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A Research on Increasing the Possibility of Using Green Areas as Post-Disaster Assembly Areas in Turkey

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ABSTRACT

Natural disasters take place quite frequently in Turkey. Since natural disasters are not preventable phenomena, the establishment of a proper relation between disasters and planning processes is an important requirement for minimizing the possible damages. In this sense, it is necessary to determine the measures to reduce the risks of disaster exposure, and to make plan and design decisions accordingly. However, disaster preparedness is not just limited to that. Preparedness for post-disaster crisis management and determination of post-disaster assembly areas is also significant. Green areas play an important role in the post-disaster period, as providing proper areas. The approach of planning and designing green areas as evacuation and assembly spaces helps provide establish safe and healthy temporary residence areas. Within this context, in this paper, possibilities of utilizing green areas as post-disaster assembly areas will be evaluated in order to increase the preparedness for disasters in Turkey.

Keywords: Disaster preparedness, green areas, post-disaster assembly areas

1. Introduction

Natural disasters have been amongst the most important agenda for Turkey, due to the geographical structure and characteristics of its location. The country has experienced a number of varying natural disasters, particularly earthquakes and floods, resulting in serious damages, injuries and deaths throughout the history (Ergünay, 2007; Genç, 2007). The acceleration of urbanization since 1950s, because of the rapid changes in social and economic structure (Genç, 2014) has unfortunately increased the disaster risks, hazards and exposure rates, because the spatial planning practices and the legislation in the country mostly ignored the factors and approaches that are inevitable for creating sustainable environments. Within this process, open and green areas have been usually planned as leftover lands in the cities (Çabuk et al, 2013) forming disintegrated and unfunctional patterns. Moreover, these spaces have been occupied by both legal and illegal constructions, and transformed into residential and/or commercial sites in time, which have also brought high risks of disaster exposure, besides other negative impacts on natural and cultural resources. Indeed, besides its precious contributions such as providing sustainable, healthy, liveable, attractive and qualified urban spaces as well as balanced natural and cultural environments (Gül and Küçük, 2009; Özcan, 2008; Eminağaoğlu and Yavuz, 2005; Wolch et al, 2014; Chiesura, 2004), properly planned and designed green areas are significant spaces as they can be also used as assembly places in case of disasters. In this context, adoption of contemporary approaches, standards and advanced technologies during spatial planning

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processes is crucial for the determination of the appropriate green areas and lands for the mentioned purpose.

Disasters, no matter whether they are natural, technological or human-induced, may produce physical disruptions, environmental damage, economic loss, injuries, loss of human life and a need for relocation of people (Trainer and Bolin, 1976; Altay and Green, 2006). Özşahin (2013) specifies that more than 100.000 casualties and 600.000 disrupted constructions were reported in Turkey between 1930 and 2005. According to the International Disaster Database (EM-DAT), 313 disasters were recorded in the country between 1923 and the end of 2016 (Bahadır and Uçku, 2018). The distribution of these disasters and the human life loss, which is 91.797, are shown respectively in Figure 1 and Figure 2. Table 1 summarises the general classification of disasters according to EM-DAT.

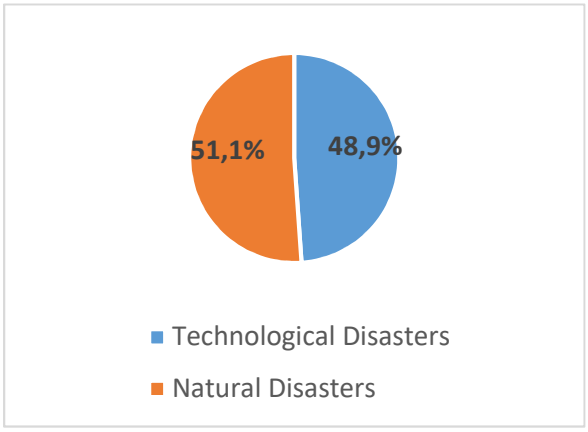

Figure 1. Distribution of disasters in Turkey between 1923-2016 (Bahadır and Uçkan, 2018).

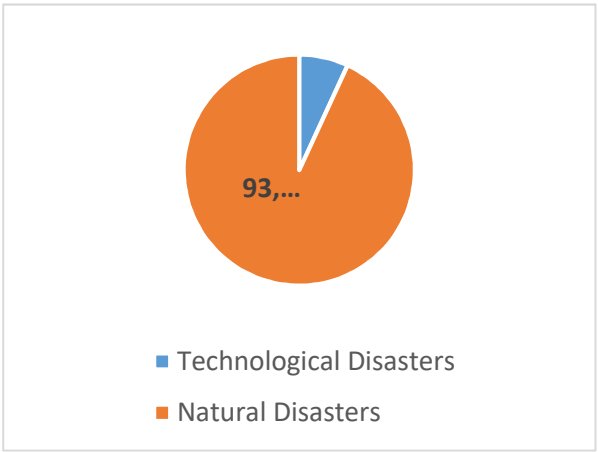

Figure 2. Distribution of human loss in Turkey between 1923-2016 according to disaster type (Bahadır and Uçkan, 2018).

Table 1:General Classification of Disasters (EM-DAT, 2018)

DISASTER GROUP	DISASTER SUBGROUP	DEFINITION	DISASTER MAIN TYPE
Natural	***Geophysical***	A hazard originating from solid earth. This term is used interchangeably with the term geological hazard.	Earthquake Mass movement (dry) Volcanic activity
	Meteorological	A hazard caused by short-lived, micro-to meso-scale extreme weather and atmospheric conditions that last from minutes to days.	Extreme temperature Fog Storm
	Hydrological	A hazard caused by the occurrence movement, and distribution of surface and subsurface freshwater and saltwater.	Flood Landslide Wave action
	Climatological	A hazard caused by long-lived, meso-to macro-scale atmospheric processes ranging from intra-seasonal to multi-decadal variability.	Drought Glacial lake outburst Wildfire
	Biological	A hazard caused by the exposure to living organisms and their toxic substances (e.g. venom, mold) or vector-borne diseases that they may carry.	Epidemic Insect infestation Animal accident
	Extraterrestrial	A hazard caused by asteroids, meteoroids, and comets as they pass near-earth, enter the Earth's atmosphere, and/or strike the Earth, and by changes in interplanetary conditions that affect the Earth's magnetosphere, ionosphere, and thermosphere.	Impact Space weather
Technological	***Industrial accident***		Chemical spill Collapse Explosion Fire Gas leak Poisoning Radiation Oil spill Other
	Transport accident		Air Road Rail Water
	Miscellaneous accident		Collapse Explosion Fire Other

Considering the severe consequences on the environment and the livings, development of an overall system and awareness for disaster and emergency management has a critical priority especially for the countries exposing to frequent natural and technological disasters. This overall system is based generally on the establishment and management of the related set of strategies as illustrated in the disaster management cycle given in Figure 3 (Flanagan et al, 2011; Farber, 2012; Konu et al, 2015).

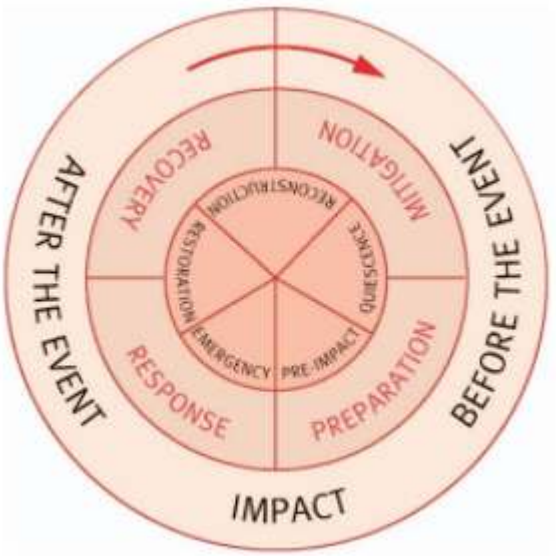

Figure 3. The disaster management cycle (Coppola, 2006).

Though the approaches to carry out the actions during the phases may vary due to the cultural, economic, political, and social characteristics of the nations and consequently may not be globally uniform, the motivating concepts of the disaster management is the same: minimizing the harms to life, property, and the environment (Coppola, 2006). Within this context, Table 2 summarises the main actions/context within the phases of the cycle.

Table 2:Context Of Integrated Disaster And Emergency Management Process (Balun, 2017).

MITIGATION	PREPAREDNESS	RESPONSE	RECOVERY
• Risk identification • Risk mitigation approaches	• Inventory detection • Emergency plans • Training and exercise activities	• Crisis management • Resource use	• Implementation of recovery plans • Review • Plan updates

The actions for each of the disaster management phase, as well as the phases themselves, should be implemented and managed in a complementary structure (Faulkner, 2001). The stakeholders involved in the process are the local governments, public institutions, non-governmental organizations, universities, private sector, media, individuals and families, and international organizations (Balun, 2017). Most of the disasters cannot be prevented (O'Brien et al, 2006) and there is no place entirely free from hazard and risk (Alexander, 2015). However, it is possible to reduce the effects. Regarding this, pre-disaster actions focus on the elimination of the hazards and getting prepared to increase the chance of survival in case of a disaster (Coppola, 2006; Zibel, 2017). Pre-disaster phases involve a

comprehensive and a complex set of activities from the disaster/risk analyses, determination of risks and proper spatial planning processes to gathering the necessary information, emergency plan training and exercises, throughout which a participatory and multidisciplinary working environment and perspective is obligatory. Within this process one of the necessities is the determination of suitable sites to serve as secure and accessible assembly and temporary residential areas, which are convenient in terms of quality, quantity and infrastructural resources.

As a result, this paper investigates the requirements for the determination of assembly areas and the importance of the urban green areas during this vital process. Within this context, the examples of benefiting from the green areas for the mentioned purpose were examined and proposals for Turkey were put forward.

1. Urban Open and Green Areas and Their Importance for Disaster Management

Önder (2012), remarks that the open space is one of the important basic elements of the urban doctrine, which refers to the vacant spaces in the city other than architectural structures and transportation areas. In other words, open spaces are perceived as areas that possess potentials for outdoor activities and recreational uses. For example, water surfaces, squares with limited or no vegetation and transportation sites are defined as open spaces. Green spaces on the other hand, are described as the surface areas of the existing open spaces, which are mostly covered with vegetation. According to this definition, each green area is actually an open area. However, the vice-versa is not correct. In the Development Regulation, numbered 23804, the green area is defined as "the sum of the playgrounds, parks, gardens, zoos, recreational sites used for excursions, picnics, entertainment and coastal areas reserved for community use".
Open and green areas and their planning is a significant matter for the sustainability and liveability of the cities. In this regard, besides proper open and green area planning implementations to form an uninterrupted system in the city, the amount of green spaces per capita is an important factor indicating the quality and welfare of the urban spaces. According to the World Health Organization (WHO), the necessary amount of green space per capita in cities should at least be 9 m², while the ideal amount is expressed as 10 to 15 m². The average amount of green areas per person in developed countries is around 20 m² (http://www.tepav.org.tr/tr/blog/s/4059, Date of access:07/13/2017). In the USA, the open-green area rate in the cities is generally accepted as 40 m² per person, if the city density is 250 persons/ha (400 m² per 10 people). In cities such as New York, Paris and Copenhagen, the amount of green area per person is more than 40 m² (Gül and Küçük, 2001).

Considering the situation in Turkey, the Regulation on the Principals of Making Development Plans and Revisions (dated 09.02.1999 and numbered 23804) stipulates the allocation of the planned sites as green areas no fewer than 10 m² per capita in the urban areas and 14 m² per capita outside municipal and contiguous area boundaries. However, the determination of the ratio of the active green area per capita in the cities in the country has been subject to much debate and scientific studies, so that the problems regarding the quality and quantity of urban green spaces are kept on the agenda. Unfortunately, the amount of active green area per person is below the standards. In Antalya, this rate per person is 3.1 m², while it is 1.9 m² in Istanbul, 3 m² in Isparta, 1.02 m² in Kars, 5.44 m² in Kayseri, 2.2 m² in Kırıkkale, 1.4 m² in Kahramanmaraş and 4,01 m² in Burdur (Önder, 2012).

These results show that Turkey, a country which frequently suffers from the consequences of disasters, especially the earthquakes and the floods, and faces rapid and unplanned urbanisation developments, has a lot to do to in terms of adopting and implementing right planning approaches. Alexander (2015) emphasizes that the emergency planning focuses on spatial decision-making and thus, is closely related with urban and regional planning. Both process try to find answer to “what is where?”. Emergency routes and service spaces are determined by collecting and analysing the necessary spatial data including the urban land use maps and the plans. At this point, besides their critical functions to

provide important ecosystem services, shaping the urban character and the aesthetics, positively affecting the environmental and human health, increasing life quality, ensuring sustainability, presenting economic and social benefits (Bolund and Hunhammar, 1999; Frampton, 2001; Baycan-Levent and Nijkamp, 2009; Sadler et al, 2010), open and green urban areas have important roles in the disaster management. One of these is their potential to serve as the post-disaster assembly areas.
In the first stage of panic, especially after the earthquakes, people instinctively rush from closed areas to open, safe and easily accessible spaces to avoid from the possible threats. After certain types of disasters, besides being a humanly manner, it is also a recognised necessity to evacuate the people to large open areas and parks with sufficient sizes, which can be quickly and regularly accessed by the victims (Erdin, 2017). Such places are described as post-disaster assembly areas. Table 3 summarizes the functions of open and green areas within disaster management process.

Table 3: Functions Of Open And Green Areas For Disaster Management (Atalay, 2008).

OPEN/GREEN AREA TYPE	FUNCTION IN DISASTER PREVENTION	DEVELOPMENT PROPOSALS
Large scale parks	Evacuation areas	Construction of metropolitan parks
Small parks	Disaster-resistant action base, Assembly area	Development and securement of parks
Roads	Fire breakers	Improvement of the roads in high risk areas

Decisions on how and where to provide the necessary services before and after a disaster are usually made and put forward by Disaster Intervention Plans. These plans explain the general information about the main evacuation routes, secondary routes and alternative evacuation sites, as well as the requirements and fundamentals for accessing to temporary shelters, food, clean water, basic infrastructure and other compulsory needs. The main purpose of such a work is to create a disaster management infrastructure and to meet the vital needs. The successful organisation and realisation of these activities is closely related with the quality of the urban spaces and their spatial organisations. As a result, the spaces designated as assembly areas have critical importance in terms of disaster management.

3. Requirements for Determining Post-Disaster Assembly Areas

Many academicians and practitioners have researches and works on the utilization of urban green areas as post-disaster service areas. Besides, in most of the developed countries, there have been regulations and applications developed for ensuring a sustainable and integrated disaster management process through which the negative impacts of the disasters can be mitigated. These experiences are valuable references for the development of standards and frameworks and assets to learn the necessary lessons.

For example, in Japan, the development of safe cities to reduce the consequences of the natural disasters, especially the earthquakes in the country, has become an important part of urban planning applications because of the significant damages caused by the fires in big cities. Urban open spaces and green spaces, such as parks and educational facilities are used as post-disaster evacuation/residential areas in the country. In these areas, infrastructure systems and large repository areas to be used during the post-disaster period are constructed (Atalay, 2008). Besides, according to

the Tokyo City Plan put into force in May 2001, namely "Grand Design for Recovery after an Earthquake", the design criteria for the disaster management have been determined as follows:

- The roads accessing to the buildings should be developed as green lines together with the parks and waterways.
- The distance between the regions should be 1.2 km.
- Safe zones should be located at a distance accessible in 30 minutes by the inhabitants.
- Disaster action plans, evacuation axes and safe shelter points should be determined.
- Open space reserves should be provided.

Greece is another country that faces the earthquake risks. Consequently, the decision makers have developed an emergency planning in this context. In 1999, a study was carried out for the Municipality of Kalamaria in Thessaloniki, Greece, in partnership with the University of Macedonia and the Municipality of Kalamaria. In this study, entitled "Analysis Method for Emergency Planning in Case of Earthquake", rational planning for the post-earthquake assembly areas was encouraged and the areas in need of open spaces were determined. According to this method, the locations of the buildings played an important role in the determination of the assembly areas' maximum carrying capacities in terms of population/victims. Depending on this model, the earthquake victims, who have to spend a night or more in the assembly areas, prefer to be close to their homes and thus, can feel safe. For this reason, the parameters that govern the distribution of the people to the assembly areas are determined as follows (Atalay, 2008);

- The proximity of open spaces to houses,
- The security level of the proposed open spaces,
- The number of existing people benefiting from the area.

Though the current measures and the approaches adopted, as well as people's awareness and preparedness is not sufficient, disaster management is always an important buzzword for the decision-makers, academicians and the professionals in Turkey. In their work, for example, Çiçekdağı at al (2012) emphasize the importance of determining the post-disaster assembly centres in Kütahya province. The authors specify that this kind of planning is crucial for performing rapid and efficient responding activities. According to Çavuş (2013), on the other hand, the problems encountered during post-disaster rescuing activities, and the facts that cities are mostly spatially unavailable for the establishment of tent cities, temporary settlement areas, and reorganisation, show that urban green areas are usually insufficient to fulfil post-disaster functions.

To avoid such circumstances and devastating consequences, it is of great significance to plan urban open and green areas in accordance with data related to the disaster and risk factors that a specific geographical territory owns. The urban open and green areas should be located at an optimum distance to the settlement areas and be easily accessible, controllable, continuous, sufficient in size, equipment storage capabilities, infrastructure and transportation availabilities. Therefore, the spatial distribution of such areas, especially within risky territories should be assessed properly to analyse and enhance their sufficiency in terms of proximity, size, accessibility and infrastructural capacity in harmony with the number of the citizens and the risks (Atalay, 2008).

Çavuş (2013) also remarks that the size of a tent cities should be between 3,000 m² (100 tents and 400 inhabitants) and 30,000 m² (1,000 tents and 4,000 inhabitants). The size of the land for a tent settlement should be between 3.5 - 4.5 m² per person and a maximum of 7.5 m² per person. When a tent area is arranged, the calculation should be done considering that the size of the tents can be

accommodated by 4 people, they are resistant to external factors and they are arranged in groups of 20-25 and islands. Moreover, tent cities (assembly areas) should be large and equipped enough to provide areas to serve for storage, parking, transportation activities, and establishment of emergency hospitals, kitchens, WCs, communication centres, and other necessary items. In this context, either existing urban green areas meeting these requirements could be designated as post-disaster assembly areas or new green areas should be planned and designed in accordance with the disaster management requirements.

4. Results and Discussions

The current structure and characteristics of open and green spaces in Tukey generally result in failure to provide safe and sufficient locations especially after the earthquakes. In other words, they cannot be utilized properly and efficiently to mitigate the disaster hazards and effects during the post-disaster period. This is mostly because the open and green area planning processes, as well as the urban and city planning applications are not realized in an integrated, sustainable and a multidisciplinary manner. Open and green areas are usually scattered throughout the cities as left over lands regardless of the necessity to benefit from their valuable functions to create sustainable environments, and the fact that the country is located in a sensitive geography open to multiple risks originating from different types of disasters. Not only the quantity per capita is below the international standards, but also the spatial organisation of these areas are improper.

Considering that the country has long experienced the devastating consequences of the earthquakes and floods, the active green areas that meet the recreational needs of the inhabitants before the disasters, should be reorganised, equipped and developed to serve as post-disaster assembly areas. The green areas are the unique places where urban services can be shifted, urgent needs can be met, and interventions can be made. The Marmara Earthquake that took place in 17th August 1999 revealed this very necessity of reconsidering the planning of green spaces. In this context, planning implementations and revision processes should consider this situation and adopt a framework depending on the accurate and precise multidimensional analyses using advanced technologies.

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