70        | 227.625          | 37,29              | 382.875          |
| 1990  | 33.326.35        | 59,01              | 23.146.68        | 297.759          | 43,59              | 385.302          |
| 2000  | 67.420.00        | 64,99              | 23.773.00        | 459.824          | 60,51              | 296.344          |
| 2010  | 56.222.356       | 76,26              | 17.500.632       | 646.899          | 74,11              | 225.973          |

**Table B.8. Comparison of provinces in terms of urbanization ratio (%)**

Source: TurkStat, 2000; TurkStat, 2010.

|      | Sakarya | Kocaeli | Yalova | Bolu  | Düzce |
|------|---------|---------|--------|-------|-------|
| 1990 | 43      | 62      | 64,41  | 37    | 38,67 |
| 2000 | 60,81   | 60      | 58,52  | 52    | 41,56 |
| 2010 | 74,11   | 93,57   | 68,41  | 62,66 | 57,40 |

**Table B.9. Population and population growth rate in Sakarya and Adapazarı (1955-2007)**

Source. TurkStat, 2000; TurkStat, 2007.

| Years       | Sakarya | Growth rate | % increase | Adapazarı | Growth rate | % increase |
|-------------|---------|-------------|------------|-----------|-------------|------------|
| <b>1955</b> | 297108  | 52768       | 39.11      | 135020    | 37027       | 64.11      |
| <b>1960</b> | 361992  | 64884       | 39.51      | 162508    | 27488       | 37.06      |
| <b>1965</b> | 404078  | 42086       | 22.00      | 182073    | 19565       | 22.74      |
| <b>1970</b> | 459052  | 54974       | 25.51      | 199839    | 17766       | 18.62      |
| <b>1975</b> | 495649  | 36597       | 15.34      | 223046    | 23207       | 21.97      |
| <b>1980</b> | 548747  | 53098       | 20.35      | 258561    | 35515       | 29.55      |
| <b>1985</b> | 610500  | 61753       | 21.33      | 301067    | 42506       | 30.44      |
| <b>1990</b> | 683061  | 72561       | 22.46      | 316995    | 15928       | 10.31      |
| <b>2000</b> | 756168  | 73107       | 10.17      | 340825    | 23830       | 7.25       |
| <b>2007</b> | 835222  | 79054       | 14.2       | 412994    | 72169       | 27.44      |

**Table B.10. Change of urban population for years 1990, 1997, 2000**

Source. TurkStat, 2000.

| Counties   | 1990                |                     |                       |                                   |                     | 1997                |                       |                     |                     | 2000                  |                                   |                     |                     | 1997-2000<br>Population<br>increase (%) |
|------------|---------------------|---------------------|-----------------------|-----------------------------------|---------------------|---------------------|-----------------------|---------------------|---------------------|-----------------------|-----------------------------------|---------------------|---------------------|-----------------------------------------|
|            | Urban<br>population | Total<br>population | Urbanization<br>ratio | Density of<br>total<br>population | Urban<br>population | Total<br>population | Urbanization<br>ratio | Urban<br>population | Total<br>population | Urbanization<br>ratio | Density of<br>total<br>population | Urban<br>population | Total<br>population |                                         |
| Adapazarı  | 272,039             | 316,995             | 85,81                 | 490                               | 184,013             | 354,029             | 51,98                 | 283,752             | 340,825             | 83,25                 | 624                               | 283,752             | 340,825             | % 7                                     |
| Ferizli    | 6,674               | 19,592              | 34,06                 | 102                               | 7,416               | 20,428              | 36,30                 | 12,379              | 24,383              | 50,76                 | 183                               | 12,379              | 24,383              | % 21                                    |
| Soğutüü    | 7,342               | 13,403              | 54,77                 | 95                                | 4,920               | 13,430              | 36,63                 | 7,858               | 14,316              | 54,88                 | 152                               | 7,858               | 14,316              | % 8                                     |
| Akyazı     | 19,331              | 68,071              | 28,39                 | 108                               | 23,336              | 72,483              | 32,20                 | 23,192              | 77,536              | 29,91                 | 126                               | 23,192              | 77,536              | % 6                                     |
| Geyve      | 13,405              | 41,263              | 32,48                 | 66                                | 15,752              | 42,247              | 37,29                 | 17,318              | 44,907              | 38,56                 | 62                                | 17,318              | 44,907              | % 6                                     |
| Hendek     | 24,029              | 60,268              | 39,87                 | 102                               | 24,567              | 58,901              | 41,71                 | 28,537              | 63,703              | 44,79                 | 109                               | 28,537              | 63,703              | % 7                                     |
| Karapürçek | 3,211               | 9,286               | 34,57                 | 72                                | 3,887               | 9,958               | 39,03                 | 4,186               | 11,073              | 37,8                  | 65                                | 4,186               | 11,073              | % 11                                    |
| Karasu     | 14,500              | 44,815              | 32,35                 | 105                               | 18,146              | 46,754              | 38,81                 | 24,672              | 54,630              | 45,16                 | 115                               | 24,672              | 54,630              | % 18                                    |
| Kaynarca   | 3,257               | 24,087              | 13,52                 | 69                                | 4,689               | 24,414              | 19,21                 | 5,064               | 24,339              | 20,8                  | 67                                | 5,064               | 24,339              | % 2                                     |
| Kocaali    | 10,131              | 28,405              | 35,66                 | 101                               | 13,464              | 28,205              | 47,74                 | 13,793              | 30,676              | 44,96                 | 97                                | 13,793              | 30,676              | % 11                                    |
| Pamukova   | 10,088              | 21,023              | 47,98                 | 72                                | 11,977              | 22,141              | 54,09                 | 13,200              | 24,072              | 54,83                 | 67                                | 13,200              | 24,072              | % 14                                    |
| Sapanca    | 15,542              | 25,167              | 61,75                 | 166                               | 16,373              | 28,988              | 56,48                 | 21,727              | 36,496              | 59,53                 | 307                               | 21,727              | 36,496              | % 22                                    |
| Taraklı    | 5,193               | 10,906              | 47,61                 | 33                                | 5,232               | 10,436              | 50,13                 | 4,146               | 9,212               | 45                    | 28                                | 4,146               | 9,212               | % -12                                   |
| Total      | 404,742             | 683,281             | 59,24                 |                                   | 333,772             | 732,414             | 45,57                 | 459,824             | 756,168             | 45,57                 |                                   | 459,824             | 756,168             | % 3                                     |

**Table B.11. Economic growth of Sakarya, Marmara and Turkey**

Source. SPO, 2002b; 561.

| Years          | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 1987-<br>2000 |
|----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|---------------|
| <b>Sakarya</b> | 5,7  | 1,3  | 9,7  | 0,7  | 7,2  | 3    | -0,9 | 16,6 | 8,9  | 4,7  | 4,9  | -7,4 | 10,3 | 4,8           |
| <b>Marmara</b> | 1,4  | 3,1  | 8,9  | 1,7  | 6,6  | 9,8  | -8,8 | 12   | 7,5  | 9,7  | 2,1  | -4,9 | 8,1  | 4,2           |
| <b>Turkey</b>  | 2,1  | 0,3  | 9,3  | 0,9  | 6    | 8    | -5,5 | 7,2  | 7    | 7,5  | 3,1  | -4,7 | 7,4  | 3,6           |

**Table B.12. Economic growth (million TL)**

Source. SPO, 2002b;561.

| Years | Sakarya | Sakarya (%) | Marmara Region | Marmara Region (%) | Turkey    | Turkey (%) |
|-------|---------|-------------|----------------|--------------------|-----------|------------|
| 1991  | 860264  | 0,6         | 30478035       | 1,7                | 84352834  | 0,9        |
| 1992  | 924336  | 7,3         | 32500111       | 6,6                | 89400744  | 6          |
| 1993  | 952086  | 3           | 35682706       | 9,8                | 96590373  | 8          |
| 1994  | 943518  | -0,9        | 32534143       | -8,8               | 91320726  | -5,4       |
| 1995  | 1099101 | 16,4        | 35966673       | 10,5               | 97887805  | 7,2        |
| 1996  | 1197979 | 9           | 39154509       | 8,8                | 104745161 | 7          |
| 1997  | 1253782 | 4,6         | 42962071       | 9,7                | 112631210 | 7,5        |
| 1998  | 1314815 | 4,9         | 43873080       | 2,1                | 116113609 | 3,1        |
| 1999  | 1218022 | -7,3        | 41732529       | -4,9               | 110645883 | -4,8       |
| 2000  | 1343891 | 10,3        | 45117496       | 8,1                | 118789113 | 7,3        |

**Table B.13. GDP per capita (thousand TL)**

Source. SPO, 2002a.

| Years | Turkey  | Marmara | Sakarya |
|-------|---------|---------|---------|
| 1990  | 1487082 | 2274373 | 1260199 |
| 1991  | 1472000 | 2237249 | 1243227 |
| 1992  | 1530808 | 2309062 | 1306883 |
| 1993  | 1623613 | 2455326 | 1320462 |
| 1994  | 1507540 | 2169458 | 1284175 |
| 1995  | 1587954 | 2325991 | 1468913 |
| 1996  | 1670657 | 2457502 | 1571914 |
| 1997  | 1802763 | 2684291 | 1719866 |
| 1998  | 1829755 | 2667003 | 1786007 |
| 1999  | 1719559 | 2472951 | 1641539 |
| 2000  | 1760856 | 2621463 | 1805963 |

**Table B.14. Sectoral structure and growth rate**

Source. SPO, 2002b; 561.

|             | 1987    |         |                        | 1988    |         |                        | 1989  |         |                        | 1990  |         |                        | 1991  |         |                        |
|-------------|---------|---------|------------------------|---------|---------|------------------------|-------|---------|------------------------|-------|---------|------------------------|-------|---------|------------------------|
| sector      | value   | percent | Annual growth rate (%) | value   | percent | Annual growth rate (%) | value | percent | Annual growth rate (%) | value | percent | Annual growth rate (%) | value | percent | Annual growth rate (%) |
| agriculture | 214,239 | 29,4    | 12                     | 239,944 | 31,1    | 215,615                | 27,6  | -10,1   | 221,791                | 25,9  | 2,9     | 205,468                | 23,8  | -7,4    |                        |
| industry    | 116,685 | 16      | -0,7                   | 115,849 | 15      | 131,32                 | 16,8  | 13,4    | 148,136                | 17,3  | 12,8    | 165,349                | 19,2  | 11,6    |                        |
| service     | 398,74  | 54,6    | 4,1                    | 415,232 | 53,9    | 433,934                | 55,6  | 4,5     | 486,556                | 56,6  | 12,1    | 491,347                | 57    | 1       |                        |
| total       | 729,663 | 100     | 5,7                    | 771,025 | 100     | 780,869                | 100   | 1,3     | 856,483                | 100   | 9,7     | 862,164                | 100   | 0,7     |                        |

|             | 1992    |         |                        | 1993    |         |                        | 1994    |         |                        | 1995      |         |                        | 1996      |         |                        |
|-------------|---------|---------|------------------------|---------|---------|------------------------|---------|---------|------------------------|-----------|---------|------------------------|-----------|---------|------------------------|
| sector      | value   | percent | Annual growth rate (%) | value   | percent | Annual growth rate (%) | value   | percent | Annual growth rate (%) | value     | percent | Annual growth rate (%) | value     | percent | Annual growth rate (%) |
| agriculture | 227,096 | 24,6    | 10,5                   | 209,311 | 22      | -7,8                   | 220,401 | 23,4    | 5,3                    | 227,537   | 20,7    | 3,2                    | 259,559   | 21,7    | 14,1                   |
| industry    | 170,676 | 18,5    | 3,2                    | 189,631 | 19,9    | 11,1                   | 178,261 | 18,9    | -6                     | 285,055   | 25,9    | 59,9                   | 326,298   | 27,2    | 14,5                   |
| service     | 526,564 | 57      | 7,2                    | 553,144 | 58,1    | 5                      | 544,856 | 57,7    | -1,5                   | 587,916   | 53,4    | 7,9                    | 612,122   | 51,1    | 4,1                    |
| total       | 924,336 | 100     | 7,2                    | 952,086 | 100     | 3                      | 943,518 | 100     | -0,9                   | 1,100,508 | 100     | 16,6                   | 1,197,979 | 100     | 8,9                    |

|             | 1997      |         |                        | 1998      |         |                        | 1999      |         |                        | 2000      |         |                        | 1987-2000       |  |  |
|-------------|-----------|---------|------------------------|-----------|---------|------------------------|-----------|---------|------------------------|-----------|---------|------------------------|-----------------|--|--|
| sector      | value     | percent | Annual growth rate (%) | value     | percent | Annual growth rate (%) | value     | percent | Annual growth rate (%) | value     | percent | Annual growth rate (%) | growth rate (%) |  |  |
| agriculture | 228,919   | 18,3    | -11,8                  | 268,628   | 20,4    | 17,3                   | 234,871   | 19,8    | -12,6                  | 269,214   | 20      | 14,6                   | 1,8             |  |  |
| industry    | 335,747   | 26,8    | 26,8                   | 328,897   | 25      | -2                     | 294,555   | 24,2    | -10,4                  | 349,484   | 26      | 18,6                   | 8,8             |  |  |
| service     | 689,117   | 55      | 55                     | 717,290   | 54,6    | 4,1                    | 688,596   | 56,5    | -4                     | 725,193   | 54      | 5,3                    | 4,7             |  |  |
| total       | 1,253,782 | 100     | 100                    | 1,314,815 | 100     | 4,9                    | 1,218,022 | 100     | -7,4                   | 1,343,891 | 100     | 10,3                   | 4,8             |  |  |

**Table B.15. Distribution of employment among sectors**

Source. TurkStat, web page, last achieved in March 2011

|         | Agriculture (%) |      | Industry (%) |      | Service (%) |      |
|---------|-----------------|------|--------------|------|-------------|------|
|         | 1990            | 2000 | 1990         | 2000 | 1990        | 2000 |
| Turkey  | 48,3            | 15   | 13,3         | 31   | 38,4        | 54   |
| Marmara | 46,1            | 5    | 13,1         | 39   | 40,8        | 56   |
| Sakarya | 63,1            | 52   | 11,3         | 13   | 25,6        | 35   |

**Table B.16. Number of establishments and annual average number of persons engaged**

Source. TurkStat, 1992 and 2002.

| Years    | Number of establishments |           | Annual average number of persons engaged |           |
|----------|--------------------------|-----------|------------------------------------------|-----------|
|          | 1992                     | 2002      | 1992                                     | 2002      |
| Sakarya  | 13 186                   | 20 471    | 27 916                                   | 60 974    |
| Kocaeli  | 18 593                   | 34 447    | 45 165                                   | 167 504   |
| Yalova   | --                       | 6 052     | --                                       | 18 337    |
| Bolu     | 9 178                    | 7 262     | 22 002                                   | 25 573    |
| Düzce    | --                       | 8 040     | --                                       | 28 650    |
| Bursa    | 41 946                   | 77 102    | 107 253                                  | 323 831   |
| Istanbul | 216 058                  | 347 617   | 672 336                                  | 1 781 934 |
| Turkey   | 1 063 738                | 1 858 191 | 2 746 566                                | 6 497 040 |

**Table B.17. Number of establishments and annual average number of persons engaged in Sakarya**

Source. TurkStat, 1980, 1985, 1992 and 2002.

| Years   | Number of establishments |        |        |        | Annual average number of persons engaged |        |        |        |
|---------|--------------------------|--------|--------|--------|------------------------------------------|--------|--------|--------|
|         | 1980                     | 1985   | 1992   | 2002   | 1980                                     | 1985   | 1992   | 2002   |
| Sakarya | 2 175                    | 12 500 | 13 186 | 20 471 | 5 336                                    | 29 033 | 27 916 | 60 974 |



**Table B.18. Number of establishments, annual average number of persons engaged by economic activity branches for the years 1992 and 2002**

Source. TurkStat, 1992 and 2002.

|                | Number of establishments |               | Annual average number of persons engaged |               |
|----------------|--------------------------|---------------|------------------------------------------|---------------|
|                | 1992                     | 2002          | 1992                                     | 2002          |
| <b>Sakarya</b> | <b>13 186</b>            | <b>20 471</b> | <b>27 916</b>                            | <b>60 974</b> |
| 14             | 8                        | 23            | 69                                       | 149           |
| 15             | 197                      | 377           | 833                                      | 3 440         |
| 17             | 77                       | 163           | 132                                      | 2 092         |
| 18             | 254                      | 316           | 369                                      | 733           |
| 19             | 28                       | 29            | 80                                       | 158           |
| 20             | 281                      | 435           | 769                                      | 1 249         |
| 21             | 6                        | 8             | 17                                       | 153           |
| 22             | 61                       | 68            | 117                                      | 216           |
| 24             | 12                       | 30            | 35                                       | 1 016         |
| 25             | 12                       | 89            | 62                                       | 1 444         |
| 26             | 65                       | 119           | 164                                      | 661           |
| 27             | 15                       | 46            | 45                                       | 386           |
| 28             | 361                      | 366           | 747                                      | 1 355         |
| 29             | 66                       | 253           | 234                                      | 1 174         |
| 31             | 13                       | 41            | 46                                       | 1 174         |
| 32             | 1                        | 7             | 5                                        | (*)           |
| 33             | 10                       | 16            | 38                                       | 30            |
| 34             | 17                       | 77            | 83                                       | 3 325         |
| 35             | 4                        | 2             | 8                                        | (*)           |
| 36             | 378                      | 294           | 1005                                     | 1 132         |
| 40             | 4                        | 18            | ---                                      | 1 007         |
| 41             | 25                       | 37            | 1 376                                    | 226           |
| 45             | 126                      | 234           | 523                                      | 2 127         |
| 50             | 1416                     | 1 933         | 14541                                    | 4 235         |
| 51             | 386                      | 690           | 1098                                     | 3 305         |
| 52             | 6163                     | 7 795         | 10239                                    | 13 645        |
| 55             | 1706                     | 2 431         | ---                                      | 4 544         |
| 60             | 195                      | 2 185         | 326                                      | 3 132         |
| 63             | 32                       | 57            | 74                                       | 128           |
| 64             | ---                      | 58            | ---                                      | 1 185         |
| 65             | ---                      | 91            | ---                                      | 745           |
| 67             | 17                       | 42            | 35                                       | 122           |
| 70             | 43                       | 85            | 58                                       | 116           |
| 71             | ---                      | 9             | ---                                      | 14            |
| 72             | 2                        | 20            | 4                                        | 27            |
| 74             | 446                      | 677           | 837                                      | 1 872         |
| 80             | 20                       | 59            | 151                                      | 717           |
| 82             | 17                       | ---           | 35                                       | ---           |
| 83             | 421                      | ---           | 794                                      | ---           |
| 85             | 164                      | 327           | 264                                      | 819           |
| 92             | 63                       | 196           | ---                                      | 370           |
| 93             | 512                      | 761           | 415                                      | 1 150         |
| 95             | 2 058                    | ---           | 3 639                                    | ---           |

Note. (--) shows irrelevant number for the given year. (\*) denotes private number for the given sector.

**Table B.19. Number of local units and employment by economic activity sections, district and SRE – 2002**

Source. TurkStat, 2002.

|                                              | Total                 |               | C                     |            | D                     |               | E                     |              | F                     |              | G                     |               |
|----------------------------------------------|-----------------------|---------------|-----------------------|------------|-----------------------|---------------|-----------------------|--------------|-----------------------|--------------|-----------------------|---------------|
|                                              | Number of local units | Employment    | Number of local units | Employment | Number of local units | Employment    | Number of local units | Employment   | Number of local units | Employment   | Number of local units | Employment    |
| TURKİYE                                      | 1 858 191             | 6 497 040     | 2 410                 | 77 027     | 272 482               | 2 183 286     | 4 206                 | 96 430       | 35 749                | 224 874      | 867 890               | 1 876 525     |
| İSTANBUL                                     | 347 617               | 1 781 934     | 213                   | 5 405      | 67 723                | 719 716       | 71                    | 14 659       | 6 862                 | 45 867       | 165 260               | 465 874       |
| TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova) | 76 272                | 301 038       | 89                    | 813        | 10 254                | 126 521       | 158                   | 4 041        | 1 360                 | 13 343       | 35 437                | 77 170        |
| TR421 KOCAELİ TOPLAM                         | 34 447                | 167 504       | 40                    | 451        | 4 683                 | 76 204        | 38                    | 1 989        | 822                   | 10 105       | 15 328                | 35 513        |
| <b>TR422 SAKARYA TOPLAM</b>                  | <b>20 471</b>         | <b>60 974</b> | <b>24</b>             | <b>150</b> | <b>2 741</b>          | <b>21 337</b> | <b>55</b>             | <b>1 233</b> | <b>234</b>            | <b>2 127</b> | <b>10 418</b>         | <b>21 185</b> |
| ADAPAZARI                                    | 11 707                | 41 989        | 13                    | 91         | 1 661                 | 15 647        | 12                    | 955          | 174                   | 1 922        | 6 223                 | 14 110        |
| FERİZLİ                                      | 488                   | 941           | 2                     | (*)        | 52                    | 164           | 4                     | 14           | 1                     | (*)          | 243                   | 416           |
| SOĞUTLU                                      | 206                   | 348           | -                     | -          | 22                    | 68            | 2                     | (*)          | -                     | -            | 93                    | 124           |
| AKYAZI                                       | 1 852                 | 5 712         | 3                     | 20         | 270                   | 2 829         | 6                     | 32           | 7                     | 11           | 907                   | 1 598         |
| GEYVE                                        | 895                   | 2 206         | 1                     | (*)        | 137                   | 832           | 3                     | 26           | 3                     | 4            | 435                   | 715           |
| HENDEK                                       | 1 676                 | 2 860         | 2                     | (*)        | 165                   | 534           | 7                     | 63           | 18                    | 31           | 674                   | 1 197         |
| KARAPURÇEK                                   | 223                   | 481           | -                     | -          | 25                    | 204           | 2                     | (*)          | 1                     | (*)          | 88                    | 123           |
| KARASU                                       | 1 059                 | 2 007         | 1                     | (*)        | 148                   | 370           | 6                     | 38           | 7                     | 16           | 552                   | 940           |
| KAYNARCA                                     | 488                   | 713           | -                     | -          | 42                    | 67            | 2                     | (*)          | 3                     | 5            | 227                   | 346           |
| KOCAALI                                      | 500                   | 1 030         | -                     | -          | 48                    | 97            | 3                     | 32           | 6                     | 62           | 273                   | 498           |
| PAMUKOVA                                     | 512                   | 949           | -                     | -          | 59                    | 155           | 2                     | (*)          | 1                     | (*)          | 287                   | 417           |
| SAPANCA                                      | 714                   | 1 512         | 2                     | (*)        | 89                    | 335           | 4                     | 27           | 12                    | 72           | 342                   | 580           |
| TARAKLI                                      | 151                   | 226           | -                     | -          | 23                    | 35            | 2                     | (*)          | 1                     | (*)          | 74                    | 121           |
| TR423 DÜZCE                                  | 8 040                 | 28 650        | 11                    | 110        | 1 031                 | 11 366        | 20                    | 236          | 124                   | 483          | 3 648                 | 7 911         |
| TR424 BOLU                                   | 7 262                 | 25 573        | 12                    | 98         | 1 170                 | 11 478        | 22                    | 267          | 69                    | 230          | 3 227                 | 6 333         |
| TR425 YALOVA                                 | 6 052                 | 18 337        | 2                     | (*)        | 629                   | 6 136         | 23                    | 316          | 111                   | 398          | 2 816                 | 6 228         |

**Table B.19. Number of local units and employment by economic activity sections, district and SRE-2002 (cont.)**

| İLÇE                                         | H                     |              | I                     |              | J                     |            | K                     |              | M                     |            | N                     |            | O                     |              |
|----------------------------------------------|-----------------------|--------------|-----------------------|--------------|-----------------------|------------|-----------------------|--------------|-----------------------|------------|-----------------------|------------|-----------------------|--------------|
|                                              | Number of local units | Employment   | Number of local units | Employment   | Number of local units | Employment | Number of local units | Employment   | Number of local units | Employment | Number of local units | Employment | Number of local units | Employment   |
| TURKİYE                                      | 174 199               | 545 167      | 270 517               | 612 814      | 14 303                | 183 169    | 95 971                | 339 502      | 6 695                 | 79 129     | 33 383                | 101 193    | 80 386                | 177 924      |
| İSTANBUL                                     | 28 198                | 121 788      | 27 700                | 126 503      | 3 792                 | 72 815     | 23 454                | 113 883      | 1 340                 | 19 388     | 6 437                 | 27 973     | 16 567                | 48 063       |
| TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova) | 8 017                 | 23 185       | 12 235                | 26 588       | 512                   | 4 206      | 3 270                 | 11 732       | 253                   | 3 114      | 1 231                 | 3 303      | 3 456                 | 7 022        |
| TR421 KOCAELİ                                | 3 422                 | 11 971       | 5 937                 | 14 166       | 223                   | 2 189      | 1 584                 | 7 389        | 138                   | 1 855      | 549                   | 1 786      | 1 683                 | 3 886        |
| <b>TR422 SAKARYA</b>                         | <b>2 431</b>          | <b>4 544</b> | <b>2 300</b>          | <b>4 445</b> | <b>133</b>            | <b>867</b> | <b>791</b>            | <b>2 029</b> | <b>59</b>             | <b>717</b> | <b>327</b>            | <b>819</b> | <b>958</b>            | <b>1 521</b> |
| <b>ADAPAZARI</b>                             | <b>1 091</b>          | <b>2 318</b> | <b>1 061</b>          | <b>2 594</b> | <b>82</b>             | <b>646</b> | <b>597</b>            | <b>1 637</b> | <b>41</b>             | <b>575</b> | <b>240</b>            | <b>656</b> | <b>512</b>            | <b>838</b>   |
| FERİZLİ                                      | 98                    | 162          | 44                    | 59           | 3                     | 17         | 7                     | 10           | 1                     | (*)        | 8                     | 21         | 25                    | 42           |
| SOĞUTLU                                      | 48                    | 60           | 15                    | 26           | 6                     | 19         | 3                     | 4            | 1                     | (*)        | 5                     | 8          | 11                    | 21           |
| AKYAZI                                       | 260                   | 539          | 232                   | 291          | 14                    | 64         | 43                    | 96           | 5                     | 30         | 19                    | 53         | 86                    | 149          |
| GEYVE                                        | 127                   | 214          | 108                   | 275          | 12                    | 35         | 15                    | 27           | -                     | -          | 2                     | (*)        | 52                    | 75           |
| HENDEK                                       | 197                   | 289          | 484                   | 516          | 4                     | 13         | 36                    | 86           | 2                     | (*)        | 12                    | 18         | 75                    | 99           |
| KARAPÜRÇEK                                   | 41                    | 52           | 52                    | 62           | 1                     | (*)        | 2                     | (*)          | 1                     | (*)        | -                     | -          | 10                    | 16           |
| KARASU                                       | 187                   | 298          | 29                    | 68           | 6                     | 36         | 35                    | 68           | 4                     | (**)       | 15                    | 23         | 69                    | 104          |
| KAYNARCA                                     | 84                    | 101          | 97                    | 112          | 3                     | 20         | 6                     | 9            | 1                     | (*)        | 5                     | 5          | 18                    | 28           |
| KOCAALI                                      | 97                    | 143          | 28                    | 109          | 1                     | (*)        | 7                     | 12           | 1                     | (*)        | 4                     | (**)       | 32                    | 52           |
| PAMUKOVA                                     | 65                    | 94           | 66                    | 207          | -                     | -          | 11                    | 22           | -                     | -          | 7                     | 10         | 14                    | 28           |
| SAPANCA                                      | 116                   | 249          | 64                    | 100          | -                     | -          | 28                    | 55           | 2                     | (*)        | 9                     | 14         | 46                    | 61           |
| TARAKLI                                      | 20                    | 25           | 20                    | 26           | 1                     | (*)        | 1                     | (*)          | -                     | -          | 1                     | (*)        | 8                     | 8            |
| TR423 DÜZCE                                  | 900                   | 2 500        | 1 539                 | 3 827        | 66                    | 372        | 259                   | 807          | 19                    | 183        | 106                   | 240        | 317                   | 615          |
| TR424 BOLU                                   | 665                   | 2 595        | 1 292                 | 2 450        | 62                    | 475        | 319                   | 714          | 17                    | 155        | 143                   | 239        | 264                   | 539          |
| TR425 YALOVA                                 | 599                   | 1 575        | 1 167                 | 1 700        | 28                    | 303        | 317                   | (**)         | 20                    | 204        | 106                   | 219        | 234                   | 461          |

C - Mining and quarrying D - Manufacturing E - Electricity, gas and water supply F - Construction G - Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods H - Hotels and restaurants I - Transport, storage and communication J - Financial intermediation K - Real estate, renting and business activities M - Education N - Health and social work O - Other community, social and personal service activities

## APPENDIX C

### A SAMPLE OF BUSINESS RECOVERY QUESTIONNAIRE

#### 1999 Depremi Sonrası İşyerleri İyileşme Süreci Anketi

Anket no: .....

Anket tarihi: ...../...../2012

##### BÖLÜM-1: FİRMANIN PROFİLİ;

- Firmanın adı: .....
- Görüşülen kişinin pozisyonu: .....
- Firmanın adresi: .....
- Firmanın kuruluş yılı: .....

##### BÖLÜM-2: DEPREM ÖNCESİ VE SONRASI DURUM;

1. İşyeri sahibinin/işletmecisinin eğitim durumu:

- ☐ ilkokul    ☐ lise    ☐ üniversite    ☐ yüksek lisans/doktora

2. Deprem **öncesinde** işyerinde çalışan sayısı kaçtı? (tam zamanlı + yarı zamanlı)

- ☐ 1-4    ☐ 5-9    ☐ 10-14    ☐ 15-29    ☐ 30+

3. **Şu anda** işyerinde çalışan sayısı kaçtır? (tam zamanlı + yarı-zamanlı)

- ☐ 1-4    ☐ 5-9    ☐ 10-14    ☐ 15-29    ☐ 30+

4. Firmanız 1999 depremi **öncesinde** hangi sektörde yer almaktaydı?

☐ imalat ise:

- ☐ gıda    ☐ tekstil    ☐ mobilya    ☐ kağıt    ☐ kimya    ☐ taş    ☐ metal    ☐ makina sanayi
- ☐ inşaat ise:    ☐ konut/konut dışı yapı    ☐ malzeme veya ince inşaat
- ☐ toptan ticaret    ☐ perakende ticaret
- ☐ finans, sigorta, gayrimenkul ve emlak işleri
- ☐ toplumsal, sosyal ve kişisel hizmetler (otel, lokanta, eğlence, eğitim, sağlık,vb.)
- ☐ diğer (madencilik, tarım, balıkçılık, ulaştırma, haberleşme, altyapı sunumu)

5. Firmanız depremden **sonra** sektör veya branş değiştirdi mi?

- ☐ evet    ☐ hayır

6. Değiştirdi ise, firmanızın **bugün** çalıştığı sektörü belirtiniz;

☐ imalat ise:

☐ gıda ☐ tekstil ☐ mobilya ☐ kağıt ☐ kimya ☐ taş ☐ metal ☐ makina sanayi

☐ inşaat ise: ☐ konut/konut dışı yapı ☐ malzeme veya inçe inşaat

☐ toptan ticaret ☐ perakende ticaret

☐ finans, sigorta, gayrimenkul ve emlak işleri

☐ toplumsal, sosyal ve kişisel hizmetler (otel, lokanta, eğlence, eğitim, sağlık, vb.)

☐ diğer (madencilik, tarım, balıkçılık, ulaştırma, haberleşme, altyapı sunumu)

7. Firmanızın 1999 depremi **sırasındaki** adresini belirtiniz.

☐ Serdivan ise; .....

☐ Merkez ise; .....

☐ Erenler ise; .....

☐ Diğer ise; .....

8. Firmanızın deprem **öncesinde** faaliyet gösterdiği işyeri/yapı üzerindeki mülkiyet durumu neydi?

☐ mülk sahibi

☐ kiracı

☐ diğer

9. Firmanızın **halen** faaliyet gösterdiği yapı üzerindeki mülkiyet durumu nedir?

☐ mülk sahibi

☐ kiracı

☐ diğer

10. Depremden **önce** firmanın hitap ettiği müşteri grubu nereden gelmekteydi?

☐ aynı mahalleden

☐ tüm kentten

☐ bölgeden (civar illerden)

☐ bölge dışından

11. **Bugün** firmanın hitap ettiği müşteri grubu nereden gelmektedir?

☐ aynı mahalleden

☐ tüm kentten

☐ bölgeden (civar illerden)

☐ bölge dışından

12. Depremden **önce** firma çalışanlarının büyük çoğunluğu nerede ikamet etmekteydi?

☐ Serdivan, Hızırtepe, Maltepe'de

☐ Adapazarı'nın diğer mahallelerinde

☐ Adapazarı'nın dışında (Sakarya'nın diğer ilçeleri)

☐ Bölgede (Kocaeli, İstanbul)

13. Firma çalışanlarının büyük çoğunluğu **bugün** nerede ikamet etmektedir?

☐ Serdivan, Hızırtepe, Maltepe'de

☐ Karaman, Korucuk, Camili'de

☐ Adapazarı'nın diğer mahallelerinde

☐ Adapazarı'nın dışında (Sakarya'nın diğer ilçeleri)

☐ Bölgede (Kocaeli, İstanbul)

14. Çalışanların ne kadarını aile/akraba/komşu gibi yakınlarınızdan oluşmaktadır?

☐ 1-4

☐ 5-9

☐ 10-14

☐ 15-29

☐ 30+

15. Firmanızın deprem **öncesi** ekonomik durumunu değerlendiriniz.

☐ sıkıntıda

☐ pek iyi değil

☐ iyi

☐ mükemmel

16. Firmanızın **bugün** bulunduğu alanda aynı ürünü/hizmeti sunan başka firmalar var mıdır?

☐ var

☐ yok

17. Firmanızın **bugün** bulunduğu alanda aynı sektörden diğer firmaların olmasını nasıl karşılıyorsunuz?  
☐ kesinlikle olumsuz ☐ olumsuz ☐ ne katılıyorum/ne katılmıyorum  
☐ olumlu ☐ kesinlikle olumlu

18. Firmanız 1999 depreminden başka bir doğal afet yaşadı mı?  
☐ evet, tarih, türü: ..... ☐ hayır

19. Deprem sonrasında iş faaliyetinizi sürdürmenizi sağlayacak başka yer seçim imkanlarınız var mıydı?  
☐ evet, yeri: ..... ☐ hayır

20. Firmanız 1999 Depremi **öncesinde** doğal afet tehlikelerine karşı herhangi bir önlem aldı mı?  
☐ evet ☐ hayır

21. Yanıtınız evet ise, firma 1999 Depremi **öncesi** ne tür önlem/ler aldı?  
☐ mülk, ekipman ve makinelerin sigortalanması  
☐ iş kesintisi sigortası  
☐ yapısal önlemler (güçlendirme, ekipmanın sabitlenmesi)  
☐ acil durum planı hazırlama  
☐ çalışanların deprem yönetimi konusunda eğitilmesi  
☐ bir deprem uzmanının tutulması, kontrol edilmesi  
☐ alternatif yerseçim düzenlemeleri yapma  
☐ işin sürekliliği için yedekleme yapma  
☐ diğer .....

22. Firma, 1999 Depremi **sonrasında** ne tür önlem/ler aldı?  
☐ mülk, ekipman ve makinelerin sigortalanması  
☐ iş kesintisi sigortası  
☐ yapısal önlemler (güçlendirme, ekipmanın sabitlenmesi)  
☐ acil durum planı hazırlama  
☐ çalışanların deprem yönetimi konusunda eğitilmesi  
☐ bir deprem uzmanının tutulması, kontrol edilmesi  
☐ alternatif yerseçim düzenlemeleri yapma  
☐ işin sürekliliği için yedekleme yapma  
☐ diğer .....

23. Sizinle aynı **sektörde** olup deprem nedeniyle kapandığını bildiğiniz işyerleri var mı?  
☐ evet, sayısı: ..... ☐ hayır

24. Sizinle aynı **çevrede** olup deprem nedeniyle kapandığını bildiğiniz işyerleri var mı?  
☐ evet, sayısı: ..... ☐ hayır

25. İşyeriniz deprem **sonrasında** ne kadar süre kapalı kaldı?  
☐ kapanmadı ☐ 1-3 ☐ 3-10 ☐ 10-30 ☐ 30 günden fazla ise: .....

26. İşyeriniz deprem **sonrasında** neden kapalı kaldı? Kesinti ne kadar sürdü?

|                                                                                                     |           |
|-----------------------------------------------------------------------------------------------------|-----------|
| <input type="checkbox"/> binanın yıkılması ve tamir edilmesi gereği                                 | ..... gün |
| <input type="checkbox"/> binada meydana gelen hasarın temizlenmesi ve onarılması                    | ..... gün |
| <input type="checkbox"/> binanın yapısal olarak değerlendirilmesi                                   | ..... gün |
| <input type="checkbox"/> makinelerde ve ofis ekipmanlarında hasar oluşması                          | ..... gün |
| <input type="checkbox"/> stokun zarar görmesi                                                       | ..... gün |
| <input type="checkbox"/> müşteri kaybı                                                              | ..... gün |
| <input type="checkbox"/> girdi veya aramal sağlayamama, tedarikçilerin kaybedilmesi                 | ..... gün |
| <input type="checkbox"/> çıktı, üretim veya hizmet sunamama, bağlantıların kaybedilmesi             | ..... gün |
| <input type="checkbox"/> girdi ve çıktı bağlantılarında depolama kapasitelerinin kaybedilmesi       | ..... gün |
| <input type="checkbox"/> çalışanların işe gelememesi, işgücü kaybı                                  | ..... gün |
| <input type="checkbox"/> çalışanların ücretlerinin ödenememesi                                      | ..... gün |
| <input type="checkbox"/> ulaşım sorunları (ana yollarda ve kent merkezine ulaşım)                   | ..... gün |
| <input type="checkbox"/> altyapı sorunları (elektrik, dağalgaz, su kesintileri; iletişim kopmaları) | ..... gün |
| <input type="checkbox"/> diğer .....                                                                | ..... gün |

27. İşyerinizin depremde gördüğü hasarı/ları nasıl değerlendirirsiniz? Hangisi nedeniyle iş kesintisi yaşadınız?

| Hasar türü                    | Hasar görmedi | Az hasar | Kısmi hasar | Ağır hasar | İş yapmaya engel mi?                                         |
|-------------------------------|---------------|----------|-------------|------------|--------------------------------------------------------------|
| Yapının kendisinde            | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Yapı elemanları (pencere, vb) | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Altyapı                       | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Mobilya ve ekipman            | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Makineler                     | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Stok ve girdi                 | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Yazılım, veri, kaynaklar      | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Bulunduğu alanda hasar        | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Çalışanlar                    | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Diğer.....                    | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Toplam hasarınız              | 1             | 2        | 3           | 4          | <input type="checkbox"/> evet <input type="checkbox"/> hayır |

28. Firmanız uğradığı zararı karşılamak için ne tür finansal kaynaklar kullandı?

- ☐ sigorta ☐ firma sahibinin kişisel birikimi/aile yardımı  
☐ kamu kredisi ☐ ticari kredi  
☐ işyerinin öz kaynakları, rezervi ☐ devlet yada iş dünyasından hibe almak  
☐ diğer .....

29. İşyerinizin depremde gördüğü zararı nasıl değerlendirirsiniz?

- ☐ hasar görmedi ☐ az hasar gördü  
☐ kısmen hasar gördü ☐ çok hasar gördü

30. İşinizi yürütmek için altyapı sunumunun önemini nasıl değerlendirirsiniz?

Depremden **sonra** hangisinde kesintisi/kayıp oldu? Bu durum iş yapmanızı engelledi mi?

| Altyapı      | Önemsiz | Kısmen önemli | Önemli | Kesinti/kayıp                                             | İş yapmaya engel mi?                                         |
|--------------|---------|---------------|--------|-----------------------------------------------------------|--------------------------------------------------------------|
| Elektrik     | 1       | 2             | 3      | <input type="checkbox"/> var <input type="checkbox"/> yok | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Su           | 1       | 2             | 3      | <input type="checkbox"/> var <input type="checkbox"/> yok | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Doğalgaz     | 1       | 2             | 3      | <input type="checkbox"/> var <input type="checkbox"/> yok | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Kanalizasyon | 1       | 2             | 3      | <input type="checkbox"/> var <input type="checkbox"/> yok | <input type="checkbox"/> evet <input type="checkbox"/> hayır |
| Telefon      | 1       | 2             | 3      | <input type="checkbox"/> var <input type="checkbox"/> yok | <input type="checkbox"/> evet <input type="checkbox"/> hayır |

31. Depremden sonra hangisinin kesintisi/kaybı iş yapamamanızda en çok etkili oldu?

| Altyapı      | Hasar görmedi | Az etkili | Etkili | Çok etkili |
|--------------|---------------|-----------|--------|------------|
| Elektrik     | 1             | 2         | 3      | 4          |
| Su           | 1             | 2         | 3      | 4          |
| Doğalgaz     | 1             | 2         | 3      | 4          |
| Kanalizasyon | 1             | 2         | 3      | 4          |
| Telefon      | 1             | 2         | 3      | 4          |

32. Depremden **sonra** işinizi yeniden düzenlemek için ne tür yollara başvurdunuz?

- ☐ finansman desteği alma
- ☐ işletmeyi küçültmek –işçi çıkarmak, üretimi azaltmak
- ☐ işletmeyi büyütmek –üretimi artırmak, işçi almak
- ☐ işletmeyi birleştirmek (ortaklık kurmak gibi)
- ☐ yer değiştirmek
- ☐ diğer .....

.....

33. Firmanız yer **değiştirmede** ise, bunun sebep/lerini belirtiniz.

- ☐ taşınma zorluğu
- ☐ mülkiyet durumu
- ☐ iş yoğunluğuna yakın olmak için (benzer ürün veya hizmete yakınlık; veya birlikte iş yapma olanağına yakınlık)
- ☐ müşteriye yakınlık
- ☐ işyerinin ulaşım bağımlılığı
- ☐ işyerinin altyapı bağımlılığı
- ☐ diğer .....

34. Firmanız yer değiştirdi ise, **deprem sonrasındaki** adres değişikliklerini ve tarihlerini belirtiniz.

| Adresler: | Yerdeğiştirme yılı |
|-----------|--------------------|
| 1. ....   | .....              |
| 2. ....   | .....              |
| 3. ....   | .....              |

35. Eğer firmanız yer **değiştirdi** ise, bunun sebep/lerini belirtiniz.

- ☐ bina güvensiz olduğu veya yıkıldığı için
- ☐ müşterilere ulaşmak, yakın olmak için
- ☐ girdi veya aramal sağlamak için
- ☐ çıktı, üretim veya hizmet sunmak için
- ☐ iş yoğunluğuna yakın olmak için (benzer ürün/hizmete/birlikte iş yapma olanağına yakınlık)
- ☐ çalışanlara yakın olmak için
- ☐ daha az kira gideri ödemek-mülk edinmek
- ☐ daha güvenli bir yere gitmek için
- ☐ ulaşım sorunlarından kaçmak için (ana yollar ve kent merkezindeki)
- ☐ altyapı sorunlarından kaçmak için (elektrik, doğalgaz ve su kesintileri)
- ☐ diğer .....



36. Yerdeğiştirme sürecinde geldiğiniz son durum nedir?

- ☐ Yeni konut bölgesine taşındık
- ☐ Serdivan'a taşındık
- ☐ Adapazarı kent merkezinde 2 katlı güvenli yapıya taşındık
- ☐ Adapazarı kent merkezinde eski yapımızda kaldık (.... katlı)

37. Deprem **sonrasında** karşılaştığınız temel problem nedir?

- ☐ finansman sıkıntısı
- ☐ onarım izni
- ☐ mekandan ayrılma
- ☐ müşterilerin azalması
- ☐ ulaşım sorunları
- ☐ müşterilerin görüşü
- ☐ alanda devam eden onarımlar
- ☐ diğer .....

### **BÖLÜM-3: DEĞERLENDİRME;**

38. Depremden sonra firmaya gelen müşteri sayısı;

- ☐ azaldı
- ☐ aynı kaldı
- ☐ arttı

39. Depremden sonra firmanın çalışan sayısı;

- ☐ azaldı
- ☐ aynı kaldı
- ☐ arttı

40. Depremden sonra firmanın karı;

- ☐ azaldı
- ☐ aynı kaldı
- ☐ arttı

41. Firmanın bugünkü iş durumu;

- ☐ kötüye gidiyor
- ☐ aynı kaldı
- ☐ iyiye gidiyor

42. Meydana gelebilecek bir depremi düşündüğünüzde, işinizle ilgili bundan sonraki adımınız ne olur?

- ☐ bulunduğum alanda işime devam ederim, alanı terk etmem
- ☐ taşınmayı düşünürüm

43. Bundan sonra taşınmayı düşündüğünüz alan varsa neresi olmasını istersiniz?

- ☐ Serdivan
- ☐ Karaman, Korucuk, Camili
- ☐ Adapazarı'nın diğer mahalleleri ve kent merkezi
- ☐ Adapazarı'nın dışı (Sakarya'nın diğer ilçeleri:.....)
- ☐ Bölge içinde başka bir il:.....
- ☐ Bölge dışında başka bir il:.....

44. **Yeni konut oluşumunun** (Karaman, Korucuk, Camili) işiniz üzerindeki etkisini nasıl değerlendirirsiniz?

- ☐ kesinlikle olumsuz
- ☐ olumsuz
- ☐ etkisiz
- ☐ olumlu
- ☐ kesinlikle olumlu

45. Adapazarı merkezdeki yapılarda **iki kat sınırlamasının** işiniz üzerindeki etkisini nasıl değerlendirirsiniz?

- ☐ kesinlikle olumsuz
- ☐ olumsuz
- ☐ etkisiz
- ☐ olumlu
- ☐ kesinlikle olumlu

## QUESTIONNAIRE ON BUSINESS RECOVERY PROCESS AFTER 1999 EARTHQUAKE

Number: .....

Date: ...../...../2012

### PART-1: FIRM PROFILE;

- Name of the firm: .....
- Position of the respondent: .....
- Address of the firm: .....
- Foundation date of the firm: .....

### PART-2: PRE- AND POST-DISASTER CONDITION;

1. Indicate the education level of the firm owner /manager:  
☐ primary school    ☐ high school    ☐ university    ☐ master/PhD
2. How many employees have been working in the business before the earthquake? (full-time + part-time)  
☐ 1-4    ☐ 5-9    ☐ 10-14    ☐ 15-29    ☐ 30+
3. How many employees work in the business in present? (full-time+part-time)  
☐ 1-4    ☐ 5-9    ☐ 10-14    ☐ 15-29    ☐ 30+
4. In which sector did the firm operate before the earthquake?  
☐ manufacturing;  
    ☐ food    ☐ textile    ☐ furniture    ☐ paper    ☐ chemicals    ☐ non-metalic products  
    ☐ basic metal    ☐ fabricated metal and machinery  
☐ construction:    ☐ residential and non-residential    ☐ equipment  
☐ wholesale trade    ☐ retail trade  
☐ financial intermediation, insurance, real estate, renting and business activities  
☐ community, social and personal service activities(hotels and restaurants, education, health and social work)  
☐ other (mining and quarry, agriculture, transport, storage and communication, electricity, water and gas supply)
5. Did your firm change sector after the earthquake?  
☐ yes    ☐ no
6. If yes, please indicate the sector in which the firm operate after the earthquake?  
☐ manufacturing;  
    ☐ food    ☐ textile    ☐ furniture    ☐ paper    ☐ chemicals    ☐ non-metalic products  
    ☐ basic metal    ☐ fabricated metal and machinery  
☐ construction:    ☐ residential and non-residential    ☐ equipment  
☐ wholesale trade    ☐ retail trade  
☐ financial intermediation, insurance, real estate, renting and business activities

- ☐ community, social and personal service activities(hotels and restaurants, education, health and social work)
- ☐ other (mining and quarry, agriculture, transport, storage and communication, electricity, water and gas supply)

7. What was the firm's address prior to disaster?

.....  
 .....

8. What was the firm's occupancy status?

- ☐ owner
- ☐ renter
- ☐ other

9. What is the firm's occupancy status?

- ☐ owner
- ☐ renter
- ☐ other

10. Where did the customers come from to the firm before the earthquake?

- ☐ from the same neighbourhood
- ☐ from the entire city
- ☐ from the region
- ☐ out of the region

11. Where do the customers come from to the firm in present (if available, thinking about the new address)?

- ☐ from the same neighbourhood
- ☐ from the entire city
- ☐ from the region
- ☐ out of the region

12. Where did the employees come from to the firm before the earthquake?

- ☐ from Serdivan, Hizirtepe, Maltepe
- ☐ from the other neighbourhoods of Adapazarı
- ☐ out of Adapazarı (counties of Sakarya)
- ☐ from the region (Kocaeli, İstanbul)

13. Where do the employees come from to the firm in present?

- ☐ from Serdivan, Hizirtepe, Maltepe
- ☐ from Karaman, Korucuk, Camili
- ☐ from the other neighbourhoods of Adapazarı
- ☐ out of Adapazarı (counties of Sakarya)
- ☐ from the region (Kocaeli, İstanbul)

14. Indicate the number of employees that are also the family member or relative of the firm owner or manager.

- ☐ 1-4
- ☐ 5-9
- ☐ 10-14
- ☐ 15-29
- ☐ 30+

15. How was the firm's pre-disaster condition before the earthquake?

- ☐ in trouble
- ☐ not doing well
- ☐ good
- ☐ excellent

16. Are there any firms within your market area selling the same good or service which is same as your firm?

- ☐ too many in the same area
- ☐ not in the same locality

17. What is your opinion about the existence of firms selling the same good or service within your market area?

- ☐ absolutely negative      ☐ negative      ☐ no effect on  
☐ positive      ☐ absolutely positive

18. Did the firm have any other location alternatives apart from this site?

- ☐ yes, where .....      ☐ no

19. Has the firm experienced any disaster previously?

- ☐ yes, date and type of disaster; .....      ☐ no

20. Has the firm ever taken preventive measures before the disaster?

- ☐ yes      ☐ no

21. If yes, what kind of prevention measures did the firm take before the 1999 earthquake?

- ☐ insurance for property, equipment and machinery  
☐ business interruption insurance  
☐ structural measures (retrofitting, fixing equipment)  
☐ preparation of emergency plan  
☐ training employees for disaster risk management  
☐ hiring a disaster manager  
☐ making alternative location choices  
☐ building of redundancy into business  
☐ other .....

22. What kind of prevention measures does the firm take after the 1999 Earthquake?

- ☐ insurance for property, equipment and machinery  
☐ business interruption insurance  
☐ structural measures (retrofitting, fixing equipment)  
☐ preparation of emergency plan  
☐ training employees for disaster risk management  
☐ hiring a disaster manager  
☐ making alternative location choices  
☐ building of redundancy into business  
☐ other .....

23. Do you know any firms that were in the same sector with your firm had to be closed after the earthquake?

- ☐ yes, number; .....      ☐ no

24. Do you know any firms that were in the same location with your firm had to be closed after the earthquake?

- ☐ yes, number; .....      ☐ no

25. How many days does the firm stay closed after the disaster?

- ☐ not closed      ☐ 1-3      ☐ 3-10      ☐ 10-30      ☐ more than 30 days;.....

26. Why does the firm stay closed after the disaster?

|                                                                                                   |            |
|---------------------------------------------------------------------------------------------------|------------|
| <input type="checkbox"/> due to building declared unsafe and need repair                          | ..... days |
| <input type="checkbox"/> due to need to clean up damage to interior and contents of building      | ..... days |
| <input type="checkbox"/> due to building needed to be structurally assessed                       | ..... days |
| <input type="checkbox"/> due to loss of machinery or office equipment                             | ..... days |
| <input type="checkbox"/> due to loss of stock                                                     | ..... days |
| <input type="checkbox"/> due to lack of customers                                                 | ..... days |
| <input type="checkbox"/> due to not get supplies or input materials                               | ..... days |
| <input type="checkbox"/> due to not deliver outputs or services                                   | ..... days |
| <input type="checkbox"/> due to loss of storage capacities of input-output relations              | ..... days |
| <input type="checkbox"/> due to employees unable to get to work                                   | ..... days |
| <input type="checkbox"/> due to transportation problems (for main motorways and city center)      | ..... days |
| <input type="checkbox"/> due to infrastructure problems (electricity, gas, water supply problems) | ..... days |
| <input type="checkbox"/> other .....                                                              | ..... days |

27. How was the firm affected from the disaster?

| Type of damage                                     | No damage | Light damage | Moderate damage | Heavy damage | Obstacle for business continuity?                        |
|----------------------------------------------------|-----------|--------------|-----------------|--------------|----------------------------------------------------------|
| damage to building                                 | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| nonstructural damage (windows, lights, partitions) | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| damage to infrastructure                           | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| damage to furniture and equipment                  | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| Damage to machinery                                | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| damage on stock or inventory                       | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| damage to utility (data, etc.)                     | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| damage on site                                     | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| injury to employees                                | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| other .....                                        | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |
| Total damage                                       | 1         | 2            | 3               | 4            | <input type="checkbox"/> yes <input type="checkbox"/> no |

28. What was your source of finance for damage?

- ☐ insurance  
☐ commercial loan  
☐ out-of-pocket  
☐ other .....
- ☐ loan (public)  
☐ business reserves – self-insurance  
☐ donations from state or business environment

29. How did you define the disruptiveness of the disaster on the business?

- ☐ not at all disruptive  
☐ moderately disruptive
- ☐ not very disruptive  
☐ very disruptive

30. Please indicate the importance of lifeline services for your businesses.

Which type of lifeline was interrupted due to the earthquake? Did the outage lead to business disruption?

| Infrastructure | Not important | Important | Very important | Loss/outage                                              | Obstacle for business continuity?                        |
|----------------|---------------|-----------|----------------|----------------------------------------------------------|----------------------------------------------------------|
| Electricity    | 1             | 2         | 3              | <input type="checkbox"/> yes <input type="checkbox"/> no | <input type="checkbox"/> yes <input type="checkbox"/> no |
| Water          | 1             | 2         | 3              | <input type="checkbox"/> yes <input type="checkbox"/> no | <input type="checkbox"/> yes <input type="checkbox"/> no |
| Sewer          | 1             | 2         | 3              | <input type="checkbox"/> yes <input type="checkbox"/> no | <input type="checkbox"/> yes <input type="checkbox"/> no |
| Phone          | 1             | 2         | 3              | <input type="checkbox"/> yes <input type="checkbox"/> no | <input type="checkbox"/> yes <input type="checkbox"/> no |

31. Which type of lifeline was interrupted due to the earthquake? Did the outage lead to business discontinuity?

| Infrastructure | No damage | Not very disruptive | Disruptive | Very disruptive |
|----------------|-----------|---------------------|------------|-----------------|
| Electricity    | 1         | 2                   | 3          | 4               |
| Water          | 1         | 2                   | 3          | 4               |
| Sewer          | 1         | 2                   | 3          | 4               |
| Phone          | 1         | 2                   | 3          | 4               |

32. What did you do to recover the business after the earthquake?

- ☐ taking financial support
- ☐ shrinking the entity
- ☐ enlarging the entity
- ☐ merging the entity
- ☐ changing sector
- ☐ relocation
- ☐ other .....

33. If the firm did not relocate, please indicate the reasons for non-relocation?

- ☐ difficulty of relocation
- ☐ ownership status
- ☐ need to be close to business agglomeration
- ☐ dependency to customers
- ☐ dependency to transportation
- ☐ dependency to infrastructure
- ☐ other .....

34. If the firm relocated, please indicate the addresses and dates of relocation.

| Addresses:       | Date of relocation |
|------------------|--------------------|
| 1. ....<br>..... | .....              |
| 2. ....<br>..... | .....              |
| 3. ....<br>..... | .....              |

35. If the firm relocated, what were the reasons for relocation?

- ☐ destruction of building and essential repairs
- ☐ need to be close customers
- ☐ need to get supplies or input materials
- ☐ need to deliver outputs or services
- ☐ need to be close to business agglomeration
- ☐ need to be close to employees
- ☐ reduce rent or possess an estate
- ☐ settle in a safer location
- ☐ depart from transportation and accessibility problems
- ☐ depart from infrastructure problems (electricity, gas, water supply problems)
- ☐ other .....

36. What are the most crucial problems that your firm faced after the earthquake?
- |                                                                    |                                                         |
|--------------------------------------------------------------------|---------------------------------------------------------|
| <input type="checkbox"/> financial problems                        | <input type="checkbox"/> repair permits                 |
| <input type="checkbox"/> relocation from site                      | <input type="checkbox"/> reduction of customers         |
| <input type="checkbox"/> transportation and accessibility problems | <input type="checkbox"/> customers' negative perception |
| <input type="checkbox"/> repairs and reconstruction in the area    | <input type="checkbox"/> other .....                    |

**PART-3: EVALUATION;**

37. The number of employees working in the firm;
- |                                    |                                          |                                   |
|------------------------------------|------------------------------------------|-----------------------------------|
| <input type="checkbox"/> decreased | <input type="checkbox"/> remain the same | <input type="checkbox"/> increase |
|------------------------------------|------------------------------------------|-----------------------------------|
38. The number of customers visiting the firm;
- |                                    |                                          |                                   |
|------------------------------------|------------------------------------------|-----------------------------------|
| <input type="checkbox"/> decreased | <input type="checkbox"/> remain the same | <input type="checkbox"/> increase |
|------------------------------------|------------------------------------------|-----------------------------------|
39. Business profits of the firm;
- |                                    |                                          |                                   |
|------------------------------------|------------------------------------------|-----------------------------------|
| <input type="checkbox"/> decreased | <input type="checkbox"/> remain the same | <input type="checkbox"/> increase |
|------------------------------------|------------------------------------------|-----------------------------------|
40. Present state of your business;
- |                                    |                                         |                                     |
|------------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> worse off | <input type="checkbox"/> about the same | <input type="checkbox"/> better off |
|------------------------------------|-----------------------------------------|-------------------------------------|
41. What would your next step be in case of a future disaster?
- |                                                   |                                     |
|---------------------------------------------------|-------------------------------------|
| <input type="checkbox"/> staying in the same area | <input type="checkbox"/> relocation |
|---------------------------------------------------|-------------------------------------|
42. If your answer is behalf of relocation, what would your location choice be?
- |                                                                       |
|-----------------------------------------------------------------------|
| <input type="checkbox"/> Serdivan                                     |
| <input type="checkbox"/> Karaman, Korucuk, Camili                     |
| <input type="checkbox"/> other neighbourhoods of Adapazarı            |
| <input type="checkbox"/> out of Adapazarı (other counties of Sakarya) |
| <input type="checkbox"/> another province within region:.....         |
| <input type="checkbox"/> another province out of region:.....         |
43. What is your opinion about the impacts of creation of resettlement district on your business?
- |                                              |                                   |                                       |                                   |                                              |
|----------------------------------------------|-----------------------------------|---------------------------------------|-----------------------------------|----------------------------------------------|
| <input type="checkbox"/> absolutely negative | <input type="checkbox"/> negative | <input type="checkbox"/> no effect on | <input type="checkbox"/> positive | <input type="checkbox"/> absolutely positive |
|----------------------------------------------|-----------------------------------|---------------------------------------|-----------------------------------|----------------------------------------------|
44. What is your opinion about the impacts of reduced development rights applied in the downtown on your business?
- |                                              |                                   |                                       |                                   |                                              |
|----------------------------------------------|-----------------------------------|---------------------------------------|-----------------------------------|----------------------------------------------|
| <input type="checkbox"/> absolutely negative | <input type="checkbox"/> negative | <input type="checkbox"/> no effect on | <input type="checkbox"/> positive | <input type="checkbox"/> absolutely positive |
|----------------------------------------------|-----------------------------------|---------------------------------------|-----------------------------------|----------------------------------------------|

## **VITA**

### **PERSONAL INFORMATION**

Surname, Name: Orhan, Ezgi  
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### **EDUCATION**

| <b>Degree</b>  | <b>Place</b>                           | <b>Year of Graduation</b> |
|----------------|----------------------------------------|---------------------------|
| Primary school | Yükseliş College, Ankara               | 1997                      |
| High school    | Yıldırım Beyazıt Anatolian High School | 2002                      |
| BS             | METU City and Regional Planning        | 2007                      |

### **WORK EXPERIENCE**

| <b>Year</b>  | <b>Place</b>                                                                     | <b>Enrollment</b>  |
|--------------|----------------------------------------------------------------------------------|--------------------|
| 2007-2012    | METU,<br>City and Regional Planning Department                                   | Research Assistant |
| 2008-present | DRM e-Learning Program<br>World Bank and METU-DMC,<br>Safer Cities online course | Trainer            |

### **FOREIGN LANGUAGES**

Advanced English

### **SCHOLARSHIP AND AWARDS**

|           |                                                    |
|-----------|----------------------------------------------------|
| 2007-2012 | TUBITAK 2211 National Scholarship for PhD Students |
| 2010      | METU Performance Award for PhD                     |

### **CERTIFICATES**

|      |                                                                                                                                                                             |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2012 | Certificate of Appreciation,<br>Association of European Schools of Planning and Middle East<br>Technical University, 26th AESOP Annual Congress, , Ankara, 26 July<br>2012. |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



|      |                                                                                                                                                                                                                  |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2012 | Certificate of Completion,<br>World Bank, Global Facility for Disaster Reduction and Recovery (GFDRR), "Training of Trainers for DRM e-Learning Program", İstanbul, 11-14 June 2012.                             |
| 2012 | Certificate of Attendance,<br>Pursaklar Municipality and Yıldırım Beyazıt University, "Şehirlerimizin Geleceğini Düşünmek ve Yeniden Tasarlamak", 4th Urbanism Conference, Panel and Workshop, 24-25 March 2012. |
| 2011 | Certificate of Attendance and Achievement,<br>Expropriation expertise<br>UCTEA Chamber of City Planners of Turkey                                                                                                |
| 2007 | Certificate of Attendance,<br>Intensive Program on Spatial Development Planning,<br>Università degli Studi di Milano-Bicocca, Milano, 04-19 April 2007.                                                          |

## PROJECTS

Keskinok, Ç., and Orhan, E., "Location choices of businesses in post-disaster recovery period in case of Adapazarı", TÜBİTAK 1002 Research Grant, no.111K577, project period: 01.03.2012-01.03.2013.

## PUBLICATIONS

Orhan, E., forthcoming, Building community resilience: Lessons from business preparedness in case of Adapazarı, AESOP YA 7<sup>th</sup> Young Academics Meeting: Resilience, AESOP Young Academics Network and University of Natural Resources and Applied Life Sciences, Vienna, 26<sup>th</sup> February-1<sup>st</sup> March 2013.

Orhan, E., 2012, Empirical Patterns of Long-Term Business Recovery in Case of Adapazarı, AESOP 26th Annual Congress, Middle East Technical University, Ankara, 11-15 July 2012.

Orhan, E., 2012, Location Choices of Businesses in Post-Disaster Recovery Period in Case of Adapazarı, AESOP 2012 Young Academics Network, PhD Workshop, İzmir Institute of Technology, İzmir, 6-9 July 2012.

Balamir, M., and Orhan, E., 2012, Uluslararası Afet Politikaları, Ersoy, M. (ed.) *Kentsel Planlama Ansiklopedik Sözlük*, Ninova Yayıncılık, İstanbul.

Orhan, E., 2011, Afet Sonrası İyileşme Sürecinde İşyerlerinin Yer Seçim Kararları: Adapazarı Örneği, 2<sup>nd</sup> Sempodium on Urban and Regional Researches, Proceedings Book, KBAM (Urban and Regional Research Network) and Middle East Technical University, Ankara, 8-9 December 2011.

Orhan, E., 2011, Afet Sonrası İyileşme Sürecinde İzlenen Politikaların Kentsel Gelişime Etkisi: Adapazarı Örneği, 7<sup>th</sup> Urbanism Congress, UCTEA Chamber of City Planners and Yıldız Technical University, İstanbul, 14-16 November 2011.

Orhan, E., 2010, Sınırlı Kaynaklar ve Sakınım Planlaması, 8<sup>th</sup> November World Urbanism Day 34<sup>th</sup> Colloquium: Planlamanın Dili, UCTEA Chamber of City Planners and Erciyes University, Kayseri, 8-9 November 2011.

Orhan, E., 2010, Afet Planlamasında Kaynak Kullanımının Siyasetinde Planlamanın Rolü, *Planlama*, vol. 2010/1, p.69-81, Ankara.