

## EVALUATION OF ÇANAKKALE EMERGENCY ASSEMBLY AREAS AND RECOMMENDATIONS



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**ABSTRACT.** Turkey's geomorphological structure, combined with rapid urbanization and unexpected natural events, has led to destructive disasters throughout various periods. The province of Çanakkale, located in northwestern Turkey, is one of the regions frequently affected by natural disasters such as forest fires, earthquakes, and floods. Unplanned and rapid urban expansion, as well as development without adequate analysis of the natural environment, has intensified the destructive impact of these events. Preventing these adverse outcomes relies on analyzing existing issues and implementing urgent measures. Based on this premise, this study examines the compliance of emergency gathering areas in Çanakkale with relevant standards. The study assesses the size and accessibility of 12 officially designated emergency assembly areas, evaluating their adequacy in terms of usability and providing recommendations. Additionally, two potential sites within the city center of Çanakkale are analyzed to determine their suitability as earthquake parks according to relevant standards.

**Keywords:** Accessibility, disaster, earthquake park, landscape architecture design

### INTRODUCTION

Disasters are events that interrupt daily life, cause physical, economic and social losses on societies and exceed the coping capacity of society [1]. Disasters are divided into natural disasters caused by geophysical, climatological, meteorological or hydrological events and non-natural disasters such as transport accidents, industrial accidents, wars or migration [2]. Natural disasters are divided into two categories as gradual and sudden disasters [3]. Earthquakes, floods and erosion are examples of sudden disasters; drought and desertification are examples of gradual disasters. Regardless of the rate of the realization of the disaster, it has devastating effects on human life. However, being prepared for expected events increases the capacity to cope with disasters. For this reason, the probability of the occurrence of negative events that have the potential to result in loss in case of exposure to disaster, in other words, disaster risk is analyzed [3].

Determination of disaster risk is quite important in the aspect of disaster management. Disaster management consists of four stages as mitigation, preparation, response and recovery [4]. The stages of mitigation and preparation covering the pre-disaster situation constitute risk management, and the stages of response and recovery covering the post-disaster situation constitute crisis management [5]. It has been recognized that risk management is more essential than crisis management because of the huge losses suffered after unprepared disasters all over the world. In the risk management phase, activities such as raising awareness of the society, increasing the level of awareness, determining the risk and making planning accordingly are included [6].

In disaster planning, short-term plans should be made for the first 72 hours during and after the disaster and long-term plans should be made for the recovery and reconstruction phases after the disaster [7]. In the short term after the disaster, information and communication, first aid services, basic needs, evacuation, emergency and temporary shelter should be planned [8]. Shelter areas are places where people will feel safe during and after the disaster and where they can return to the normal routine of life as soon as possible and where other needs are organized [9]. Post-disaster sheltering stages are categorized under four headings: emergency sheltering, temporary sheltering, temporary housing and permanent housing [10].

## **EMERGENCY ASSEMBLY AREAS**

Emergency assembly areas (EAAs) are considered under the heading of emergency shelter, which is the first stage of shelter [11]. EAAs is defined as risk-less and safe areas where people can access quickly and safely during and after disasters and emergencies [8]. For this reason, many studies have been carried out to determine criteria and international standards for EAAs site selection [12, 13, 14, 15, 16, 17, 18]. Accessibility, road axes and connectivity, usability and multifunctionality, ownership and size are the main issues in EAAs site selection. In addition, there are other considerations such as slope, elevation, soil structure, land drainage, climatic condition, distance from secondary hazards, distance to relief services, proximity to the homes of disaster victims [19].

Open and green areas are the most suitable places for EAAs in urban areas with dense construction [20]. Because it is mandatory to plan open and green areas of a reasonable size in urban areas for the public to meet their needs such as recreational, entertainment, rest and play [21, 22]. Although open and green space standards vary worldwide, in general, as in Turkey, a minimum of 10m<sup>2</sup> of green space per person should be planned in residential areas [23]. Gathering areas should be a minimum of 1.5-2m<sup>2</sup> per person [16, 18]. In addition, open and green areas need to be accessible to everyone. Access to the assembly areas should be maximum 15 minutes or less as walking distance. In the literature, the walking distance to assembly areas is determined as maximum 500 m and average 200 m [12, 13, 11]. The fact that open and green areas are generally public, or foundation land is another factor that is effective in determining these areas as EAAs.

In Turkey, disaster response plans are made by the Disaster and Emergency Presidency to the provincial directorates. In this plan, the emergency or disasters that would affect the provinces, their hazard and risk capacities and the ways of preparation for them are determined. Within the scope of this plan, EAAs is determined for each province by Provincial Disaster and Emergency Directorates.

## **EARTHQUAKE PARKS**

Aftershocks felt after major earthquakes can continue for very long periods of time like 2-3 months. Disaster victims who have experienced fear of the big earthquake feel the same fear and panic after each aftershock [24]. For this reason, disaster victims prefer to be in open spaces instead of closed spaces [25]. After the 1999 Marmara earthquake, people did not enter their homes due to fear and sheltered in safe places they found outside such as open spaces, parks, roadsides, green areas [26]. However, weather conditions may not always be suitable for outdoor shelter. In addition, open spaces are not fully convenient for sheltering issues such as privacy, safety and health. Therefore, during the emergency and temporary sheltering phase, disaster victims need open spaces where they can feel safe and return to their daily life as soon as possible. Open and green areas should enable easy access and meeting, aerial access, emergency rescue, stocking and distribution of materials, and the use of tents or temporary

housing areas for emergency shelter in case of disaster and emergency [27]. Earthquake parks are green areas planned to fulfil these needs.

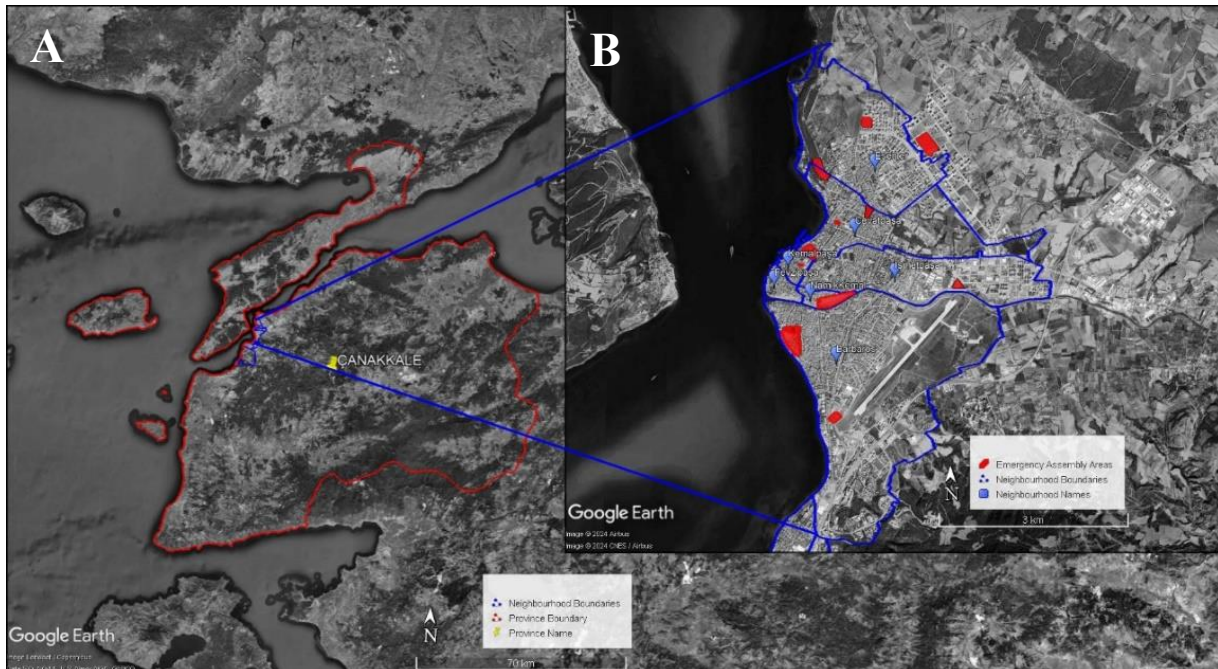
Design and equipment standards have been developed for earthquake parks to have a multi-functional structure [28, 11]. ‘Generators, underground tanks, ramps, aid turnstiles, vehicle parks, ice-skating rings, sport facilities, sofa suites, food distribution unit, computer center, sound system, flashes, wasteyards, heliport, toilets, laundry, meeting area, bath and dishwashing area’ are the standard equipment elements that should be included in earthquake parks [29]. These facilities can be used multifunctionally in daily life and emergency situations. For example, while the ice rink is used for sports in daily life, it can be used as a supply collection area or morgue after an earthquake. Cafeterias, which are used for recreational purposes in daily life, can be used in different functions such as kitchen, food distribution point, and communication center after a disaster [30].

In this study, 12 official EAAs determined by Disaster and Emergency Presidency for the city center of Çanakkale province were examined in terms of areal size and accessibility considering the relevant standards and recommendations were made. In addition, two areas that may qualify as earthquake parks for Çanakkale city center were investigated about the standards.

## MATERIALS AND METHODS

### *Study Area*

The study area is located between  $26^{\circ}00'36''$ - $27^{\circ}56'57''$  east longitude and  $39^{\circ}21'19''$ - $40^{\circ}50'34''$  north latitude (Figure 1A). There are 7 neighbourhoods in the city centre of Çanakkale, namely Barbaros, Cevatpaşa, Esenler, Fevzipaşa, İsmetpaşa, Kemalpaşa and Namikkemal. The total population of the study area is 143675 people.



**Fig. 1.** Study area (A), emergency assembly areas (B) [31].

### *Emergency Assembly Areas in the Study Area*

In the city center of Çanakkale province, there are 12 EAAs identified by Disaster and Emergency Presidency (Figure 1B). Fevzipaşa is the only neighbourhood without an EAAs

(Table 1). Barbaros, Cevatpaşa and Esenler have the highest number of EAAs. In terms of area, the smallest EAAs is Cumhuriyet Square, which has a ceremonial area of 2023m<sup>2</sup> and the largest EAAs is Hamidiye Bastion, which has a park function with an area of 79997 m<sup>2</sup>.

**Table 1.** Information on emergency assembly areas

No	Neighbourhoods	Emergency Assembly Areas	Function	Ownership Status	Area (m <sup>2</sup> )
1	Barbaros	Dardanel Sports Facilities	Sports and Playgrounds	Municipality of Çanakkale	25363
2	Barbaros	75th Year Park	Park	Hüseyin Akif Terzioğlu Foundation	14468
3	Barbaros	Hamidiye Bastion	Park	Finance Treasury	79997
4	Cevatpaşa	Rotary Park	Park	Municipality of Çanakkale	19116
5	Cevatpaşa	Hastane Bayırı Sports Facilities	Neighbourhood Playground	Finance Treasury	4112
6	Cevatpaşa	Public Garden	Park	Municipality of Çanakkale	40102
7	Esenler	Freedom Park	Recreation Area-Park	Municipality of Çanakkale	37445
8	Esenler	Assembly Areas	Park	Municipality of Çanakkale	25786
9	Esenler	Karacaören Culture Park	Park	Municipality of Çanakkale	75629
10	İsmetpaşa	Place of Sacrifice	Wholesale Market	Municipality of Çanakkale	11882
11	Kemalpaşa	Republic Square	Square (Ceremony Area)	Finance Treasury	2023
12	Namıkkemal	Friday Bazaar	Market Area	Municipality of Çanakkale	25929

### **Hamidiye Bastion**

The Hamidiye Bastion is located on the coast of the Dardanelles Strait in the Barbaros Quarter of Çanakkale city center. The park consists of arc-shaped historical bastions located in the northwest-southeast direction parallel to the coast and park areas expanding towards the east. The restoration works of the Anatolian Hamidiye Bastion were completed in 2017 within the scope of the ‘Anatolian Hamidiye Bastion Çanakkale Wars History Museum Project’, which was initiated by the Ministry of Culture and Tourism in 2014 with the Contractor Company and Çanakkale Onsekiz Mart University [32]. The park can be reached by connecting to Aziziye Street via Beach Street and Atatürk Street.



**Fig. 2.** Location of Hamidiye Bastion [31].

### ***Özgürlük Park***

Özgürlük Park, which is a recreation area and park, is in the Esenler. The park is located 280 meters from the coast and has an altitude of 50 m. Built on a sloping area, the park is one of the parks with the largest area width in the study area. The park is accessed via Özgürlük Street, which connects to İnönü Street.



**Fig. 3.** Location of Özgürlük Park [31].

## **RESULTS AND DISCUSSION**

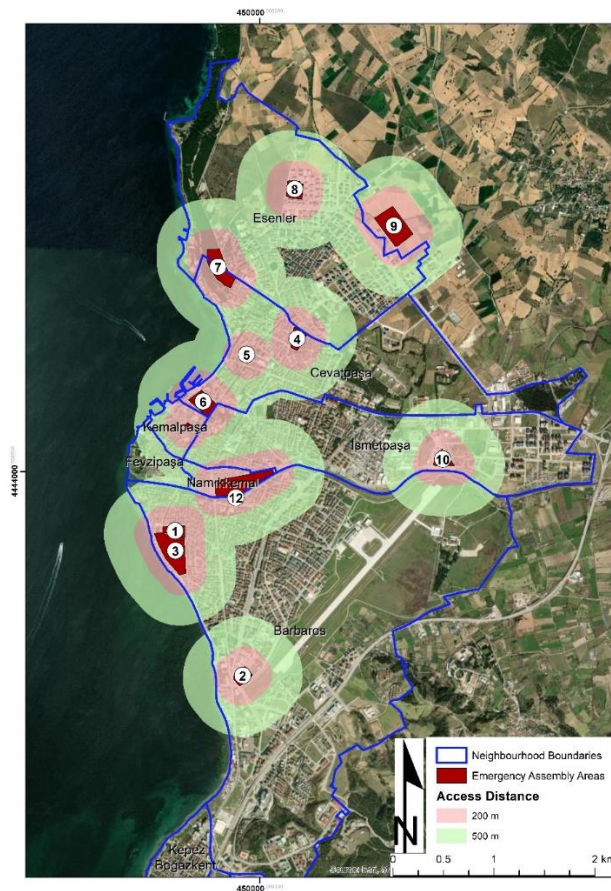
### ***Emergency Assembly Areas***

In the study area, 12 officially identified EAAs were evaluated in terms of accessibility and size (Table 2). Thus, only three of the seven neighborhoods in the area have adequate EAAs in terms of size. In addition to this, only two EAAs in two neighborhoods are suitable in terms of accessibility. Barbaros, Fevzipaşa and İsmetpaşa neighborhoods are inadequate in terms of both size and accessibility. Only Namıkkemal neighborhood is adequate in both size and

accessibility. However, to be noted that this neighborhood is the smallest in size and the neighborhood with the lowest population. In addition, EAAs, which is a functional marketplace in Namıkkemal neighborhood, is located on the shores of Sarıçay, the only river flowing through the city, where the soil liquefaction is the highest. In Barbaros neighborhood, which is the largest neighborhood of the area, EAAs is sufficient in accessibility in the section from Atatürk Street to the coast. However, it is inadequate in terms of both accessibility and capacity in a large area bounded by Troy Street and the airport to the east. In addition, there are no EAAs at Terzioğlu Campus, the largest campus of the university located in Barbaros neighborhood (Figure 4). In addition, the campus is built on a hill and has a challenging topography. Determination of EAAs and making disaster management plans for this campus with the highest number of students, academic and administrative staff is an issue that needs to be addressed separately.

**Table 2.** Accessibility and size analysis of emergency assembly areas

Neighbourhoods	Population (person)	Neighbourhood Area (m <sup>2</sup> )	Emergency Assembly Areas (m <sup>2</sup> )	Area per capita (m <sup>2</sup> /person)	Size	Accessibility
Barbaros	61647	8169265	119828	1.9	Insufficient	Insufficient
Cevatpaşa	23820	2603841	63330	2.7	Sufficient	Insufficient
Esenler	29767	3665851	138860	4.7	Sufficient	Insufficient
Fevzipaşa	1790	240722	0	0.0	Insufficient	Insufficient
İsmetpaşa	23959	2638781	11882	0.5	Insufficient	Insufficient
Kemalpaşa	1633	203937	2023	1.2	Insufficient	Sufficient
Namıkkemal	1059	197012	25929	24.5	Sufficient	Sufficient



**Fig. 4.** Distance analysis to emergency assembly areas.

### Earthquake Parks

There is no earthquake park designed in the study area. For this reason, the earthquake parks of the gathering areas in the area were evaluated. The earthquake park potential of Hamidiye Bastion and Özgürlük Park, which were designed as spatially sufficient and multifunctional, was analyzed using the standards in the literature [30] (Table 3).

**Table 3.** Compliance of Hamidiye Bastion and Özgürlük Park with earthquake park standards

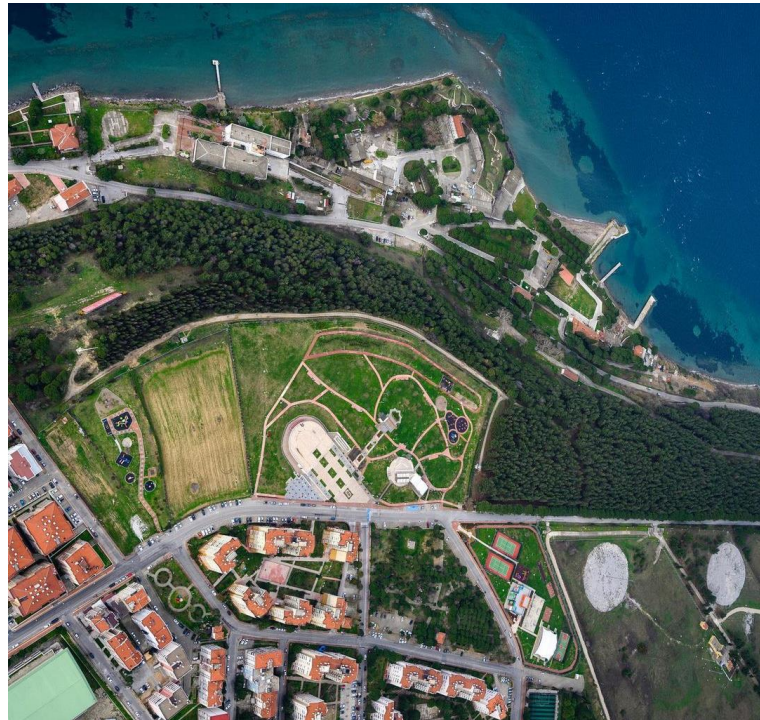
	Definition	Hamidiye Bastion	Özgürlük Park
OPEN SPACES	Heliport	–	–
	Children's playgrounds	+	+
	Amphitheatre	+	–
	Picnic Site	+	+
	Playgrounds	+	+
	Sport Facilities	–	–
	Ice-skating rinks	–	–
	Parking lot	+	+
	Greenhouse	–	–
	Skateboard ramps	–	+
	Pool	+	–
	Large openings	+	+
CLOSED SPACES	Warehouse	+	–
	Rainwater harvesting area	–	–
	WC	+	+
	Cafeterias	+	+
	Buffets	+	+
	Waste yards	–	–
	Religious buildings	+	+
Security boxes	+	–	

*Hamidiye Bastion:* It is the largest assembly area in the study area. In the park, there are open and closed areas for different audiences and aims. The area shown with a red circle in Figure 5A is the Dardanel Sports Facility area, which is determined as another assembly area. Dardanel Sports Facilities, which has a high open space potential, and Hamidiye Bastion, which has indoor space and infrastructure facilities, can be used together as emergency and temporary shelter areas in case of an emergency and after a disaster. Hamidiye Bastion is not designed as an earthquake park, but it can be utilized as an earthquake park with necessary additions and arrangements.



**Fig. 5.** North view of Hamidiye Bastion (A) [33], South view of the Hamidiye Bastion [34].

*Özgürlük Park:* Özgürlük Park, which is the fourth largest EAAs in area, has been examined for its potential as an earthquake park due to its multifunctional structure. The park has a rectangular form and is surrounded by dense mature woodland on two sides and wide roads on the other two sides. There are also recreation areas and social facility areas in the east and northeast of the area. Although the open space potential of the area is sufficient, the high slope of the area reduces the utilization potential of the open spaces. The closed area potential of the area is not sufficient. When analyzed in respect of earthquake park standards, it is found to be suitable for gathering and information purposes, but inadequate for sheltering and coordination purposes. The park, located on the shore of the Dardanelles and at an altitude of 50 m, must also be addressed by climatic situations. The park is exposed to the winds due to the low density of construction in the north and north-east of the area. In case Özgürlük Park is designed as an earthquake park, its infrastructure, climatic condition, closed and open space potentials and transportation issues should be prioritized.



**Fig.6.** View Freedom Park from above [35].

## CONCLUSION

Turkey has been frequently exposed to natural disasters due to its geographical location, geomorphological and geophysical structure. Rapid and unplanned urbanization as a result of the sudden increase in urban population reduces the resilience of cities in Turkey to disasters. Çanakkale, located in the northwest of Turkey, is one of the provinces where disasters such as earthquakes, floods, lightning strikes, landslides and forest fires are frequently experienced. In this study, 12 EAAs in Çanakkale province are evaluated in respect of accessibility and size. In addition, two areas that can be considered as earthquake parks for Çanakkale city center are examined in accordance with the earthquake park standards. Results of this study indicate that there are inadequate EAAs in Çanakkale city center in size and accessibility. It is necessary to evaluate the capacities of existing EAAs and determine their risks. In the Barbaros, which is the largest neighborhood of the city and contains the largest campus of the university, new EAAs areas should be proposed. Fevzipaşa, the oldest neighborhood of the city, does not have any EAAs. There are not enough open and green areas in the neighborhood, which is defined as an urban conservation area. Fevzipaşa, Namikkemal and Kemalpaşa, which are defined as the commercial center of the city, are places with a high density of daytime users. In this context, three neighborhoods should be considered together, different scenarios should be produced, evacuation corridors and gathering areas should be determined.

There is no earthquake park designed in Çanakkale province, which has a high earthquake risk. Two of the EAAs analyzed within the scope of this study, Hamidiye Bastion and Özgürlük Park, are examined in terms of their earthquake park potential by using the standards in the literature. Accordingly, both parks are areas to be preferred in case of a possible emergency due to the sports, recreation and social facilities around them. Hamidiye Bastion is in a relatively better condition than Özgürlük Park due to its open and closed space potential. Özgürlük Park has difficult conditions topographically and climatically. Besides, both parks are located on the coast. Therefore, both areas should be analyzed in terms of secondary disasters. Hamidiye Bastion, which is the largest EAAs in the study area, is suitable to be designed as an earthquake park considering the current situation and standards.

The destructive effects of disaster can be minimized with effective disaster management. Disaster risk should be revealed through disaster management plans to be prepared in this line and appropriate plans should be made for post-disaster. Emergency assembly areas and earthquake parks are life-saving places during and after disasters. Therefore, they should be planned adequately and appropriately for each settlement and updated according to new conditions.

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