Turkish Journal of Forest Science
Available online at dergipark.gov.tr/turkjforsci

DETERMINATION OF USER PREFERENCES FOR THE POTENTIAL USE OF ATA BOTANICAL GARDEN AS A POST-DISASTER ASSEMBLY AREA

Büşra AKSU[1*], Hasan YILMAZ[2,]

[1]Atatürk University, İnstute of Science, Department of Landscape Architecture, Erzurum
[2]Atatürk University, Architecture and Desing Faculty, Department of Landscape Architecture, Erzurum

[*]Corresponding author: busraksu262@gmail.com

Büşra AKSU: http://orcid.org/0000-0001-7748-2915
Hasan YILMAZ: http://orcid.org/0000-0003-3768-4760

Please cite this article as: Aksu, B. & Yilmaz, H. (2024) Determınation of user preferences for the potentıal use of ata botanıcal garden as a post-dısaster assembly area, *Turkish Journal of Forest Science*, 9(1), 186-202.

ESER BİLGİSİ / ARTICLE INFO
Araştırma Makalesi / Research Article
Geliş 13 Mart 2024 / Received 13 March 2024
Düzeltmelerin gelişi 19 Eylül 2024 / Received in revised form 19 September 2024
Kabul 16 Ekim 2024 / Accepted 16 October 2024
Yayımlanma 30 Nisan 2025 / Published online 30 April 2025

ABSTRACT: Botanical gardens not only serve as areas that protect plant species, connect users with nature, and function as educational spaces, but also act as essential green spaces for urban populations. Urban green spaces can be utilized for a variety of purposes within the city. Among these functions, one of the most crucial is their role as places where people feel safe following potential disasters. In this study, a survey was conducted with 136 participants to investigate the potential of the Ata Botanical Garden, one of the significant green spaces in Erzurum, as an assembly and temporary shelter area after a disaster. The results revealed that the majority of participants live in apartment complexes without gardens (43.4%), do not feel safe where they currently reside (47.8%), and would prefer to live in safer places if given the opportunity (52.9%). It was found that the botanical garden has a high potential as an assembly area after a potential disaster (71.6%); however, in its current state, the garden is insufficient for post-disaster use (28%). Several recommendations were made to adapt the area for such purposes.

Keywords: Gathering areas, open green spaces, user preferences

ATA BOTANİK BAHÇESİ'NİN OLASI AFET SONRASI TOPLANMA ALANI OLARAK KULLANICI TERCİHLERİN BELİRLENMESİ

ÖZET: Botanik bahçeler bitki türlerini koruma altına alan, kullanıcıları doğayla buluşturan, çeşitli eğitim alanları oluşturan laboratuvar görevi üstlenen alanlar olmasının yanı sıra kent halkı için en önemli açık-yeşil alanlardan birini oluşturmaktadır. Kentsel açık-yeşil alanlar kent içerisinde birçok farklı fonksiyonlarda kullanılabilmektedir. Kentlerde bulunan açık-yeşil alanlar olası afet sonrasında insanların güvende hissettikleri mekânların başında yer

almaktadır. Bu çalışmada Erzurum kentinin önemli yeşil alanlarından birisi olan Ata Botanik Bahçesinin afet sonrası için toplanma ve geçici barınma alanı olma potansiyeli araştırılmak amacıyla 136 kişi ile bir anket çalışması yürütülmüştür. Katılımcıların çoğunluk olarak kentte bahçesiz toplu konutlarda yaşadıkları (%43,4), yaşadıkları yerde kendilerini güvende hissetmedikleri (%47,8) ve fırsatları olsa daha güvenli yerlerde yaşamak istedikleri (%52,9) ortaya çıkmıştır. Olası bir afet sonrasında botanik bahçenin toplanma alanı potansiyelinin yüksek olduğu (%71,6) bununla beraber alanın mevcut hali ile afet sonrası kullanım için yeterli olmadığı (%28) sonucuna ulaşılmıştır. Alanın bu amaçla da kullanılmasına yönelik bazı önerilere yer verilmiştir.

Anahtar Kelimeler: Toplanma alanları, açık-yeşil alan, kullanıcı tercihleri

INTRODUCTION

One of the most significant factors contributing to the rapid urbanization in our country is the attraction of cities due to the job opportunities created in urban areas. As a result, population growth driven by migration from rural areas has begun (Atalay, 2008). Economic and physical problems arise due to human-induced disasters caused by both natural and unplanned urbanization, depending on the physical characteristics of the regions where cities are established (Şahin & Üçgül, 2019).

Since the dawn of humanity, people have sought ways to understand and contend with nature (Şahin & Üçgül, 2019). Disasters, commonly referred to as "kıran" among the public, are defined as natural or human-induced events that cause material and emotional damage in settlements and disrupt regular activities (AFAD, 2012). Disasters are sudden occurrences that lead to various losses. Events such as landslides, avalanches, rockfalls, floods, and earthquakes are classified as disasters. In addition, occurrences like drought, climate change, and deforestation, which result in the loss of lives and property, are also considered disasters (Varol & Gültekin, 2016).

The United Nations University Institute for Environment and Human Security (UNU-EHS) evaluated the disaster potential and risk assessment of 171 countries using 28 indicators such as floods, earthquakes, and storms in its 2016 World Risk Report. Among 171 countries, Turkey ranked 106th with a World Risk Index score of 5.20, placing it in the low-risk category. Although Turkey appears to be a low-risk country, its disaster management risk score is approximately 69%, and its exposure risk score is around 12%, positioning it among high-risk countries and medium-level nations in terms of adaptability (Ersoy, 2017).

In Turkey, earthquakes causing both material and emotional damage have occurred on average every five years. It has been reported that approximately 100,000 people have lost their lives (Table 1), 2,100 have been injured, and more than 7,000 buildings have been destroyed as a result of these earthquakes (AFAD, 2012). These earthquakes have resulted in significant loss of life and property, causing both material and emotional harm.

Table 1. Major Earthquakes In Our Country

Year	Province	Magnitude ofEarthquake	Death Toll
1924	Erzurum Earthquake (Horasan)	6,8	60
1939	Erzincan Earthquake	7,9	33 000

1966	Muş Earthquake (Varto)	6,9	2.396
1970	Kütahya Earthquake (Gediz)	7,2	1.086
1971	Bingöl Earthquake	6,8	878
1975	Diyarbakır Earthquake (Lice)	6,6	2.385
1976	Van Earthquake (Muradiye)	7,5	3.840
1983	Erzurum-Kars Earthquake	6,8	1.151
1992	Erzincan Earthquake	6,6	653
1999	Kocaeli Earthquake (Gölcük)	7,8	17.840
1999	Düzce Earthquake	7,2	894
2003	Bingöl Earthquake	6,4	176
2011	Van Earthquake	7,2	601
2020	Elazığ Earthquake	6,8	44
2020	Izmir Earthquake	6,6	117
2023	Kahramanmaraş Earthquake	7.8 (± 0.1) and 7.5	±50.783

The primary goal in landscape architecture studies is to conserve existing resources and ensure a balance between usage and preservation, while planning, designing, and maintaining spaces within an ecological framework through functional and aesthetic efforts. In this context, the concept of geo-design has emerged with the aim of reducing exposure to disaster risks by identifying suitable areas for designs and minimizing problems caused by such risks (Kırçın et al., 2017). Geo-design is one of the key methods used in disaster risk reduction by selecting appropriate locations through various analyses during the landscape planning process. Disaster management involves two phases: pre-disaster and post-disaster, and the importance of landscape planning in mitigating physical and psychological damage becomes evident after a disaster (Ciga, 2020).

In the post-disaster reconstruction process, alongside economic and physical rebuilding, social restructuring also takes place. Therefore, in order to reduce psychological and social problems, it is crucial to create an environment that facilitates users' adaptation to their surroundings as they strive to return to normal life and meets their needs (Düzenli et al., 2017). Post-disaster assembly areas are divided into two categories: emergency assembly areas and temporary shelter areas (Maral, 2016). Emergency assembly areas are spaces that people can quickly access in the immediate aftermath of a disaster, while temporary shelter areas are designated to meet people's needs post-disaster. Temporary shelter areas must be designed to provide basic needs such as water, communication, and infrastructure (Şentürk & Erener, 2017; Çalışkan, 2019). The identification and planning of appropriate locations for emergency assembly and temporary shelter areas before disasters are critical topics within landscape planning (Ciga, 2020).

According to the Sphere Project, temporary shelter areas should be located near city centers, be suitable for habitation, provide security and peace, and not cause harm to the environment. The area should be accessible, located at least 3 meters above the rainwater basin in case of rainy weather, have good soil drainage and be suitable for excavation, and should not pose risks such as disease or landslides. The slope of the land should not exceed 7%, and the area should not be agricultural land. If there is no sewer connection, septic tanks should be available, and the area should have electricity and water connections. Temporary shelter areas should provide 45 m² per person, including infrastructure (Ciga, 2020).

In our country, standards set by AFAD (Disaster and Emergency Management Authority) exist regarding emergency assembly areas. When selecting these areas, the following factors must be considered:

• Population,
• Accessibility,
• Ensuring accessibility for the disabled and elderly as much as possible,
• Distance from secondary hazards,
• Preference for flat terrains,
• Proximity to residential areas, but far enough to remain unaffected by the disaster,
• Proximity to structures that can meet basic needs (Doğan, 2023).

In temporary shelter areas, container and tent placements should have at least 8 meters of clearance from the entrance door and at least 15 meters from main roads. Containers should provide a minimum of 3.5 m² per person, have a minimum elevation of 30 cm above the ground, and include infrastructure for facilities such as bathrooms, toilets, and kitchens. They should be equipped with a power supply of 15 kW, be made from waterproof and fire-resistant materials, and have durable and unbreakable floors. Tents should also provide at least 3.5 m² per person, with the upper part constructed from double layers or insulating materials. They should have a power capacity of 5-7 kW and include lockable doors. Temporary shelter areas should be less than 500 m². Containers or tents should be provided at a rate of 3.5 m² per person, with at least 2 meters of space between each unit (AFAD, 2015).

Several studies have been conducted regarding the potential of open-green spaces as assembly areas following disasters. Maral (2015) reported that in İzmir, the selection of assembly and tent areas did not comply with the international standards set by AFAD. It was anticipated that proper planning could address communication and interaction problems. A study conducted in Gümüşhane identified that the selected assembly areas were particularly unsuitable from a population perspective, and recommended more accessible alternative areas (Şirin, 2020). Palazca (2020) addressed the positioning and capacities of green spaces in the city after a disaster, while Kalkan (2022) noted that open-green areas did not meet the requirements as assembly areas. Saygılı and Akpınar (2022) categorized open-green areas and assessed their adequacy, and Uyar and Özkan (2023) found that assembly areas were insufficient in relation to the population. A study on the adequacy of open spaces in the Aydın-Efeler district for disaster and emergency assembly determined that while the total number of assembly areas was adequate relative to the population, they were insufficient at the neighborhood scale.

Özdikmen (2015) emphasized the necessary actions to be taken in and after disaster situations, and Erdin et al. (2018) identified that earthquakes, floods, and landslides are the most frequent natural disasters in Turkey. The study found that visitors primarily mentioned earthquakes, rockfalls, and landslides.

Adıgüzel (2024) listed the functions that parks should have for use in potential disaster situations, including administrative buildings, security, parking, areas that could serve as hospitals, sports fields, picnic areas that could be converted into tent areas if necessary, playgrounds, hobby gardens, cafeterias, hard surfaces that could be used as tent areas, seating areas, restrooms, showers, changing cabins, storage areas, charging stations, water tanks, fountains, waste collection areas, and infrastructure systems. The study also found that while Ata Botanical Garden is suitable for use as a post-disaster assembly area, its current state presents several opportunities but is still insufficient.

In terms of seismicity, Erzurum, located in the Eastern Anatolian Compression Zone, is situated between the North Anatolian Fault Zone and the Eastern Anatolian Fault Zone. The area,

characterized by active tectonic surfaces and fault systems, features prominent fault zones including the Aşkale Fault Zone, Başköy-Kandilli Fault Zone, Palandöken Fault Zone, and Erzurum-Dumlu Fault Zone. Throughout history, these four fault zones have experienced and continue to experience various destructive earthquakes (Anadolu Kılıç, 2021).

By examining active fault zones in Erzurum, five earthquake regions have been identified. The city center of Erzurum is designated as a 2nd-degree earthquake region (Figure 1). The population density in Erzurum is highest in the Aziziye, Palandöken, and Yakutiye districts.

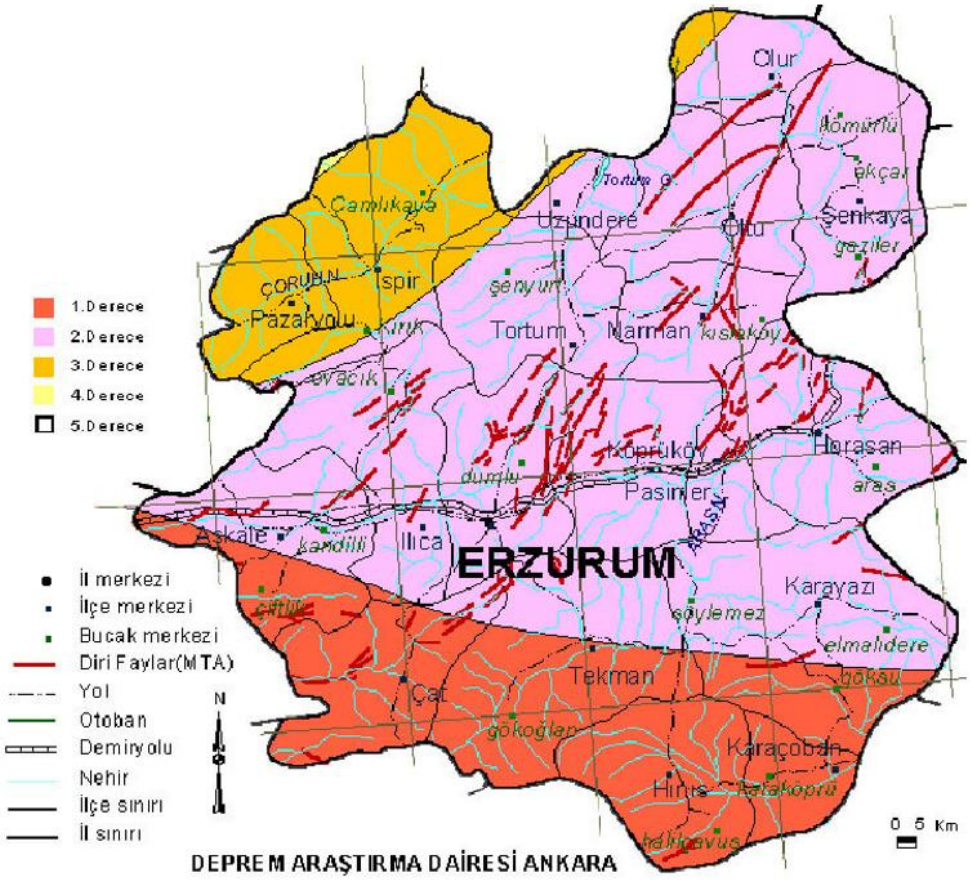

Figure 1. Earthquake Risk Map of Erzurum Province by Districts

The districts of Palandöken and Yakutiye in Erzurum city center are primarily situated on old alluvial soils. These areas are marked in pink on the geotectonic map, indicating problematic areas that require preventive measures. Due to the varying groundwater levels between 35-150 meters, there is a forecast of potential issues such as soil liquefaction in the event of an earthquake (AFAD, 2021).

The Ata Botanical Garden, one of the important open-green spaces in Erzurum, has become a frequently visited site due to its recreational facilities. Botanical gardens offer numerous benefits, including opportunities to spend time in nature, recreational activities, viewing various plant compositions together, and preserving plant diversity. This study aims to evaluate the suitability of Ata Botanical Garden as an assembly and temporary shelter area in the event of a disaster for the city of Erzurum, which is located in an earthquake-prone zone. The study seeks to answer the question: “Does the garden have the physical potential to serve the people of Erzurum in the aftermath of a potential disaster?

MATERIAL and METHOD

The study area is the Ata Botanical Garden, located within Atatürk University in Erzurum, covering approximately 35 hectares. The garden was designed and established in 2005 by Prof. Dr. Hasan Yılmaz. Around 100,000 m² of the Ata Botanical Garden features various landscape applications. Additionally, there is a large hobby garden within the boundaries of the botanical garden. The actively used section of Ata Botanical Garden includes an artificial pond, bridges, seating areas, an irrigation system, lighting elements, walking paths, terraces, a jogging track, a parking lot, and grassy areas (Figure 2) (Yılmaz, 2012). The study area consists of the Ata Botanical Garden within Atatürk University in Erzurum, which has an area of approximately 35 ha. The garden was designed and implemented by prof. Dr. Hasan Yılmaz in 2005. Various landscaping applications are included in approximately 100,000 m^2 of the Ata Botanical Garden. There is also a large hobby garden within the boundaries of the botanical garden. In the part actively used in the Ata Botanical Garden, there are artificial ponds, bridges, seating areas, irrigation system, lighting elements, walking paths, terraces, running path, parking lot and grass surfaces (Yılmaz, 2012).

Figure 2. ATA Botanical location map and some images. (H. Yılmaz)

In the study, after conducting a literature review on the topic, a questionnaire was prepared for the users of Ata Botanical Garden. During the fall semester of 2023, a total of 136 people were surveyed on different dates (Appendix 1). The sample size for the questionnaire was determined using simple random sampling methods (Yazıcıoğlu, 2004; Lai & Nepal, 2006). The results were analyzed using the SPSS statistical program, subjected to the chi-square test, and presented graphically along with some recommendations. The chi-square test was used to evaluate the differences between variables, tested at a 95% confidence interval. The results were analyzed with the SPSS statistical program, and presented graphically with some recommendations.

The source used for calculating the sample size is as follows:

$$n = \frac{N.P.Q.Z_{\alpha}^{2}}{(N-1).d^{2}}$$

N: Population size,
n: Sample size
P: Proportion of occurrence of X in the population
Q: (1-P): Proportion of non-occurrence of X
$Z\alpha$: α= 1.96 for $\alpha = 0.05$
d: Sample error with $\alpha = 0.05$ (d = 0.10)

For Ata Botanical Garden, with a population size of 15,000, the sample size calculation is as follows:

$N=31260*0.5*0.5*(1.96)^2 :(31260-1)*(0.10)^2=96$

In 2022, Ata Botanical Garden hosted approximately 31,260 visitors. Considering additional visitors such as unregistered guests, guest visitors, and Atatürk University staff, it was anticipated that the population size would be larger, leading to an increase in the sample size from 96 to 136. This adjustment was made to improve accuracy as the number of respondents increases.

RESULTS

Of the survey participants, 52.9% are female and 47.1% are male. The age distribution of the participants is as follows: 71.1% are between 19 and 25 years old, 27.4% are between 26 and 40 years old, and 1.5% are either 0-18 years old or over 60 years old. Regarding occupation, 58.1% are students, 9.6% are civil servants, 7.4% are workers, 4.4% are self-employed professionals, 0.7% are homemakers, and 19.9% belong to other occupational categories. Additionally, 51.1% of the participants have a university degree, 36.6% have completed high school, 12.6% have other educational backgrounds, and 0.7% have completed elementary school.

Generally, 43.4% of the participants live in apartment complexes without gardens, 32.4% live in apartment complexes with gardens, 1.2% live in detached houses with gardens, and 8.1% live in other types of housing. Among the participants, 60% of women and 56% of men, as well as nearly half (47.8%) of the university graduates who constitute the majority, reported living in apartment complexes without gardens. In this context, the type of housing in which visitors reside is found to be significantly associated with their educational background ($p < 0.05$) at a 95% confidence level (Table 2).

Table 2. Analysis of the Types of Residences of Participants

		Detached House/Garden House		Apartment Building Without Garden		Apartment Building with Garden		Other	
		N	%	N	%	N	%	N	%
Gender	Female	24	16,9	60	42.3	46	32,4	12	8,5
	Male	18	14.1	56	43.8	44	34,4	10	7,8
	Total	42	15.6	116	43	90	33,3	22	8,1

Chi-square (x^2) = .487							Significance value=3.443[a]		
Age	0-18	0	0.0	2	100.0	0	0.0	0	0.0
	19-25	28	17.3	64	39.5	58	35,8	12	7,4
	26 of 40	12	13,6	44	50	24	27,3	8	9,1
	41-60	0	0	2	20	6	60	2	20
	60 and above	2	2	4	50	2	2	0	0
	Total	42	15.6	116	43	90	33,3	22	8,1
Chi-square (x^2) = .293							Significance value=14.120[a]		
Occupation	Employee	4	20	10	50	4	20	2	10
	Officer	0	0.0	18	69.2	8	30,8	0	0.0
	Self-Employment	2	16.7	4	33,3	4	33,3	2	16.7
	Student	28	17.9	58	37.2	56	35,9	14	9.0
	Other	8	14.3	26	46.4	18	32.1	4	7,1
	Total	42	15.6	116	43	90	33,3	22	8,1
Chi-square (x^2) = .196							Significance value=15.898[a]		
Educational Status	Primary School	0	0	0	0	0	0	2	100
	High School Graduate	12	12.5	42	43.8	38	39.6	4	4,2
	University Graduate	24	17.4	66	47.8	40	29.0	8	5,8
	Other	6	17,6	8	23,5	12	35,3	8	23,5
	Total	42	15.6	116	43	90	33,3	22	8,1
Chi-square (x^2) = .000							**Significance value=41.901[a]**		

When asked about the primary disaster risk in Erzurum, 83.8% of the participants identified earthquakes, 2.9% identified rockfalls, 2.2% identified landslides, 2.2% identified floods, and 8.8% chose other options. In this context, determining the most likely natural disaster in Erzurum is found to be significant with respect to age, occupation, and educational background ($p < 0.05$) at a 95% confidence level (Table 3).

Table 3. Primary Natural Risks in Erzurum According to Participants

		Flood		Landslide		Earthquake		Rockfall		Other	
		N	%	N	%	N	%	N	%	N	%
Gender	Female	2	1,4	4	2,8	116	81,7	4	2,8	1	11.3
	Male	4	3.1	2	1,6	110	85.9	4	6,3	8	6,3
	Total	6	2,2	6	2,2	226	83,7	8	3,0	24	8,9
Chi-square (x^2) = .196								Significance value=15.898[a]			
Age	0-18	0	0	2	100	0	0	0	0		
	19-25	4	2.5	4	2.5	144	88,9	2	1,2	8	4,9
	26 of 40	2	2.3	2	2.3	72	81.8	0	0.0	12	13,6
	41-60	0	0.0	0	0.0	6	60.0	2	20.0	2	20.0
	60 and above	0	0.0	0	0.0	2	25.0	4	50,0	2	25.0
	Total	6	2,2	6	2,2	226	83,7	8	3,0	24	8,9
Chi-square (x^2) = .000								**Significance value=88.378[a]**			
Occupation	Employee	0	0.0	0	0.0	14	70,0	0	0.0	6	23,1
	Officer	0	0.0	0	0.0	20	76,9	0	0.0	6	23,1
	Self-Employment	0	0.0	0	0.0	10	83.3	0	0.0	2	16.7
	Student	4	2	4	2	138	88.5	2	1.3	8	5,1
	Other	2	3,	2	3,	44	78,6	4	10,7	2	3,6
	Total	6	2,2	6	2,2	226	83,7	8	3,0	24	8,9
Chi-square (x^2) = .001								**Significance value=40.407[a]**			

Educational Status	Primary School	0	0.0	0	0.0	0	0.0	0	0.0	2	100.0
	High School Graduate	2	2,1	4	4,2	84	87.5	0	0.0	6	6,3
	University Graduate	4	2.9	2	1,4	112	81.2	6	4,3	14	10,1
	Other	0	0.0	0	0.0	30	88,2	2	5,9	2	5,9
	Total	6	2,2	6	2,2	226	83,7	8	3,0	24	8,9
Chi-square (x^2) = .002										**Significance value=30.722[a]**	

Regarding the question of whether the buildings and neighborhoods where participants live are disaster-resistant, 47.8% answered "no," 25% answered "yes," and 27.2% selected "no opinion." Among the occupational groups, workers were most likely to answer "no" (16%), civil servants were most likely to answer "no opinion" (10%), self-employed individuals were most likely to answer "yes" (6%), students were most likely to answer "no" (70%), and those in other occupations were also most likely to answer "no" (32%) (Figure 3).

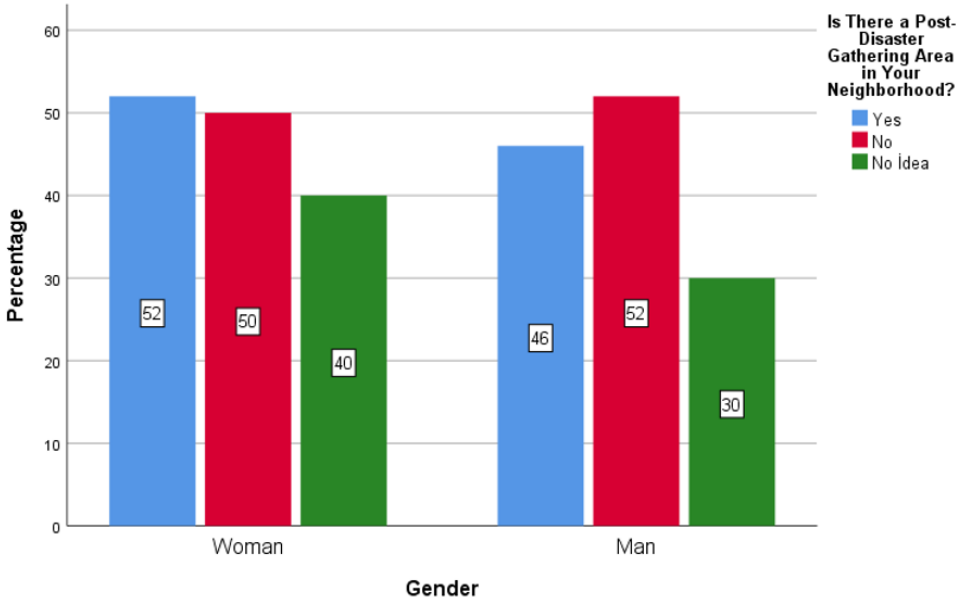

Figure 3. Participants' Views on the Disaster Resilience of Their Living Areas

In response to the question, "Is there a gathering place in your neighborhood after a disaster?" the overall answers were 36% "yes," 38.2% "no," and 25.7% "no opinion." As shown in Figure 4, 52% of women answered "yes," while 52% of men answered "no."

In response to the question, "Is Ata Botanik Garden suitable for the development of a new area as a post-disaster living space?" the overall answers were as follows: 24.4% said "very suitable," 28.9% said "suitable," 22.2% said "somewhat," 14.1% said "no opinion," 7.4% said "not suitable," and 3% said "not at all suitable."

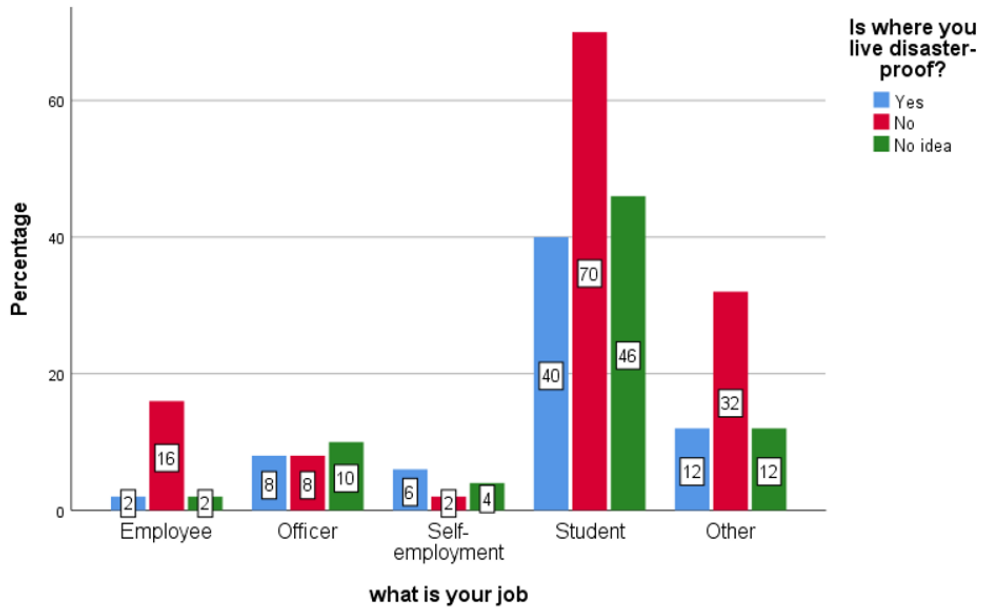

Figure 4. Participants' Opinions on Post-Disaster Gathering Places by Gender

As shown in Table 4, 28.2% of women responded "suitable," while 29.7% of men also answered "suitable." Among the participants, individuals aged 19-25 were the majority who found it "suitable" (34.6%), as well as students (32.1%) and high school graduates (47.9%). This indicates that the suitability of the botanical garden for post-disaster use is statistically significant based on gender, age, occupation, and education level at a 95% confidence level ($p<0.05$).

Table 4. Suitability Analysis of Ata Botanic Garden as a Gathering Area After a Potential Disaster

		Very Suitable		Suitable		Partially Suitable		Not suitable		No Opinion		Not Suitable at All	
		N	%	N	%	N	%	N	%	N	%	N	&
Gender	Female	30	21,1	40	28.2	38	26.8	14	9.9	20	14.1	0	0.0
	Male	34	26,6	38	29,7	24	18,8	6	4,7	18	14.1	8	6,3
	Total	64	23.7	78	28,9	62	23.0	20	7,4	38	14.1	8	3,0
Chi-square (x^2) = .015												**Significance value=14.080[a]**	
Age	0-18	0	0.0	2	100	0	0.0	0	0.0	0	0.0	0	0.0
	19-25	30	18,5	56	34,6	32	19.8	12	7,4	24	14,8	8	4,9
	26 of 40	24	27,3	18	20.5	24	27,3	8	9,1	14	15.9	0	0.0
	41-60	8	80.0	2	20.0	0	0.0	0	0.0	0	0.0	0	0.0
	60 and above	2	2,0	2	25.0	4	50,0	0	0.0	0	0.0	0	0.0
	Total	64	23.7	78	28,9	2	23.0	20	7,4	38	14.1	8	3,0
Chi-square (x^2) = .002												**Significance value=42.720[a]**	
Occupation	Employee	2	10,0	8	40,0	6	30,0	0	0.0	4	20.0	0	0.0
	Officer	12	4,2	4	1,4	6	23,1	2	7,7	2	7,7	0	0.0
	Self-Employment	8	66,7	4	33,3	0	0.0	0	0.0	0	0.0	0	0.0
	Student	30	19,2	50	32.1	32	20.5	16	10.3	24	15,4	4	2.6
	Other	12	21.4	12	21.4	18	32.1	2	3,	8	14.3	4	7,1
	Total	64	23.7	78	28,9	62	23.0	20	7,4	38	14.1	8	3,0
Chi-square (x^2) = .004												**Significance value=41.175[a]**	

Educational Status	Primary School	2	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	High School Graduate	22	22.9	46	47,9	18	18,8	0	0.0	8	8,3	2	2,1
	University Graduate	36	2,1	24	17.4	36	2,1	1	11	22	15.9	4	2.9
	Other	4	11.8	8	23,5	8	23,5	4	11.8	8	23,5	2	5,9
	Total	64	23.7	78	28,9	62	23.0	20	7,4	38	14.1	8	3,0
Chi-square (x^2) = .000												**Significance value=46.084[a]**	

Regarding the question, "Does the current condition of Ata Botanik Garden have the potential to serve as a gathering area for the people of Erzurum after any disaster?" the responses were as follows: 71.6% answered "yes," 15.7% answered "no opinion," and 12.7% answered "no." This indicates that determining the potential of the botanical garden to serve as a gathering area in the event of a disaster is statistically significant based on gender, age, and occupation at a 95% confidence level ($p<0.05$) (see Table 5).

Table 5. Analysis of the Potential of Ata Botanic Garden as a Gathering Area

		Gardened/Detached House		Non-Gardened Multi-Unit Housing		Gardened Multi-Unit Housing	
		N	%	N	%	N	%
Gender	Female	98	69	14	9.9	30	21,1
	Male	94	73,4	20	1,9	14	10.9
	Total	192	71.1	34	12	44	16.3
Chi-square (x^2) = .044						**Significance value= .251[a]**	
88	0-18	0	0.0	2	100	0	0.0
	19-25	118	72.8	16	9.9	28	17.3
	26 of 40	56	63,6	16	18,2	16	18,2
	41-60	10	100.0	0	0.0	0	0.0
	60 and above	8	100.0	0	0.0	0	0.0
	Total	192	71.1	34	12.6	44	16.3
Chi-square (x^2) = .001						**Significance value=25.375[a]**	
Occupation	Employee	12	60.0	4	20.0	4	20.0
	Officer	18	69.2	6	23,1	2	7,7
	Self-Employment	12	100.0	0	0.0	0	0.0
	Student	106	67,9	16	10.3	34	21.8
	Other	44	78,6	8	14.3	4	7,1
	Total	192	71.1	34	12.6	44	16.3
Chi-square (x^2) = ,031						**Significance value=16,960[a]**	
Educational Status	Primary School	2	100.0	0	0.0	0	0.0
	High School Graduate	72	75	10	10,4	14	14.6
	University Graduate	94	68,1	22	15.9	22	15.9
	Other	24	70	2	,9	8	23,5
	Total	192	71.1	34	12.6	44	16.3
Chi-square (x^2) = .509						Significance value=5.273[a]	

When asked, "What opportunities does Ata Botanik Garden offer to serve as a post-disaster gathering place?" the participants responded as follows: 22.5% identified large grassy areas, 21.3% identified vacant spaces, 16.6% identified wooded areas, 13.4% identified restrooms, 12.5% identified water sources, 7.6% identified parking spaces, and 6.1% identified vehicle pathways as contributing factors for its potential as a post-disaster gathering place.

Regarding the question, "What features would you prioritize for the proposed post-disaster living area at Ata Botanik Garden?" the respondents were asked to rank their preferences, and the evaluation results are illustrated in Figure 5.

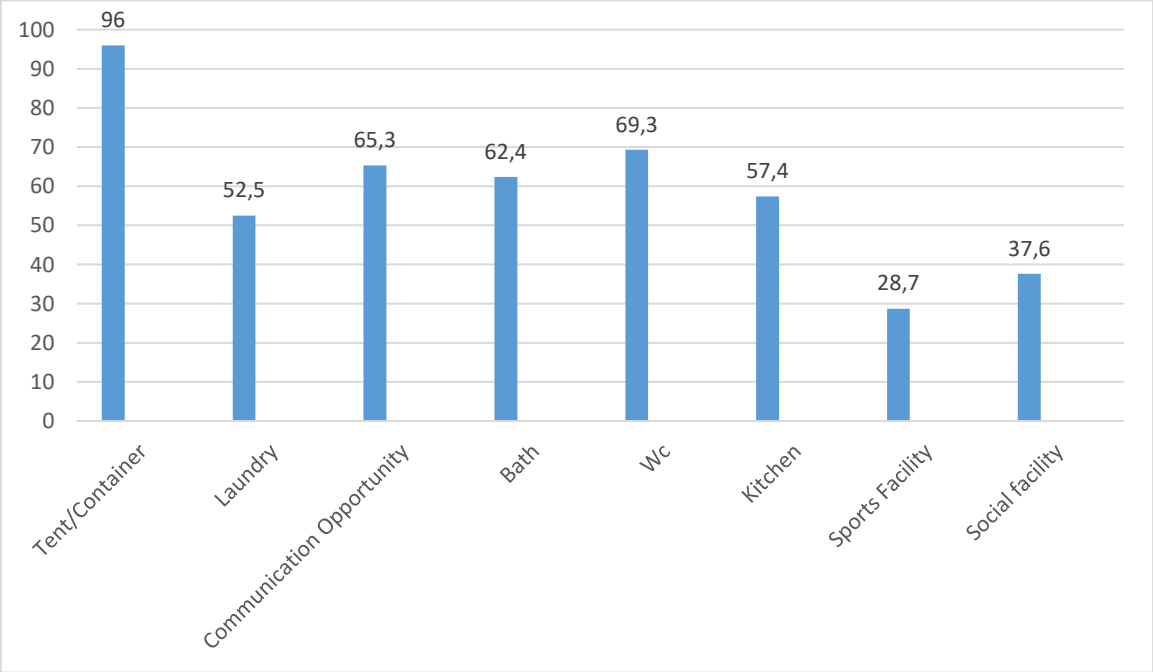

Figure 5. Priority Physical Structures Required in Post-Disaster Living Areas

CONCLUSION and DISCUSSION

Botanical gardens are open-green spaces that provide opportunities for individuals to connect with nature, create recreational areas, and preserve plant diversity through the collection of various plant species. While botanical gardens serve recreational purposes like other gardens, they are distinguished by their roles in education and scientific research. Therefore, botanical gardens should be approached with different techniques to create sustainable green spaces (Okan, 2022).

Urban open-green spaces are often deemed suitable and preferred for use as gathering areas. This highlights the importance of incorporating disaster-focused policies into land use plans in cities prone to disaster risks (Palazca, 2020). However, according to Gerdan's 2019 study, identified gathering areas were found to be insufficient, and open-green spaces were deemed unsuitable for post-disaster scenarios. While recreational open-green spaces might be sufficient, issues such as accessibility, safety, and meeting needs during and after a disaster remain concerns. Furthermore, urban open-green spaces are distinguished from other land uses due to their role in disaster management. Notably, urban planning regulations emphasize the importance of plazas and national parks in relation to disaster management (Palazca, 2020). Urban transformations and innovative landscape designs are fundamental to a holistic approach to urban space planning. These transformations must also ensure continuity and develop new models (Aşur, 2019).

Gathering areas should also be utilized for various open space uses such as walking, relaxation, and children's play areas in daily life. These areas are crucial for emergency purposes, including

evacuation, shelter, and first aid. Therefore, designated areas should be designed to be functional both during and outside of emergencies (Jayakody et al., 2016).

According to the JICA (2002) report, post-disaster gathering areas are essential not only for assessing damage and performing initial interventions but also for being easily recognizable and sufficiently large public spaces (Palazca, 2020).

Erzurum, located in the 2nd seismic zone, has experienced earthquakes historically across its districts. Ata Botanic Garden, an important open-green area in Erzurum, appears to have potential for use as a post-disaster area. The potential of the garden for post-disaster use has been assessed through visitor surveys, and while the existing physical infrastructure is suitable for a gathering area, it requires additional long-term structural improvements.

A survey conducted by the Socio-Political Field Research Center revealed that 37.5% of respondents considered their homes to be partially secure, 71.2% felt unprepared for earthquakes, and following the February 6 Elbistan and Pazarcik earthquakes, 26.9% of respondents sought refuge in parks, green spaces, or vacant lots (Url 2).

It has been noted that after a disaster, people primarily seek open spaces and thus head towards easily accessible and safe areas (Kırçın et al., 2017). Meral et al. (2021) found in their study that while open-green areas in Bingöl city center were adequate, they were lacking in terms of facilities, infrastructure, and accessibility. Another study indicated that parks were not suitable for post-disaster use and that necessary attention was not given to their preparedness (Meral et al., 2023). Areas with infrastructure that can support safe access, gathering, and basic needs during a disaster have been identified as suitable for gathering (Maral et al., 2015; Çınar et al., 2018; Mengi and Erdin, 2018; Gerdan and Şen, 2019).

According to the results of the study, the type of residence and the desire to move to a safer location in the event of a disaster varied by occupation. Participants indicated that they would be willing to move to safe locations even if they were far away in the event of a disaster. It was also determined that preferences for disaster-resistant living spaces were influenced by educational background and occupation. The study confirmed that Ata Botanic Garden has the potential to serve as a gathering area in the event of a disaster.

A large portion of participants who identified the most likely natural disaster in Erzurum as an earthquake lived in apartment complexes without gardens (43.4%) and indicated that their buildings and neighborhoods were not disaster-resistant. They also mentioned that while there were gathering areas in their living environments, these were inadequate. Additionally, their primary expectations from gathering areas were safe accommodation, followed by amenities such as restrooms, communication opportunities, bathrooms, kitchens, laundries, social facilities, and sports facilities (Figure 5).

While 24.4% of participants found Ata Botanic Garden very suitable as a gathering area in the event of a disaster, 28.9% found it suitable. The criteria determined by AFAD, such as accessibility and ease of evacuation, suitability for people with disabilities and the elderly, safety, as flat terrain as possible, proximity to residential areas but not affected by structural and non-structural elements, and proximity to buildings providing basic needs like electricity, water, and toilets, were found to be met (Url 3).

The botanical garden, which is suitable as a gathering area in terms of size, accessibility, security, and meeting basic needs, also has the potential to protect users from risks arising from surrounding developments.

The garden has the following advantages for use as a gathering place after a potential disaster:

- **Safety**: The area is secure, with a designated safety unit and enclosed surroundings.
- **Location**: Situated within the city, making it accessible and well-connected.
- **Topographical Suitability**: The topography is suitable, with an appropriate slope.
- **Energy Supply**: Availability of sufficient energy sources.
- **Clean Drinking Water**: Presence of three water wells providing clean drinking water.
- **Administrative Facilities**: Includes an administrative building and structures that can be partially utilized as a restaurant.
- **Basic Amenities**: Facilities such as WC and prayer rooms that can partially meet basic needs.
- **Parking and Open Spaces**: Availability of parking areas and open spaces, with potential for container and tent setups.
- **Temporary Shelter and Nourishment**: Numerous hobby gardens within the area available for temporary shelter and nourishment.
- **Extensive Open-Green Areas**: Large open-green spaces suitable for potential tent sites.
- **Psychological Support and Recreation**: Areas for demonstrations and recreational activities (plant displays, pond area, pergolas, and groves) providing psychological support and opportunities for leisure.

The study has determined that the Ata Botanic Garden is suitable for use as a gathering area and temporary shelter in the event of a disaster. The existing unused areas of the botanic garden can be adapted through infrastructure improvements and new arrangements to become suitable for temporary shelter and gathering purposes. Enhancing these areas can increase the garden's functionality.

In areas designated for new arrangements, facilities such as storage, kitchens, bathrooms/WC, containers, tent sites, and communication facilities can be established to meet post-disaster needs. The existing parking area, which is currently inadequate, can be expanded to increase its capacity.

Given that Ata Botanic Garden is one of the significant open-green spaces in the city, it is deemed suitable for use as a gathering area. However, its current state is insufficient.
To mitigate psychological trauma experienced by individuals following a disaster, social activity areas should be created. Water features and various thematic gardens should be incorporated to positively impact mental well-being. Playgrounds should be designed for children across different age groups. Additionally, the design should ensure that the space remains functional for daily use when not affected by disasters.

AUTHOR CONTRIBUTIONS

All authors contributed equally to the article.

FUNDING STATEMENT

The study received no financial support.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

ETHICS COMMITTEE APPROVAL

This study requires ethics committee approval. Ethics committee form was approved with the document number of 60665420-000-E.2100228866 on 01.09.2021 by the Ataturk University Institude of Science.

ACKNOWLEDGMENT

This study was prepared using Büşra AKSU's Thesis titled 'Ata Botanical Garden User Satisfaction and Possible 'Post-Disaster Recommendation Landscape Design Scenario'. It has not been published anywhere before.

REFERENCES

Adıgüzel, F. T. (2024). Examination of post-disaster preparation areas and earthquake park design: “A case study of Sancaktepe,” Master's Thesis, Istanbul University Institute of Science and Technology.

AFAD. (2012). Disaster Management and Natural Disaster Statistics in Turkey.

AFAD. (2015). Regulation on the Establishment, Management, and Operation of Temporary Shelter Centers.

AFAD. (2021). Provincial Disaster Risk Reduction Plan, Planning and Risk Reduction Department, Malatya.

Aşur, F. (2019). An evaluation of visual landscape quality of coastal settlements: a case study of coastal areas in the Van Lake Basin (Turkey). Applied Ecology & Environmental Research, 17(2).

Atalay, H. (2008). The use of urban open and green spaces in the event of an earthquake: A case study of Küçükçekmece Cennet Mahallesi (Doctoral Dissertation, Istanbul Technical University, Institute of Science and Technology).

Ciga, B. (2020). Examination of the adequacy of emergency assembly areas from the perspective of landscape planning: A case study of Kartal District, Istanbul, Master’s Thesis, Yıldız Technical University, Institute of Science and Technology.

Çalışkan, M. C. (2019). Examination of the applicability of disaster management plans: A case study of Çorlu (Master’s Thesis, Trakya University, Institute of Science and Technology).

Çınar, A., Akgün, Y., & Maral, H. (2018). Analyzing the planning criteria for emergency assembly points and temporary shelter areas: Case of İzmir-Karşıyaka. Planlama-Planning, 28(2).

Doğan, G. (2023). Examination of emergency assembly area planning criteria within the framework of integrated disaster management system: A case study of Malatya-Battalgazi, Master's Thesis, Erciyes University, Institute of Science and Technology.

Düzenli, T., Mumcu, S., & Yılmaz, S. (2017). Landscape design for earthquake survivors: Surroundings of İzmit Yuvacık earthquake housing. Academic Journal of Social Research, 237-247.

Gerdan, S., & Alper, Ş. E. N. (2019). Evaluation of the adequacy of designated assembly areas for disaster and emergency situations: A case study of İzmit. İdealkent, 10(28), 962-983.

Erdin, H. E., Zengin Çelik, H., Sılaydın Aydın, M. B., & Partigöç, N. S. (2018). Determination and evaluation of criteria for public assembly areas after disaster and emergency situations. İzmir City Example, Afad-Udap Study, Project No: Udap-G-16-08, Ankara.

Ersoy, Ş. (2017). 2016 Natural Disasters Yearbook: "World and Turkey", 1st Edition, Ankara: TMMOB Chamber of Geologists Publications.

Jayakody, C., Amaratunga, D., & Haigh, R. (2016, September). Planning and Designing Public Open Spaces as a Strategy for Disaster Resilient Cities: A Review of Literature. In 9th Faculty of Architecture and Research International Research Conference: Building the Future-Resilient Environments (pp. 156-168). Faculty of Architecture: University of Moratuwa.

JICA, İBB. (2002). Turkey Istanbul Seismic Microzoning and Basic Disaster Prevention/Reduction Plan Study. Istanbul: Istanbul Metropolitan Municipality.

Kalkan, M. (2022). Evaluation of the adequacy of designated disaster and emergency assembly areas in Uşak City. Resilience, 6(2), 269-285.

Kılıç, N. C. A. (2021). The profile of natural events and earthquake hazard in Erzurum Province. Journal of Disaster and Risk, 4(1), 61-83.

Kırçın, P. N., Çabuk, S. N., & Çabuk, A. (2017). The role of landscape architecture in reducing exposure risk to disasters. 4th International Conference on Earthquake Engineering and Seismology. Eskişehir: Anadolu University.

Lai, P., Nepal, S. (2006). Local perspectives of ecotourism developments in Tawushan Nature Reserve, Taiwan.

Maral, H., Akgün, Y., Çınar, A., & Karaveli, A. (2015). An evaluation of assembly and emergency shelter areas after disaster in İzmir. Turkey Earthquake Engineering and Seismology Conference.

Maral, H. (2016). Examination of factors in the planning of temporary settlements after disasters: A case study of Karşıyaka. Master's Thesis. İzmir: Gediz University Institute of Science and Technology.

Mengi, O., & Erdin, H. E. (2018, May). Management, design, and systematic approaches of assembly areas in disaster and emergency situations. In 2nd International Symposium on Natural Hazards and Disaster Management, Sakarya University Culture and Congress Center, Sakarya-Turkey 04-06 May 2018.

Meral, A., Vural, H., & Doğan, S. (2021). What Our Cities Can Offer After Natural Disasters. Online Journal of Art & Design, 9(3).

Meral, A., Kayalı, R., Kabay, Y., & Avcı, Y. E. (2023). Preparation status and scenario of Bingöl City's open green spaces for natural disasters. Bozok Journal of Agriculture and Natural Sciences, 2(1), 58-72.

Naguib, N., Ye, H., Gogotsi, Y., Yazıcıoğlu, A. G., Megaridis, C. M., & Yoshimura, M. (2004). Observation of water confined in nanometer channels of closed carbon nanotubes. Nano Letters, 4(11), 2237-2243.

Okan, Y. R. (2022). Sustainable planning and design approach of botanical gardens: A case study of the Turkish National Botanical Garden (Master's Thesis, Institute of Science and Technology).

Özdikmen, T. (2015). Disaster and emergency management: Field application of disaster management and emergency methodologies. Seçkin Publishing.

Palazca, A. (2020). Analysis of assembly areas after disasters: A case study of Denizli (Master's Thesis, Pamukkale University Institute of Science and Technology).

Saygılı, H. B., & Akpınar, A. (2022). Examination of the adequacy of urban green spaces in Aydın/Efeler for disaster and emergency assembly areas. Journal of Adnan Menderes University Faculty of Agriculture, 19(2), 305-311.

Şahin, Ş., & Üçgül, İ. (2019). Disaster management and occupational health and safety in Turkey. Journal of Disaster and Risk, 2(1), 43-63.

Şentürk, E., & Erener, A. (2017). Determination of temporary shelter areas in natural disasters by GIS: A case study of Gölcük/Turkey. International Journal of Engineering and Geosciences, 2(3), 84-90.

Şirin, M., & Ocak, F. (2020). Evaluation of disaster and emergency assembly areas in Gümüşhane City within the geographic information systems environment. Eastern Geography Journal, 25(44), 85-106.

Uyar, H. E., & Evrim, T. Ö. R. E. (2023). First Stop After Earthquake: An Examination of Assembly Areas in Istanbul. Journal of Disaster and Risk, 6(1), 206-222.

Varol, N., & Gültekin, T. (2016). An effective migration factor: Disasters. Anthropology, (32), 43-51.

Yılmaz, H. (2012). The importance of botanical gardens and the Atatürk University Ata Botanical Garden. Retrieved from https://www.plantdergisi.com/yazi-botanik-bahcelerinin-onemi-ve-ataturk-universitesi-ata-botanik-bahcesi-9.html (Accessed: 03.08.2023).

URL 1: https://www.afad.gov.tr/kurumlar/afad.gov.tr/35429/xfiles/turkiye_de_afetler.pdf (Accessed: 03.08.2023).

URL 2: https://sahamerkezi.org/depreme-yonelik-hazirlik-algi-ve-beklentilere-iliskin-anket-calisma-raporu/

URL 3: https://www.afad.gov.tr/kurumlar/afad.gov.tr/30991/xfiles/toplanma_alanlari.pdf (Accessed: 17.09.2024).