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READING VULNERABILITIES THROUGH URBAN PLANNING HISTORY: AN EARTHQUAKE-PRONE CITY, ADAPAZARI CASE FROM TURKEY (1)

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1. This paper gives an overview of the contextual setting and conceptual framework of the author's Ph.D. thesis (Orhan, 2012), conducted under the supervision of Prof. Dr. H. Çağatay Keskinok and Prof. Dr. Murat Balamir. The theoretical and practical debates presented in this paper through conducting a research on urban vulnerabilities contributes to the creation of a safer urban development by analysing the planning decisions, which disregard the possible impacts of natural hazards on development, particularly in developing countries such as Turkey.

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INTRODUCTION

In disaster studies, vulnerability is used to denote "the susceptibility or potential for harm to social, infrastructural, economic and ecological systems" (Pine, 2009, 136). As the nodes of critical systems of human artefacts, urban areas are vulnerable to natural hazards, and suffer losses from disasters. The vulnerability of urban areas is triggered by historical, social, political and physical factors which may pose crucial risks on the continuity of urban system. The aim of this study is to put forward the urban vulnerabilities by addressing the planning decisions which affect urban development and the degree of vulnerability.

Turkey has experienced natural disasters throughout history, but none of them with more catastrophic consequences than the 1999 Earthquake in terms of fatalities, injuries, property damages and economic losses. These results arose due to the location of seismic shock; the quake emerged in the most urbanized, populated and industrialized region of Turkey. Among the affected cities, Kocaeli, Adapazarı, Yalova, Düzce and Bolu suffered from the disaster severely due to the physical destruction. Prime Ministry Crisis Centre (2000) reported that in these cities, 17,225 people died and 23,781 people were injured. 23% of total deaths and 22% of total injuries were recorded in Sakarya Province. In addition to causalities, according to the report of OECD (Organization for Economic Co-Operation and Development), more than 213,000 housing units and 30,000 business premises were affected by the disaster (Bibbee, et al, 2000). Approximately, one third of these were heavily damaged or demolished in the affected zone. In Adapazarı city, the centre of the Sakarya Province, 49% of total housing stock and 55% of total business premises were damaged from the disaster more or less.

As tragic as it was, the earthquake provides an opportunity to evaluate the reasons of such destruction and construction of vulnerabilities by focusing on the urban spatial structure. Destructed by the earthquake and

re-shaped by the public policies, Adapazarı city reveals a significant case in discussing outcomes of planning decisions as reasons of vulnerabilities. To shed light on urban vulnerability and its reasons, this paper examines the stage of urban development according to planning policies. In doing so, the urban development of Adapazarı, as the case study of the paper is discussed within a larger context of the Marmara Region, examining the historical, political and spatial factors which constructed the urban vulnerability. These factors include dynamics of regional policies, history of urban development, and planning decisions affecting the land-use. This study focuses on the Republican State Period since the scientific and technical improvements were accelerated after 1923 in urban plans and instrumental measurements of earthquakes. First, the stage of urban development is introduced in three subsequent periods as 1923-1957, 1957-1985, and 1985-1999; later focuses on the post-1999 period. Each of the planning periods provides information about the plans considering spatial development from a critical point of view.

A THEORETICAL FRAMEWORK ON URBAN VULNERABILITY

Vulnerability is the term revealing "the exposure of physical and societal frameworks to violent events" (Albala-Bertrand, 2003, 77). For a broader definition, it 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). Vulnerability is a product of social inequalities and patterns of social relations (Hewitt, 1983; Perry, 1998) influencing the future conditions of societies (Pine, 2009) with its links to the past (Bankoff, 2004; Benson and Clay, 2004).

The political ecological approach draws the frame of vulnerability by claiming that the degree of vulnerability shows differentiations with respect to the complicated structure of social, political, and economic relations. According to the political ecological approach, vulnerability of societies varies among developed and developing countries, which is explained by Smith and Petley (2009) through the factors of population, birth rate, resource scarcity, density of cities, level of technological improvement, safety of environment, position in global economy, and aid dependency. Vulnerability of developed countries is relatively lower than developing ones which hold populations in billions, high birth rate, deficit resources, megacities, unsafe environments, fragile livelihoods, low technology, and local economy. Similarly, Bolin and Stanford (1998) make a distinction between rich and poor countries with reference to social causes and effects of disasters. Since vulnerability is accepted as a function of people's unequal exposure to risk and their unequal access to resources, the asymmetries in resource access and assets differ in rich and poor countries.

The issue of vulnerability has been an inquiry domain for researchers since the 1980s with the increasing awareness of social dimension on disaster impacts. Contrary to the functionalist approaches prior to 1980s, alternative conceptualizations took place in explaining the social milieu against risks (Orhan, 2015a). The well-known researcher criticizing the basic premises of modernity and industry society in explaining the contemporary world order is Ulrich Beck. Beck's theory claims that the industrial society is transforming into a risk society with the shift of the formerly calculable risks into calculable threats (Beck, 1992). Beck (1992) argues that this shift could not be explained by postmodernity, 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). In line with the paradigmatic shift in assumptions, various explanations and classifications were also developed 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 resistance of infrastructure and applies quantitative techniques of engineering sciences (Cutter, 1996). The basic premise in this approach is the physical occupation of hazard prone areas by settlements and human activities. Social explanation of vulnerability deals with the social resistance which occurs as a result of coping capacity of people to respond to a disaster (Blaikie et al., 1994; Wisner, 2004). In this approach, the problem is not restricted to exposure to hazards; but vulnerability is recognized as a complex issue due to the interdependency of social, economic and natural systems. Therefore, it is claimed to give priority to strengthen the social fabric, infrastructure and business enterprises' initiatives. Third approach is an integrated explanation that considers both hazard exposure and social resistance. The aim of this approach is to combine the vulnerability of exposure risk with the vulnerability of place and social response. Along with this approach, Palliyaguru et al. (2014, 50) claim that "vulnerability does not only stand for exposure to a hazard and a lack of capacity, but also it represents a series of resultant states of cultural, economic, environmental, physical, political, social, and technological under-development processes, before, during, and after a disaster". To illustrate, Burton et al. (1978 cited in Prater and Lindell, 2000) regard the vulnerability of a community as a function of three components, namely physical environment, human environment and the adjustments developed against hazards. Sharing this integrated perspective, the Hyogo Declaration (2005) highlights the concept of vulnerability by showing its physical and social 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." (UN/ISDR-United Nations International Strategy for Disaster Reduction, 2005, 6)

Leading on from the internationally accepted criteria of Hyogo Declaration and the integrated social and physical explanation, factors affecting urban vulnerability are classified into two main groups, namely socio-economic factors and physical factors to clarify the major points addressed in the case study. Recent literature emphasizes socio-economic factors of vulnerability as urban population growth (Bolin and Stanford, 1998; Quarantelli, 2003; Smith and Petley, 2009; Aubrecht et al, 2013), and inadequacy of institutional arrangements (Bolin and Stanford, 1998; Smith and Petley, 2009; Delica-Willison and Willison, 2004; Smith and Petley, 2009) which

are related to demographic, political, and cultural aspects at all level. Physical factors are related to industrial concentration (Quarantelli, 2003; Balamir, 2007), growth of informal settlements (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.

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- Earthquake and Megacities Initiative, 2007). This growth takes place mostly in developing countries that already suffer from disasters. Migration plays a significant role in population increase. 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, physical and social services, and structural densities has also accelerated the pace of vulnerability (Quarantelli, 2003; Aubrecht et al, 2013). The dense concentrations of population create more competition for natural resources with unsafe physical settings. Since the decline of welfare state from 1970s, countries have reduced their commitment to internal welfare. While state regulation has been declining, free market ideals take place in countries for almost all issues. The lack of effective central government including weak organizational structure and deficit welfare programs is crucial for construction of vulnerability. Besides, the loss of commitment of central governments, there is also limited collaboration between central and local authorities and other institutions. Although "disasters are initially local events" (Quarantelli, 2003, 211), authority and resources are not sufficiently decentralized to meet losses (EMI, 2007). In addition to inadequate institutional capacity, scarcity of financial resources and insufficient knowledge among community makes it difficult in coping with disaster risk. Since local governments do not have comprehensive rules, auditing mechanisms and adequate resources, they could not manage with urban development effectively against disaster risks.

The main feature of settlement areas is the capacity of providing added value to national economy or local population. Concentration of industry attracts more population, especially low income groups that face additional risks to their life and health by the mere fact of their poverty, and tend to locate around industrial zones and hazardous industrial sites (Quarantelli, 2003). Besides, the expansion of megacities due to population growth leads to informal housing that is highly vulnerable to disasters (Brauch, 2003). Many of the most dangerous sites, steep and unstable slopes, flood prone areas and environmentally hazardous areas are usually turned into slum areas. Inhabitants of slum areas contend with every-day risk from malnutrition, inadequate health care, substandard housing, unemployment and illiteracy (EMI, 2007). Compounded by disaster risks, they are often the most vulnerable groups to any natural hazards. Unplanned and rapid growth of cities makes it difficult to provide adequate infrastructure and basic services throughout the expanding areas. Also, the growth hampers to plan and control development, land-use, and construction. El-Masri and Tipple (2002, 159) 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". 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. The socio-economic and physical inputs increase vulnerability of cities and yield unprecedented consequences for cities against disasters.

In Turkish case, previous studies criticize the urban planning policies that increase the vulnerability of cities (Keskinok, 2001; Brauch, 2003; Gedikli, 2004; Balamir, 2007). Experiencing the 1999 Earthquake and its consequences, the affected region enables decision-makers and academicians to discuss the reasons of such destruction. According to Keskinok (2001), vulnerability of cities depends on the planning, engineering and design processes including regional policies, land-use and density decisions as well as construction quality. Thus, urban vulnerability is claimed to be related to the malpractices in regional development strategies and urbanization policies; city planning and urban growth regulation instruments as land use, micro zoning, density restriction, and development guides; and control in construction process, and design and engineering choices regarding building (Keskinok, 2001). Keskinok (2001) argues that in a country with limited resources and economic ability, risk management needs to include the steps of regional policies, land-use decisions and engineering choices without postponing solutions to the last stage. According to the study of Brauch (2003, 156) covering Mediterranean cities between 1975 and 2001, the extent of damage and fatalities caused by geophysical disasters depend mostly on vulnerability of urban centres. For Brauch (2003, 158), reasons of the vulnerable characteristics of Turkish cities are; population growth and urbanization, failure to apply existing building regulations consistently, and sites of industrial facilities. Gedikli (2004) highlights regional policies, particularly industrialization and urbanization, unsuitable land-use planning and engineering processes in order to explain the reasons of vulnerability. 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" (Gedikli, 2004, 84). Sengezer and Koc (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. Their primary criticism about Turkish planning system includes inadequacy of planning hierarchy; limited spatial concern of both central and local authorities; ineffectiveness of planning in managing disasters for a sustainable mitigation approach; inadequacy of planning tools and evaluation techniques; and politicized decision-making processes without public participation (Sengezer and Koc, 2005). Balamir (2007) defines the reasons behind rapid urbanization and vulnerability as historical factors affecting settlement decisions of societies on agricultural plains; increasing population growth resulting in a rapid and uncontrolled urbanization; improvements in construction technology accelerating construction process; additional development rights leading to increase in density of building stock; and ineffectiveness of auditing mechanisms.

METHODOLOGY

In line with the previous explanations on urban vulnerability, this study aims to find out the factors that turned the 1999 Earthquake into a catastrophe for Adapazarı city and discuss whether post-disaster planning contributed to a safer urban context. In order to answer these questions, the analysis on urban development is constructed upon different planning periods and disaster experiences of the city.

To start with the earthquake experiences, the city suffers its proximity to active fault lines. Adapazarı has experienced several earthquakes as listed in **Table 1**. On 20 June 1943, an earthquake hit Adapazarı, resulting in 346 casualties. As a result of the earthquake, 524 buildings were totally collapsed; 227 buildings were heavily, 928 buildings were moderately, and 575 buildings were slightly damaged in the city (Altun et al., 1967, 16). In 1957, an earthquake occurred with the epicentre in Bolu-Abant with a magnitude of 7.1 which damaged 187 buildings heavily and 317 buildings slightly without leading to any fatalities in Adapazarı (Altun, 1967, 16). The 1967 Earthquake caused to 5,837 heavily damaged buildings. It was reported that 81 people lost their life, 111 people were injured lightly and 113 people were injured heavily (Altun et al, 1967). Apart from residential and commercial buildings, industrial plants were damaged by the earthquake. The main building of agricultural equipment and machinery industry was collapsed including the manufacturing workshops. The wagon industry stayed closed for 10 days after the earthquake. Also, railways stations were destructed; and Adapazarı Sugar Industry took structural damage to its factory building and equipment. Finally, the latest catastrophe took place in 1999 by causing a heavy burden on not only the city but a nationwide territory.

Apart from the disaster history, understanding the urban development of Adapazarı requires to analyse planning decisions so that a chronological sequence was employed in introducing planning history of the city. The first planning attempts in Adapazarı, in more systematic and scientific terms, have been initiated in 1950s. Since then, plans at different scales, ranging from regional scale to urban development scale, have been prepared in order to meet urban development needs and to recover from disaster impacts. 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 **Figure 1**. Therefore, we employ a chronological sequence in analysing the urban vulnerability, which are determined as pre-1957, 1957 to 1985, 1985 to 1999, and post 1999.

By using the periodization, the main principles of plans, plan proposals, and the stage of urban development with respect to macroform are

Date	Epicenter	Magnitude	Total mortality
1923	Adapazari	Not reported	Not reported
20 June 1943	Hendek	Ms: 6.6	346
26 May 1957	Bolu-Abant	Ms: 7.1	52
22 July 1967	Adapazari-Geyve	Ms: 7.2	89
17 August 1999	Golcuk	Mw: 7.4	17225
12 November 1999	Duzce	Mw: 7.2	763

Table 1. Previous earthquakes in Adapazarı. Source: Prime Ministry Crisis Centre, 2000; and Altun, et al.,1967

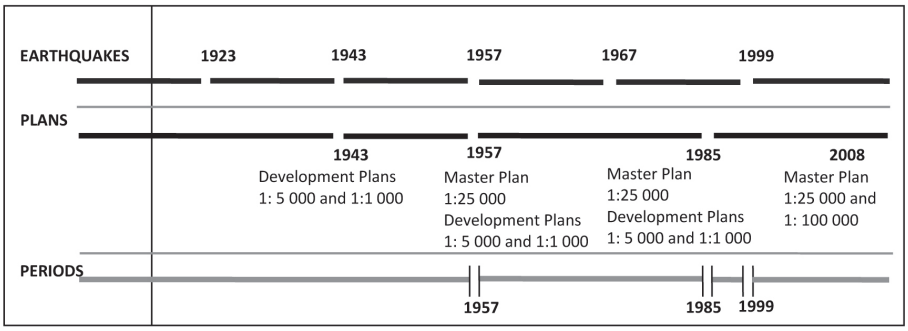

Figure 1. Planning periods used in this study

presented in a chronologic in order to reveal the vulnerability of Adapazarı city to disasters.

CONSTRUCTION OF URBAN VULNERABILITIES IN THE CONTEXT OF ADAPAZARI

The analysis on urban vulnerabilities in Adapazarı with respect to the planning history and disaster experiences of the city is investigated under four major periods. Each period covers the evaluation of plan decisions and urban development respectively. The first period starts with the proclamation of Republic and goes until 1957. After 1950s, migration from rural to urban areas throughout the country 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 1980s witnessed the liberal policies which had crucial impacts on urbanization. Then, the third period covers the years between 1985 and 1999, which shows the stage of development until the catastrophe. The contemporary stage of development is presented in the fourth period which starts with the 1999 Earthquake and covers the post-disaster recovery process.

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 since 1950s is illustrated in **Figure 2**.

Core: 1923-1957 Period

At the end of 19th century, Adapazarı was an Ottoman village of Kocaeli province depending on the primary economic activities of small-sized production and commerce (Sakarya Governorate, 2004, 501). With the construction of railway in 1899, the population of the district increased and the central functions expanded around the station. In the midst of 19th century, as a result of population exchange policy after the Independence War, immigrants from Balkans were settled in the area. Located between the Sapanca Lake and the Sakarya River, the city has been settled on agricultural plain. Since there are not any significant topographic limitations for growth, the city has developed over the plain with respect to the increase in population. Urban population was counted as 22.559 inhabitants in the first general population census in 1927 (Sakarya Governorate, 2004, 501). According to the General Census, the population of Adapazarı was reached 24,839 people in 1935 and 25,793 people in 1940 (Sakarya Governorate, 2004, 501).

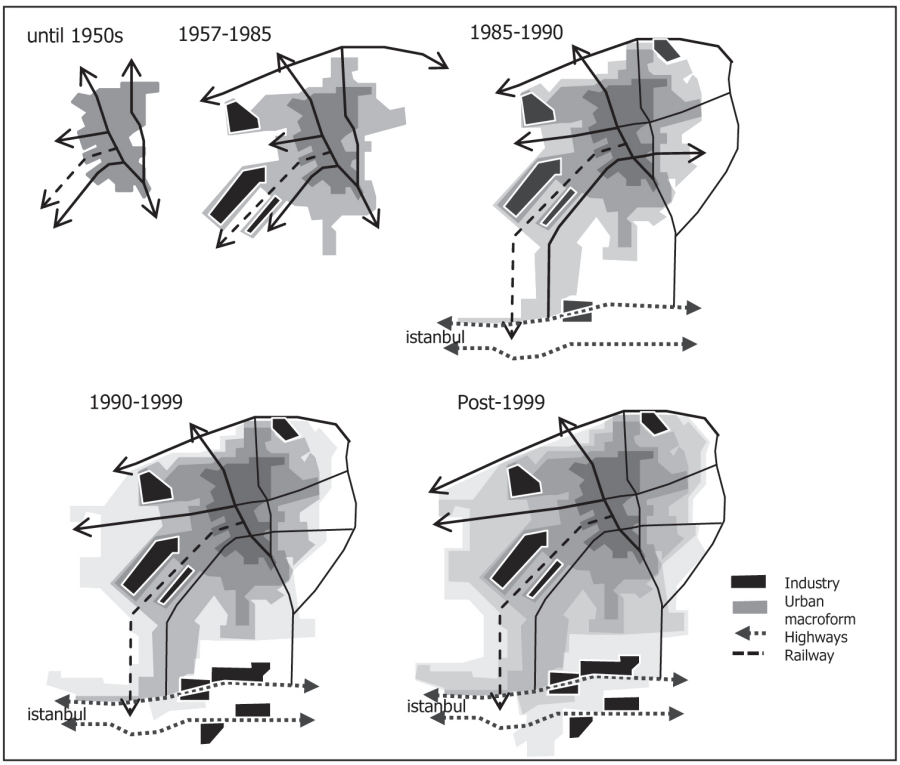

Figure 2. Change in the macroform of Adapazarı according to planning periods

In line with the modernity vision of the young Republic, cities were needed to be planned in order to regulate both spatial and social structure. The new Republican government aimed to prove the success of the new regime by constructing a modern socio-cultural and physical environment. Therefore, the planning history of Adapazarı dates back to early 1930s. However, negotiations on urban planning of Adapazarı with Prof. Hermann Jansen and later Van der Berg remained inconclusive. Following the unsuccessful plan initiatives and the 1943 Earthquake, Ferit Ors prepared the 1/1000 scaled plans of Adapazarı under the consultancy of Prof. Oelsner (Bayhan, 2010, 51). The planning initiative did not target a long-term development; rather it held a short-term approach for spatial development. The planned area covered an area of 400 ha, and the estimated population of the city was 45,000 inhabitants. Ors' plan regulated the spatial development of Adapazarı until the enactment of the 1957 plan (Bayhan, 2010, 51).

Until 1957 plan, the city witnessed the development strategy of the early republican period including nationwide state-led investments. Initial industrial developments such as Agricultural Equipment and Machinery Factory, Wagon factory and Sugar Industry appeared along the Istanbul-Eskisehir railway route in early 1950s. Then, with the construction of Istanbul-Ankara highway, industries tended to locate along the highway. These improvements encouraged settlements around these industries which would determine the directions of urban development. During the period, Adapazarı developed around its administrative and commercial centre over the plain area. The city was mostly shaped by 2 or 3-storey buildings constructed with traditional methods. However, the city showed a mercantile and agricultural centre identity despite the industrial investments.

Concentration: 1957-1985 period

The period covering 1957-1985 begins with the 1957 Bolu-Abant Earthquake. After the disaster, a planning study was initiated for Adapazarı. During this period, Eastern Marmara Development Plan was developed in 1963 which affected the economic function and urban growth of cities in the region. This period, which witnessed another earthquake in 1967, ended with the 1985 Master Plan.

Since Ors' plan was limited in size and scope, the need for preparation of a general plan emerged. The 1957 Plan of Adapazarı was developed by Mehmet Ali Topaloglu and his team through a national architectural design competition organized by the Bank of Provinces. The plan was structured for the following 20 years around an estimated population of 250,000 inhabitants which would be accompanied with the actual population of 1975. The plan aimed at regulating urban growth with respect to continuous investments and hazardous geological structure.

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. The report stated the unsuitable locations for the urban settlements addressing to North Anatolia Fault zone and high groundwater level. Along with this report, the 1957 Plan highlighted a building code system envisaging the buildings heights, building types, constructions styles, plot widths, and depths of buildings. The maximum number of floors was determined as three and the depth of the buildings, allowing attached ones was set as 9.50 m from streets. Furthermore, the plan determined the growth direction towards western part of the city where groundwater level was low. In his 1957 planning proposal for Adapazarı, Topaloglu planned the main axis of the city to hold commercial, administrative and recreational facilities and to connect the railway station to the central area.

The 1957 Plan determined the urban growth until 1970s. 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.

Meanwhile, in the 1960s, Turkey experienced a planned economy period. Regional planning studies aimed at determining the sectoral structure, interregional relations, population distribution, settlement hierarchy, and central functions of cities within the region in order to achieve a balanced development among the national territory. Respectively, Eastern Marmara Development Project was prepared by Ministry of Reconstruction and Resettlement during 1958-1960. 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 which had interconnected problems in terms of physical structure, infrastructure and urbanization.

The regional plan was designed to alter the economic functioning of Istanbul from manufacturing city into a commercial and consumption centre. On the one hand, the continuous trend in both urbanization and industrialization was emphasized, and on the other hand, spontaneous

existence of industry was restricted in the plan. Main goals of the plan were determined as integrating the region into national development, benefiting from the existing limited capital and development tendency of the country, encouraging urbanization, implementing interregional equity principle by considering the maximum development principle throughout the country and differentiated functionality of regions approach, and supporting the welfare state through provision of investments (MRR-Ministry of Reconstruction and Resettlement, 1963, 7). The main issue raised in this plan is decentralization of industry from Istanbul to eastern corridor up to Adapazarı and determining central functions of the cities of Eastern Marmara. In this respect, the plan assigned new roles to cities in the Eastern Marmara region apart from the international centre identity of Istanbul. The plan proposed central functions to Kocaeli as a port city to play a crucial role countrywide whereas Adapazarı remained as a regional centre to serve for local needs.

Accepting that agriculture were losing its relative significance compared to industry in Eastern Marmara, analyses on population, employment and land-use were conducted to direct future trends. The figures on population indicated that there was an increase in both total and urban populations of eastern Marmara region and the plan supported the trend with an estimated population of Istanbul of 5.8 million, and of Kocaeli and Sakarya of 1.3 million for 1980. Similarly, the plan expected an increase in non-agricultural employment concentrating in industry and service sectors, thus redefined the employment distribution. Considering the natural limits and geological facts, the plan reported that Adapazarı lies on the least suitable locations with its closure to the fault zone, soil structure, and high groundwater level. These limits would make intense and high-rise settlement and infrastructure provision difficult, especially considering the construction techniques of the country. Therefore, the plan assumed that Adapazarı which had a population over 80,000 inhabitants, would reach an estimated population of 380,000 inhabitants in 1980. The size of the new development area would be 1500-2000 hectares with the density at 150-200 persons per hectare. Parallel to the development took place in the region; it was expected to hold 20,000 employees in the industry sector, particularly operated in transport vehicles industry, agricultural industry, and manufacturing industry (MRR, 1963, 145). The most suitable area for industry was determined as the south part of the new Ankara way.

Although the Eastern Marmara plan considered the seismic risks posing threat to whole region, it promoted industrial development in the region, which would result in migration, urbanization and thus increase urban vulnerability. Despite the agricultural characteristic of Adapazarı, the city was supported as a regional centre that attracted further industrial investments. What is critical in Adapazarı's planning history is the decision of decentralization of industry from Istanbul to eastern parts and of shifting the small town into an industrial location.

Agglomeration: 1985-1999 period

In the 1980s, the neo-liberal economic restructuring and its related policies have led to the acceleration of industrialization in Adapazarı. The construction of Trans-European Motorway (TEM) in 1985 and the establishment of Organized Industrial District (OID) have contributed to the decentralization process (Gedikli, 2004). As infrastructural requirements of the new industries were supported by the government, a growing number of industrial plants began to locate within the city.

Together with the socio-economic restructuring in 1980s, Adapazarı experienced a rapid growth in terms of urban development and population. Therefore, a new plan was required to regulate the restructuring of social, physical and economic environment. Developed by Bulent Berksan, the 1985 Development Plan of Adapazarı aimed to regulate the spontaneous urban development of the city which gained pace due to industrial developments and highway construction. The 1985 Plan proposed a comprehensive approach rather than partial land-use plans by covering the neighbouring areas of Adapazarı, 4,387 ha in total, for an estimated population of 600,000 residents.

Prior to the 1985 Plan, a geological report indicating the seismicity of settlements was released in 1982 as a basis for planning studies (Gedikli, 2004). The report displayed the possible outcomes of a further earthquake by referencing previous experiences and damages. It was advised that the high groundwater table and alluvial characteristic of soil should be taken into consideration in settlement decisions. Regarding the fact that seismic sensitive structure of plain areas were not suitable for dense settlements, the report suggested to settle in slopes which was consistent with the outcomes of the1957 Plan and the 1963 Eastern Marmara Plan. In line with this report, the 1985 Plan was prepared by giving priority to development and considering the seismic vulnerability of residential and industrial areas. Highlighting the necessity for residing in safer slopes rather than alluvial plains, the plan proposed settlements around Serdivan in west, and Erenler in south part of the city, stressing the necessity to obey the building codes. Depending on the 1985 Plan, five-storey buildings were permitted; hence, there existed multi-storey buildings over the plain despite the limitations in development rights of the 1957 Plan. Despite additional land provision, a denser urban development was generated on the existing urban structure to respond the population increase.

The Adapazarı city continued to develop with modifications and revisions of the 1985 Plan until the 1999 Earthquake. Meanwhile, high-rise buildings spread over the entire city from centre to neighbourhoods gradually (Bayhan, 2010). The state of development before the 1999 Earthquake in the city could be described as attached and high-rise buildings in centre, and detached and high-rise apartment blocks around the centre. Modifications in the Berksan's Plan resulted in a denser urban core, and activities agglomerated within the central area where soil conditions and geologic structure were not suitable for dense urbanization. This tendency was supported by the construction of E-5 Highway in 1970 and TEM in 1990 which attracted the industrial developments as proposed by the Eastern Marmara Development Plan. Also, with the foundation of Sakarya University in Serdivan, in western part of the city in 1992, urban growth was directed towards the west. 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. Due to the dominance of the regional dynamics and large scale investments, urban plans did not properly provide a policy for safer urban development and consequently remained inadequate in addressing to the vulnerable structure of the city.

Fragmentation: Post-1999 period

The 1999 Earthquake made a considerable influence on the city leading to a multitude of problems in physical, social, economic, environmental, political and spatial aspects. Recovery process after the 1999 Earthquake has been monitored first by the central government. The public resources

Urban spatial recovery models	**Resettlement**	**New development**	**Reconstruction**
Role of urban planning	Regulation of high public resource allocation	Regulation of investments and development	Regulation of development rights
Means	Public resources, External aid	Private investments, Public resources	Public resources
Aim	Creating safe environment with mass housing Attracting business by creating safe suburbs	Creating safe environment in urban periphery Attracting business by using the advantage of location	Reducing development rights Developing with lower density
Implementations	Expropriation Permanent housings Construction of public buildings Max. four-storey building	Max. two-storey new development	0,25 basement area ratio 0,50 floor area ratio 6,5 m building height
Spatial outcomes	Priority to residential areas Ignorance of businesses in plans Inability to attract businesses in the long-term	Proximity advantage to central area Residential development and increase in demand	Continuity of businesses Recovery within existing sites for production facilities Recovery of commercial units within existing centre

Table 2. Safe urban development models and their policies applied after 1999 Earthquake
Source: Orhan (2012) and Orhan (2015a).

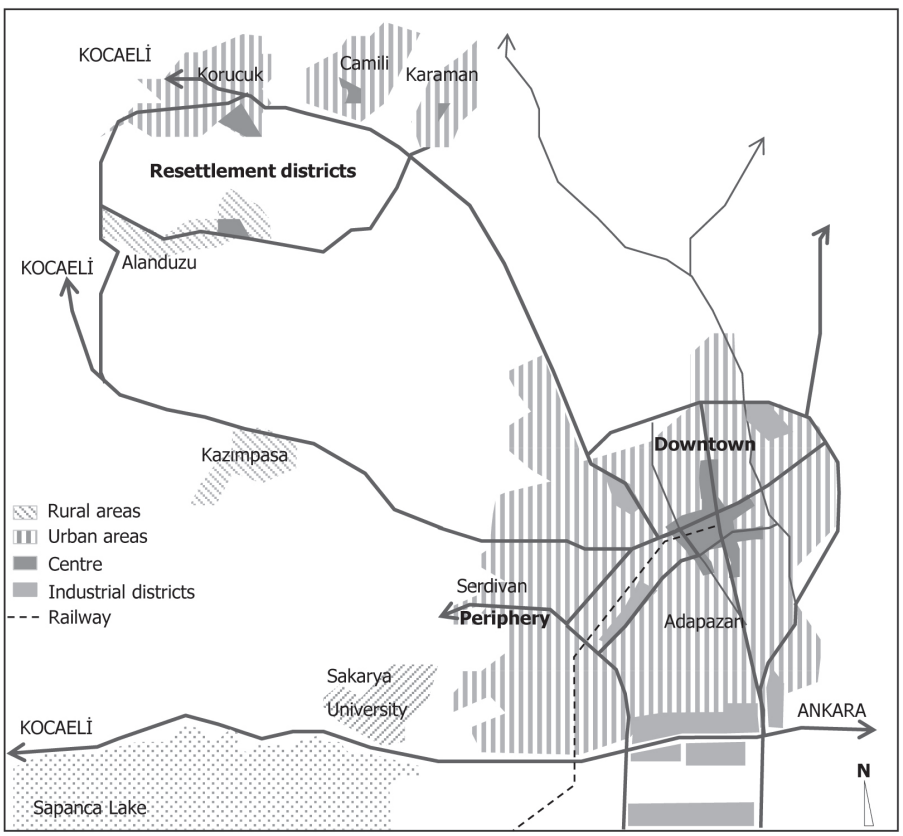

Figure 3. Schematic diagram of current Adapazarı settlement

obtained in forms of donations, credits, and taxes were used to resettle the affected population and reconstruct the affected parts of cities. In line with the initial recovery goals, the post-disaster spatial policies in Adapazarı are observed in three types as reconstruction of downtown, resettlement of affected population, and new development of periphery, as summarized in the **Table 2** (see also **Figure 3**).

Regarding the resettlement policies, permanent housing units were constructed on geologically safer areas. Public investments and resource allocation were the means of construction. The role of urban planning can be defined as the regulation of high public resource allocation. Apart from the resettlement policies, the downtown was reconstructed with reduced development rights with respect to geotechnical considerations. In the existing city, development rights were revised and reduced from five to two-storey. Public investments and resource allocation were the means of reconstruction of affected areas and revitalization of centre. Here, planning was used as the regulation mechanism of development rights. Additionally, the west hills called Serdivan district as one of the geologically suitable location nearby the downtown has become to be populated increasingly. Due to the close location to city centre, the district has developed gradually after the disaster. Private sector investments were the means of development, while public investments were the means of infrastructure construction. The role of planning can be defined as regulation of investments and development.

Resettlement policies were initiated immediately after the disaster by Prime Ministry for the damaged districts of Marmara Region. In line with the geological report indicating suitable sites for settlement considering the agricultural, forestry and conservation areas, and transportation network, land-use plans of resettlement sites in the region were prepared. Suitable resettlement districts for Adapazarı were determined in the 12 km apart from the city where the soil structure was relatively safer than other parts according to geotechnical analysis. The site over 1200 hectares was allocated to housing development and left to the commitment of Adapazarı Metropolitan Municipality (Gulersoy et al., 2003). The resettlement plan was prepared in three different project areas under the legal responsibility of Ministry of Public Works and Settlement, constructed by Mass Housing Administration and private enterprises, and delivered to the right owners in 2001. The planned area had a density of 120 people per hectare designed with three-storey detached apartment blocks, in accordance with the topographical conditions, without forming a dense and qualified urban structure.

In order to regulate the urban growth challenged by the 1999 Earthquake, the post-disaster period witnessed two macro-level plans. The 1/25,000 scaled Master Plan of Adapazarı, approved in 2006, was prepared to regulate the urban development after the resettlement implications. The plan still provides the basic framework for development of Adapazarı and its surroundings. The vision of the plan was to generate an urban area which presents economic welfare and social development as well as the merits of a liveable, competitive, productive, and well-equipped settlement system (SMM, 2006, 2). The 2006 Plan emphasized disaster vulnerability of the city in its main strategies as considering the seismic characteristic of the city and its specific conditions, protecting both citizens and urban development (SMM, 2006, 3). The plan developed two alternative scenarios in reference to population and employment, suggesting do-nothing

model and the influences of regional tendencies model. For the former model, the city would grow around its present development tendencies and functions until 2030, and would present a centre-periphery form of relation with the resettlement district. The latter scenario reveals a jointed urban macroform among the pieces which would show a centre-north-west direction growth. In line with the geological report prepared prior to the plan development and alternative scenarios, the 2006 Plan adopted the second model supporting the essence of regional dynamics and the urban growth in north-west direction. The plan offered a comprehensive infrastructure system and a railway system between settlements in order to integrate new settlement districts into main city. Also, the plan suggested that social services should be hierarchically distributed among settlements where the main city centre contains both urban and rural functions. Plan decisions related to macroform development included that Adapazarı settlement has two parts which are differentiated from each other in functional terms. It was mentioned that the main centre of Adapazarı holds working places to provide service and production facilities including commerce, university, public institutions, education, health, culture and sport facilities, organized industrial district, and other industries, whereas the new settlements provide residential areas, specialized retail commercial areas, administrative and health services, cultural and education facilities such as the second university. The agricultural and forest areas separating urban settlements would provide open and green space requirements (SMM, 2006, 18). At the end of the planning period, estimated population of the main city would be 396,000 whereas new settlement areas will hold 350,000 inhabitants.

The 1/100.000 scale Master Plan of Sakarya, approved in 2009 and targeting 2025, aimed to develop goals and strategies for planned area. Considering the regional relations of Adapazarı, the 2009 Plan adopted the proposals of the 1/100.000 scale Istanbul Environmental Management Plan (IEMP) approved in 2006. The vision of the IEMP Plan was to restructure Istanbul as a global centre for finance, logistics, tourism and culture between Europe, Asia, and Middle East aiming at strengthening the role of Istanbul in global markets by supporting technology intensive industries and business sector (IMPB, 2006, 19). Similar to the decisions of 1963 Eastern Marmara Development Plan, the main policy of the IEMP plan was the decentralization of industry towards the periphery of Istanbul in order to develop service sector in inner parts of the city. Under the regional dynamics, the vision statement of the 2009 Plan of Sakarya was determined as;

> "a city which is active in culture and art, in addition to industry, commerce and agriculture with its strong local government and complete infrastructure, in order to cope with environmental problems and enhance its ability in science and technology" (SMM, 2009, 5).

In line with the vision, the plan supported the modernization of heavy industry with technological and managerial methods and the development of mid-scale industry under certain environmental conditions, by expecting an increase in employment of industry and service sectors. The employment distribution among sectors was estimated as 22% in industry, 45% in service and 33% in agriculture for the year 2025. Furthermore, the plan estimated the population of 760,000 for the target year where 86.8% of the total population was projected to live in urban areas of Adapazarı. The proposed spatial pattern developed in line with the strategic goals and population estimations. The city was expected to grow in west, north

and south parts of the existing structure where Sakarya River remained as an edge for the urban development. The plan recommended settling in the previously planned areas so that it did not propose any additional land provision for development. Development priority was given to Serdivan district. Besides, reduced development rights were preserved for the downtown area due to the seismicity of the existing settlements. Considering the seismicity, local soil conditions, and building features, the 2009 Plan categorized settlements as; areas suitable for settlements; areas forbidden for settlement without taking measures; areas required detailed geotechnical analysis; and areas unsuitable for settlement (SMM, 2009, 12). Additionally, the plan offered the conduct of geological and geotechnical analyse to evaluate the appropriateness of the proposed area for settlement, to consider the additional traffic volume that may arise in emergency cases in designing the road network, and to determine and preserve open spaces for the purpose of gathering places, temporary settlements and centres for emergency management.

To conclude, the post-disaster planning studies of Adapazarı aimed to develop the city as a part of regional dynamics by encouraging industrialization. Challenged by the earthquake and their negative consequences, the plans are expected to focus on mitigation strategies in achieving a resilient urban environment. Although post-disaster plans indicated the relation between natural inputs and limits, industrial development and urbanization, it did not clearly put forward concrete measures to prevent settlements from seismic risks. Rather, the plans served to bring additional population and industrial development despite the seismicity of the area. It can be noted that the current state of development of Adapazarı city achieves a fragmented urban structure. Since the policies after the earthquake generated distinct settlement areas from the main city and post-disaster plans could not integrate these urban parts each other, the city now challenges with problem of fragmentation.

CONCLUSION

The review of the urban development until the 1999 Earthquake puts forward that Adapazarı city developed around its historical location on the seismically sensitive plain with respect to the regional dynamics. The historical core of the city remained as the central district and residential areas grew around the centre with respect to the increase in population. Despite its agricultural productive capacity, the development scenario of the city was drawn together with Istanbul which has been the locomotive of the economy in the region. The seismic vulnerability of the city has been increased through the regional plan decisions which aimed at shifting Istanbul's economic base from industry to finance. The Eastern Marmara Development Plan (1963) supporting industrial decentralization of Istanbul through eastern corridor was a catalyst for the production of new and larger vulnerabilities, 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 Istanbul. 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, has become inadequate to meet the increasing demand ones time. Thus, in 1985, a master plan was prepared with awareness on seismic risks. Introduction of neo-liberal economic policies, since 1980s,

have turned the agricultural structure of Adapazarı into an industrial city characteristic. The shift in population and demand on housing and services by 1980s was responded by the increasing development rights despite the seismic risks of 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. In sum, urbanization process was affected from the policies 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 the circumstances of high density development and inadequate institutional capacity. Following the earthquake, the affected population was moved to resettlement districts, as the most common recovery strategy of the Turkish disaster management system. Implementation of resettlement policies considers reducing building pressures on the city centre and residential areas of the inner area; relocating private sector companies, businesses and government establishments into safer districts; and strengthening the overall integrity of community structure. An illustration of this policy is seen in Adapazarı case. Construction of dwellings in resettlement area met the housing need of affected population without providing a considerable diversity of a pleasant urban setting. Apart from the problems of newly produced residential districts, there have been inconsistencies between the development of residential units and business premises

Table 3. Evaluation of urban vulnerability for different periods. Source. Adapted from Orhan, 2012.

Periods	Policies	Socio-economic consequences	Physical consequences	Spatial consequences
Before 1950s	State-led industrialization	Small town Agricultural employment	Limited growth Continuity of historical location	Core
1957-1985	Regional policies directing industrial development Planned urban growth	Urban population growth Demand to locate in urban area Problems in auditing	Urbanization over weak soil Rapid urbanization to meet housing needs	Concentration
1985-1999	Private entrepreneurship in industrial development	Urban population growth Increase in industrial employment Plan amendments	Industrial concentration Dense urbanization High development rights Limited open space	Agglomeration
1999-2015	Avoidance from hazard-prone area Development in new settlement districts Transformation of areas under disaster risks New institutional arrangements	Increase in urban population Integration problem between new areas and existing city Regeneration tools for existing town	Reduced development rights in downtown Central development in downtown Low density urban sprawl Household-centred resettlement districts	Fragmentation

(Orhan, 2015a; Orhan, 2015b). The resettlement areas cannot attract businesses parallel to dwellings, so that private entities continue to settle in damaged urban core. The problem caused by recovery policies isolating businesses from household recovery leads to generation of a fragmented urban structure (Orhan, 2015a). While the city growing around the most vulnerable locations with its businesses and industrial plants, a large amount of population still demands to the vulnerable urban core, despite the investments made for a safer location in resettlement areas. **Table 3** summarizes the urban vulnerability in case of Adapazarı based on each predetermined periods.

1999 Earthquake can be accepted as the milestone for urban restructuring of Adapazarı. The factors in the background of this phenomenon are decentralization of industry to Eastern Marmara, increasing urban population, spreading dense built environment, accelerating pressure on urban centre by 1980s, and locating on seismic-risk prone sites – all of which have promoted both the economic growth and urban vulnerability in Adapazarı. Here, it is worth arguing that experiencing the severe consequences of the disaster, policies and actions taken in recovery period could not serve for developing a resilient city. The planning procedure in post-disaster period, after the completion of permanent housing districts cannot achieve the problematic of the fragmentation. However, an attempt is expected from the plans to integrate fragmented urban bodies in order to generate a more resilient city. Although resettlement policies succeeded household recovery to some extent, implementation of post-disaster plans did not resolve the problems at community level in Adapazarı. This has led to restructuring of the urban space which is not consistent with the primary goals of recovery policies aiming at a safer urban environment. 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.

For the long-term period after the 1999 Earthquake, it is worthwhile to report the recent improvements in legal and organizational domains that affect the planning schema. With the establishment of Prime Ministry Disaster and Emergency Management Authority (AFAD), a new institutional capacity was generated at central level with its local level organizations, in 2009. The most influential impact of such an organization is expected to be on developing a risk reduction approach for Turkish case. Through the macro-level policy documents, such as National Earthquake Strategy and Action Plan (UDSEP) and Road Map for Earthquake Mitigation, AFAD aims to constitute a basis for risk reduction. Another change in institutional aspect was seen in the operational domains of metropolitan municipalities to enlarge their responsibility areas up to the provincial territory (Act no 6360), including Sakarya Metropolitan Municipality. Apart from the institutional arrangements, a legal framework was enacted in 2012 about transformation of areas under disaster risks (Act no 6306). The Act enables people at risk to regenerate the built environment with pre-determined tools, such as credits, loans, and rent allocation. All of the recent improvements are to be expected to reduce the vulnerability of cites, yet their impacts cannot be evaluated in this stage of development. Therefore, it is necessary to conduct further studies in evaluating the consequences of such changes on urban vulnerabilities.

DISCUSSION

This study addresses two main implications with respect to the review on planning history and urban vulnerabilities. First, planning at all levels should regard disaster risks as an inherent part of the decisions affecting the future of a city. Addressing the outputs of this study, it can be noted that earthquake risks and the urban vulnerability are produced by the intense urbanization. Therefore, decisions taken in each step of planning procedure should be kept in a balance. The steps are to be considered as formulation of a regional development and urbanization policy regarding earthquake and risks; regulating the development from region to localities regarding the same measures; and finally implementing relevant engineering methods. Second, urban planning is to be proposed with appropriate land-use decisions in order to response community needs. In order to sustain development, it is required to adopt a risk reduction approach in disaster management system. As urban planning concerns to ensure a sanitary, pleasant and safe environment for population, urban planning should consider the local needs and demands before making permanent implementations that may have effects on a whole city. Pre-disaster plans and practices can regulate location preferences, land prices, demographic trends and other driving forces to shape the city. By this way, problems such as fragmentation of urban and community structure can be achieved through appropriate pre-disaster planning decisions. In sum, it is essential to construct a planning approach considering not only the development trends but also the disaster risks in vulnerable cities. Therefore, it would be possible to broaden the policy-making perspective into pre-disaster periods and integrate risk mitigation into planning schema.

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READING VULNERABILITIES THROUGH URBAN PLANNING HISTORY: AN EARTHQUAKE-PRONE CITY, ADAPAZARI CASE FROM TURKEY

Agglomeration of urban population, inadequate institutional capacity, unplanned urbanization, dense built environment, and industrial concentration are considered as the main causes of urban vulnerabilities against encountered disturbances. Planning decisions which regulate these factors are expected to make contribution to safer urban and social contexts and resilience of cities. However, in developing countries such as Turkey where disaster management is not an integrated part of urban planning process, planning decisions may serve for the construction of vulnerabilities. This study reads urban vulnerabilities with respect to urban structuring led by planning decisions. In doing so, an earthquake-prone city, Adapazarı was selected to investigate urban vulnerability according to different planning periods and disaster history. The outcome of this study is that planning decisions disregarding urban risks may not contribute to the creation of a safer spatial and social context with respect to disaster mitigation, rather serve to reproduction of urban vulnerabilities.

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Anahtar Sözcükler: Kentsel kırılganlık; planlama tarihi; kentsel mekansal yapı; 1999 depremi; Adapazarı

KENT PLANLAMA TARİHİ ÜZERİNDEN KIRILGANLIKLARIN OKUNMASI: AFETE MARUZ BİR KENT, ADAPAZARI ÖRNEĞİ

Kentsel nüfus yığılmaları, kurumsal kapasitenin yetersizliği, plansız kentleşme, yapılı alanların ve sanayinin yoğunlaşması tehditlere karşı kentsel kırılganlığın temel sebepleri olarak kabul edilmektedir. Bu etkenleri düzenleyen planlama kararlarının güvenli kentsel ve sosyal yapıların oluşmasına ve kentlerin dirençli kılınmasına katkı vermesi beklenmektedir. Ancak, afet yönetiminin kent planlama süreçlerinin bütünleşik bir parçası olmadığı Türkiye gibi gelişmekte olan ülkelerde planlama kararları kırılganların inşa edilmesine yol açabilmektedir. Bu çalışma planlama kararları ile üretilen kentsel yapılanma üzerinden kentsel kırılganlıkları okumaktadır. Bunun için, farklı planlama dönemleri ve afet tarihçesine göre kentsel kırılganlıkları incelemek üzere afete maruz bir kent olan Adapazarı seçilmiştir. Çalışmanın çıkarımı kentsel riskleri gözetmeyen planlama kararlarının afet sakınımı açısından daha güvenli bir mekansal ve sosyal yapının oluşmasına katkı koymaktan ziyade kentsel kırılganlıkların yeniden üretilmesine yol açtığıdır.

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