



Assessment of Temporary Shelter Areas After Disaster Using the Delphi Method: The Case of Osmaniye

Elife Büyüköztürk

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Abstract

Earthquakes are disasters that cause thousands of lives and property losses. Türkiye is under constant earthquake threat due to its geological location. One of the most important problems that arise after the earthquake is shelter. It is urgently necessary to provide shelter for earthquake victims. Therefore, temporary shelters are constructed in the cities where the earthquake occurred so that the earthquake victims, who are first placed in tents, can continue their vital functions until permanent residences are completed. In the study, the method was carried out in two steps. In the first step, spatial and structural suitability was determined for temporary shelter areas using the Delphi method. In this regard, 7 priority criteria and their significance levels were determined with the opinions of 15 experts and tested on the Osmaniye southern ring road. In the evaluation made by the field experts, it was determined that the Osmaniye container city was not sufficient to be a shelter area. In the second step of the method, the shelter area that was deemed unsuitable by the experts was also evaluated from the perspective of the users and a 21-question survey was conducted with 155 users. As a result of the analysis, it was concluded that earthquake victims were also dissatisfied with the shelter area. In this context, the temporary shelter area should be reconsidered. It is thought that this study will be guiding in terms of ensuring the satisfaction of users in the selection of temporary shelter areas in future studies.

Keywords: Temporary shelter areas, Delphi Method, Osmaniye, User Satisfaction

1. INTRODUCTION

Disasters are natural events that occur suddenly and affect society by disrupting the usual life in residential areas (Ildır, 1995, cited in Tüzün, 2002). In other words, natural, technological or human-induced events that cause physical, socio-economic damage to people and affect communities by stopping or interrupting normal life are called disasters (Ergünay, 1993; cited in: Yüksel, 2012).

In Türkiye, there are many disasters that cause thousands of lives and property losses. One of them is earthquakes. Turkey is under constant earthquake threat due to its geological location (Ünal, Akın, 2017). Earthquake is the type of natural disaster that results in the highest number of disaster victims in Türkiye (Can, Saka, 2022).

One of the issues that should be resolved as a priority after the earthquake is the shelter problem. The shelter, which is one of the basic needs of people, is primarily provided in tents and then in containers called temporary housing. Temporary shelters can be defined as units that provide temporary solutions such as shelter, nutrition, water, electricity and services after the tent settlement under the name of emergency shelter after the earthquake, until permanent houses are completed (Kalkan, 2019).



These temporary residences, where earthquake victims provide all their vital functions until their permanent residences are completed, and the areas where they are located must meet some criteria. Site selection is a process that requires many different settlement alternatives, multiple criteria and multiple stages to be considered together. Acting urgently to provide shelter to earthquake victims quickly may cause some factors not to be considered (Uslu, 2018 15).

In this context, the study will examine the temporary shelter area of the container city established in Osmaniye, one of the cities affected by the 2023 Pazarcık earthquake. In line with the criteria to be determined by the Delphi method, the spatial and structural suitability of the temporary shelter area in the city will be evaluated. Then, a survey will be conducted with the users of the area and user satisfaction analysis will be carried out.

2.METHOD

This study aims to test the spatial and structural suitability of post-earthquake temporary shelter areas on Osmaniye sample area. The method was carried out in two steps. In the first step, the opinions of experts in the city were consulted using the Delphi Method and accordingly, the criteria that should be addressed first for temporary shelter areas were determined. The experts consisted of different disciplines such as civil engineers, architects and geological engineers who know the city well. The criteria were also tested by the expert group in Osmaniye temporary shelter area and the suitability of the site selection was determined. Interviews with the expert group were conducted on-line.

The Delphi Technique is a process of obtaining a reliable survey on which an expert group reaches agreement by providing controlled feedback (Delbecq et al., 1975; cited in: Bahar, Somuncu Demir, 2021).

Delphi, a technique consisting of consecutive surveys, is used in many types of research (Aydin, 1999, 237).

In the Delphi technique, the sample size is formed in different ways by different users. "According to Armstrong (2001), Rowe and Wright (1999), it may be between 5-20, according to Okoli and Pawlowski (2004), between 10-18, according to Hasson et al. (2000) between 15-60 and there are also researchers who state that the participant group can be formed in wider ranges (Grisham, 2008; Hatcher & Colton, 2007; Skulmoski et al., 2007; Wiersma & Jurs, 2005; Williams & Webb, 1994). It is stated that in Delphi studies, the number of individuals is generally shaped according to the purpose of the study and the diversity of the target audience (Williams & Webb, 1994, cited in: Bahar, Somuncu Demir, 2021).

The opinions of 15 experts were consulted in the study. Of these experts, 2 are interior designers, 3 are academicians, 2 are geological engineers, 3 are civil engineers and 3 are architects. While selecting among the experts, it was paid attention that they worked in different places. Therefore, 8 of the experts were selected among those working in the private sector and 7 among those working in the state.

In the second step of the method, a survey was conducted with temporary shelter users to determine their satisfaction level with the area. The population of the survey consists of the temporary shelter area adjacent to the southern ring road in Osmaniye province. Since the number of families living in this area is accessible, the "Simple Random Sampling" method was used to calculate the sample size in the study (Yaygın, 2016). Within the scope of the data received from Osmaniye Municipality, it was determined that there were 2063 containers built for families in the area. In this context, it was decided that one person from each family would be interviewed in the study, and N: 2063 (Osmaniye Municipality, 2023).

N = the number of the target population, n = the number of individuals to be sampled, p = frequency of occurrence of the event under study (probability of occurrence), q = probability of non-occurrence of the event under study, t = the theoretical value found according to the "t" table at a certain level of significance (1.96 for 95%; 2.58 for 99%), d =sampling error accepted according to the frequency of occurrence of the event (0.1), $pq=(0.5)\times(0.5)=0.25$ is the sample percentage for the maximum sample size (Yaygın, 2016).

Within the scope of the study area consisting of 2063 individuals, 155 individuals were sampled for 99% confidence interval and a survey was conducted with these individuals by random face-to-face interview method. The surveys were evaluated with IBM SPSS Statistics (Statistical Package for the Social Sciences) computer software.

The study was supported by the Delphi method and survey study, as well as observation, photography and experiences.

3. FIELD STUDY

The sample area of the study is the temporary shelter area in Osmaniye province. This area is the place where earthquake victims in Osmaniye can stay after the 2023 Pazarçık earthquake until their permanent residences are completed. The temporary shelter area is in Fakiuşağı Neighborhood, adjacent to the southern ring road.

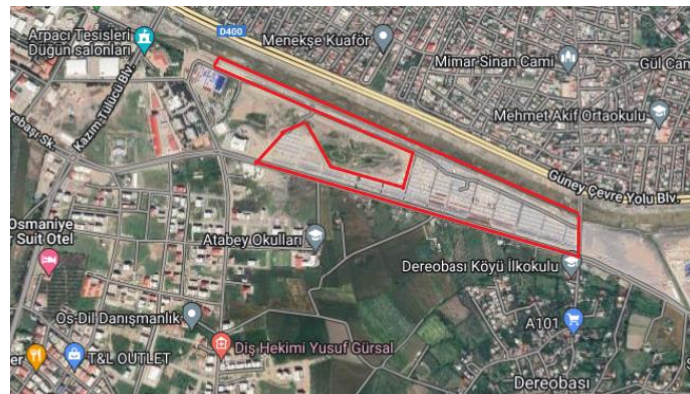


Figure 2.1. Osmaniye Temporary Shelter Area

In the temporary shelter area, the houses are made of prefabricated materials. This is because this construction material is considered to be a determining factor in shortening the installation time. In addition, thanks to the durability of the housing material, earthquake victims did not suffer from cold and difficult winter conditions (Figure 2.2.).



Figure 2.2. Container city

In the camp area, where each unit has a capacity of 3-4 people depending on the size of the residence, the temporary shelter area is 182 decares and there are 2063 containers (Osmaniye Municipality, 2023). The distance between these containers is 1 meter, which can be criticized for being too close. The secondary roads within the area are 8 meters and the roads determining the main axes are 15 meters. It can be said that these main roads were built for material trucks, garbage vehicles and ambulances (Figure 2.3.).

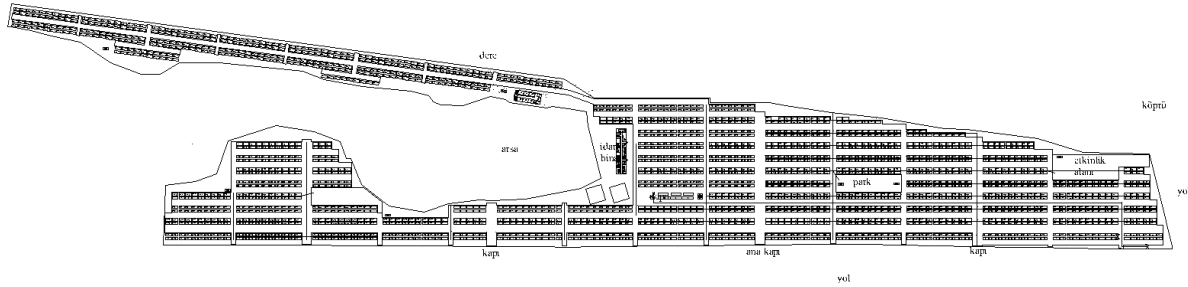


Figure 2.3. Temporary Settlement Area Layout Plan

The temporary settlement area includes a health unit, a park, laundry areas, food and beverage units, a library-study center, psychological support units, AFAD administrative building, masjids and a nursery (Figure 2.4.).



Figure 2.4. Container city common areas

The fact that the houses in the temporary shelter area are single-storey and built in an orderly manner in the settlement plan shows that they are accessible for earthquake victims (Kalkan, 2019). A prefabricated house, described as a temporary residence, has an average size of 20 m² with a living area, kitchen counter, bathroom and bedroom (Figure 2.5.).

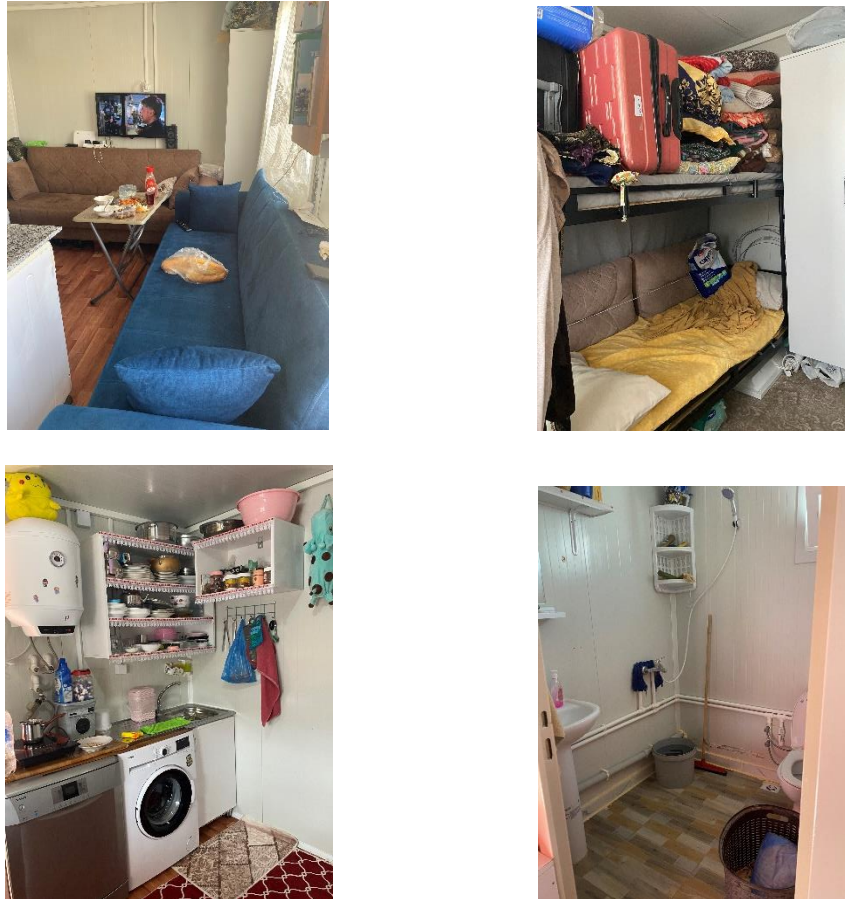


Figure 2.5. Container interior

Containers are produced in a single type as standard. The height inside the residence increases from 2.8 meters on one side to 3.6 meters on the other side due to the slope of the roof. The uniform production and regular positioning of the houses positively affected the production time (Kalkan, 2019). However, it was found to be insufficient by very crowded families in face-to-face interviews. In this context, it would be more beneficial to produce several different types of container models considering crowded families.

4. CONDUCTING THE METHOD ON THE STUDY AREA

While testing the methodology on the sample area, first of all, determinations were made with the selected expert group within the scope of the Delphi method, and then a survey was conducted with the area users within the scope of the second step of the method.

4.1. Application of the Delphi Method

When creating temporary housing areas, the fact that the physical data of each region is different causes the priority criteria to be different. The Delphi is a method that can be used in temporary shelter areas because it includes the opinions of experts from different disciplines who know the city well. On the other hand, it is essential to manage the process quickly during the establishment of temporary shelter areas. In this context, the Delphi method is usable because it provides rapid results. The Delphi Method was preferred in this study because it can be used in temporary shelter areas with its adaptability to every region in the selection and construction of temporary shelter areas after the earthquake.

In the study, the Delphi method was carried out in three stages. Firstly, the criteria with high level of significance for temporary areas were determined by the experts, then their significance values were determined, and in the last stage, these criteria were tested by the experts in the temporary shelter area adjacent to the Southern Ring Road in Osmaniye to determine their suitability.



Determination of Criteria for the Problem

While determining the criteria for the problem, first a literature review was conducted. In this context, AFAD criteria and 27 criteria collected under 6 main headings by Soltani et al. (2014, 2015) for the selection of temporary shelter areas to be used after a possible earthquake disaster were examined (Hazırcı, Şahin, 2019).

In line with these examinations, 25 criteria were selected.

Chart 1. Assessment Criteria

CRITERIA	
1	Infrastructure
2	Land Drainage
3	Shelter type/model
4	Flora
5	Environmental Situation
6	Ecological Situation
7	Economic Dimension
8	Electrical Infrastructure
9	Accessibility
10	Security and Protection
11	Prevailing Wind Direction
12	Distance to Secondary Hazards
13	Climate
14	Communication Services
15	Geology
16	Elevation/Slope
17	Culture, tradition and population
18	Cultural heritage
19	Current Land Use
20	Ownership
21	Proximity to Health Facilities
22	Suitable Size/Capacity
23	Precipitation
24	Local Materials
25	Soil Permeability

The experts were asked to evaluate the 25 criteria under the headings of "very suitable", "suitable", "moderate", "not suitable", and "not suitable at all". In this context, it was concluded that the 7 criteria to which the experts responded "very suitable" were prioritized (Chart 2).

Chart 2. Assessment Criteria Selected by Experts

Criteria	Description
1. Suitable Size/Capacity	Suitable for accommodating the current number of people These areas must be large enough to serve a minimum of 10 people. It is concluded that temporary shelters have a capacity of 10 people or more, with a minimum area of 100 m ² with 10 m ² per person (Gökgöz et al., 2020, cited in: Özer, Kuşak, 2021).
2. Accessibility	Proximity to residential areas, health and education facilities, easy access to the area without traffic problems Disaster victims must reach the area where temporary housing is located safely. Proximity to the road is important for disaster victims' access to the gathering area, as well as for transportation to health facilities and for health services to reach that area (Gökgöz et al., 2020, Cited in: Özer, Kuşak, 2021).



3. Geology	Soil structure
The ground value must be high for protection from possible secondary earthquakes and aftershocks.	
4. Infrastructure	Infrastructure status
The area must already have infrastructure such as electricity, water, etc.	
There should be no infrastructure problems so that earthquake victims can meet their primary needs.	
5. Elevation/Slope	The elevation and slope of the land must be analyzed.
Disasters such as earthquakes can trigger the occurrence of other disasters. Areas that are resistant to other disasters such as possible floods must be selected.	
6. Shelter type/model	Container housing plan
The shelter model to be chosen must have a low cost, be able to adapt to different climatic conditions, be easily and quickly assembled, and have a flexible design (Dayanir et al., 2022).	
7. Climate	Suitability for climate
Local climate characteristics such as precipitation, sun, and wind direction must be analyzed.	

With the determination of these criteria, the first stage of Delphi was completed.

Determination of Significance Criteria

In the second stage of the Delphi Method, the weight criteria of the 7 selected priority criteria were scored by the experts. In this stage, 3 indicates the highest level of significance and 1 indicates the lowest level of significance. It was created by averaging the opinions of 15 experts (fractions were rounded according to expert opinions).

In this context, Suitable Size/Capacity, Accessibility, Infrastructure received the value of 3, while Geology, Elevation/Slope, Shelter Type/Model and Climate received the value of 2. The total of average values was calculated as 17 (Chart 3).

Chart 3. Assessment Criteria Significance Level

Criteria	Significance Level (3>2>1)
1. Suitable Size/Capacity	3
2. Accessibility	3
3. Geology	2
4. Infrastructure	3
5. Elevation/Slope	2
6. Shelter type/model	2
7. Climate	2
Total	17

The final criteria list, which emerged in the second stage of the Delphi panel, was approved by all experts.

Assessment of Significance Criteria in the Study Area

In the last part of the study, the design-implementation criteria obtained from the Delphi panel, i.e. the design-implementation criteria determined within the scope of chart 2, were evaluated by 15 experts for the temporary shelter area of Osmaniye province, which constitutes the study area. The results in chart 4 shows that Osmaniye's temporary shelter area did not receive sufficient points ($10 < 17$) in terms of significance. Therefore, it was determined that the region selected as the temporary shelter area in Osmaniye province was not found suitable by the experts. However, it was found that the shelter type/model and climatic characteristics were sufficient in the temporary shelter area in Osmaniye province (Chart 4).

Chart 4. Assessment of Temporary Shelter Area in Osmaniye Province

Criteria	Significance Level (3>2>1)
1. Suitable Size/Capacity	1
2. Accessibility	2
3. Geology	1
4. Infrastructure	1
5. Elevation/Slope	1
6. Shelter type/model	2
7. Climate	2
Total	10

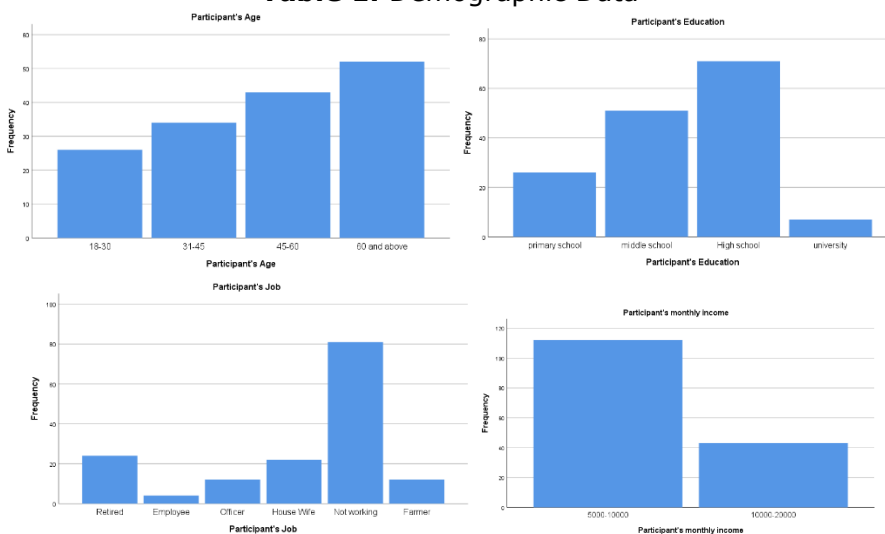
4.2. Survey Study

In the survey study with a sample size of 155, the population of which is the temporary shelter area adjacent to the southern ring road in Osmaniye province, 21 questions were asked to the earthquake victims through face-to-face interviews. The individuals to be surveyed were randomly selected. While preparing the survey questions, the topics determined by the expert group as priority criteria were also included. In this context, it was aimed to compare the answers given by the expert group with the answers of the area users. The survey consists of questions on the demographic data of the area user, temporary shelter area and residences.

Analysis of Demographic Data

Table 1 shows the demographic structure of the users of permanent disaster residences where the field study was conducted. Determining the user profile of these residences is important in terms of revealing user compatibility with the temporary housing area. The data obtained in the study were analyzed in terms of age, educational status, employment status, income status, and the number of members in the family. When looking at the age distribution of the participants within the scope of the surveys conducted in the study, it was seen that 33.5% were 60 years old and over and 27.7% were men. When the educational status of the participants was analyzed, it was determined that the majority were high school graduates and their monthly income was mostly in the range of 5000-10000 (72.3%). When their employment status was analyzed, it was determined that the majority did not work. Face-to-face interviews in the area revealed that many participants lost their workplaces during the earthquake. When the number of members in the participants' families was analyzed, it was found that 45.8% of the participants had 1-3 users, 34.2% had 4-5 users, and 20% had 5 or more users.

Table 1. Demographic Data



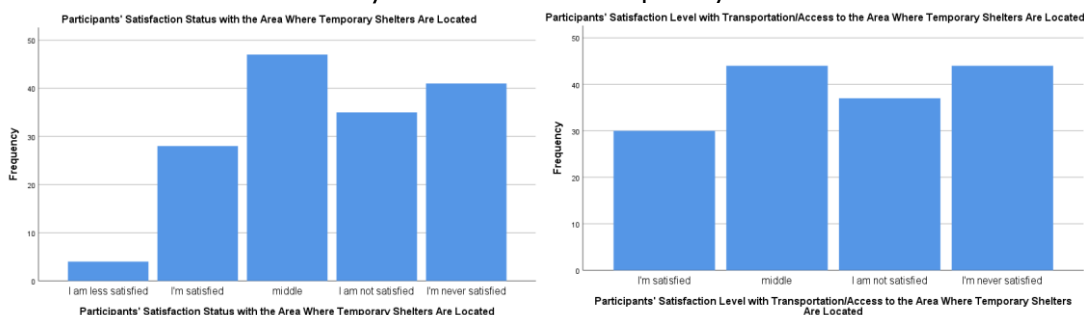


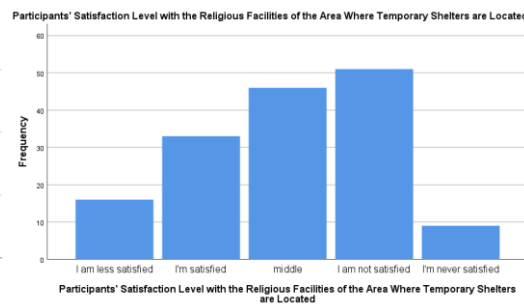
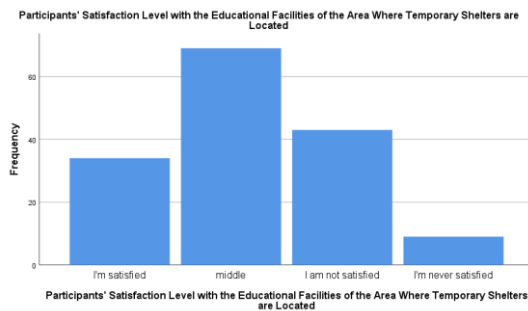
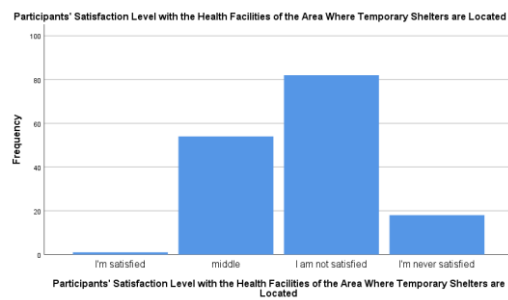
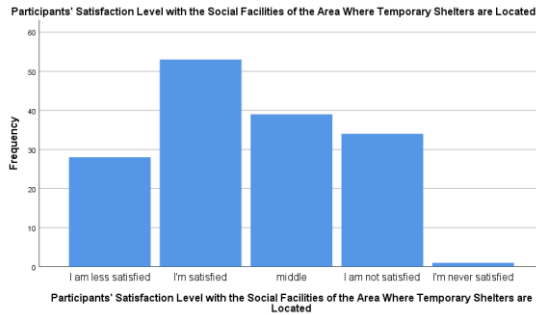
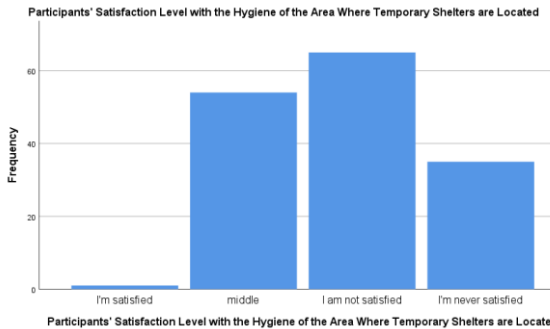
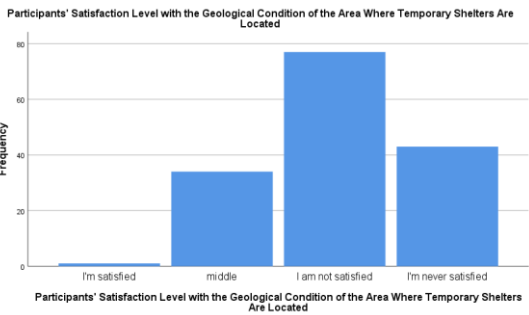
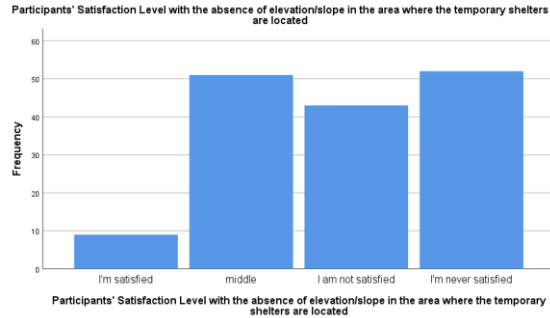
Analysis of Data for Temporary Shelter Area

In the analysis of the satisfaction levels of the participants regarding the location of the temporary shelters, it is seen that earthquake victims mostly gave the answers "slightly satisfied", "moderately satisfied", "not satisfied", "not satisfied at all". Regarding transportation/accessibility, it was determined that they concentrated on 4 options and gave the answers: "satisfied", "moderately satisfied", "not satisfied", "not satisfied at all". A very small number of people stated that they were "very satisfied" with the area. When the reason for this indecision was interpreted in the analysis of transportation/accessibility and location status, it was thought that it may be due to the fact that people who go to work every day have problems, while people who do not go to work do not have problems because they do not leave the container area.

In the analysis of the infrastructure status of the temporary shelter areas, it was found that the participants mostly gave the answers "not satisfied at all" and "not satisfied", while they were undecided about whether there was a slope or not. In face-to-face interviews, the participants stated that the lack of a slope in the area is positive in terms of access, but they also stated that the lack of a slope may cause problems in case of flooding since the area is located in a stream bed. It can be seen in Table 2 that when the participants were asked about their satisfaction with the ground value and hygiene of the area, they mostly gave the answers "not satisfied at all" and "not satisfied". When the level of satisfaction with the social facilities in the area was investigated, it was found that the answers were mostly "satisfied", "slightly satisfied", "moderately satisfied", and "not satisfied". When the level of satisfaction with the health facilities in the area was investigated, it was found that the majority responded that they were "not satisfied". The reason for this was that the health facilities in the area are mostly unused and the hospitals are far away from the area. The participants were also undecided about the religious facilities in the temporary shelter area (Table 2).

Table 2. Analysis of Data for Temporary Shelter Area

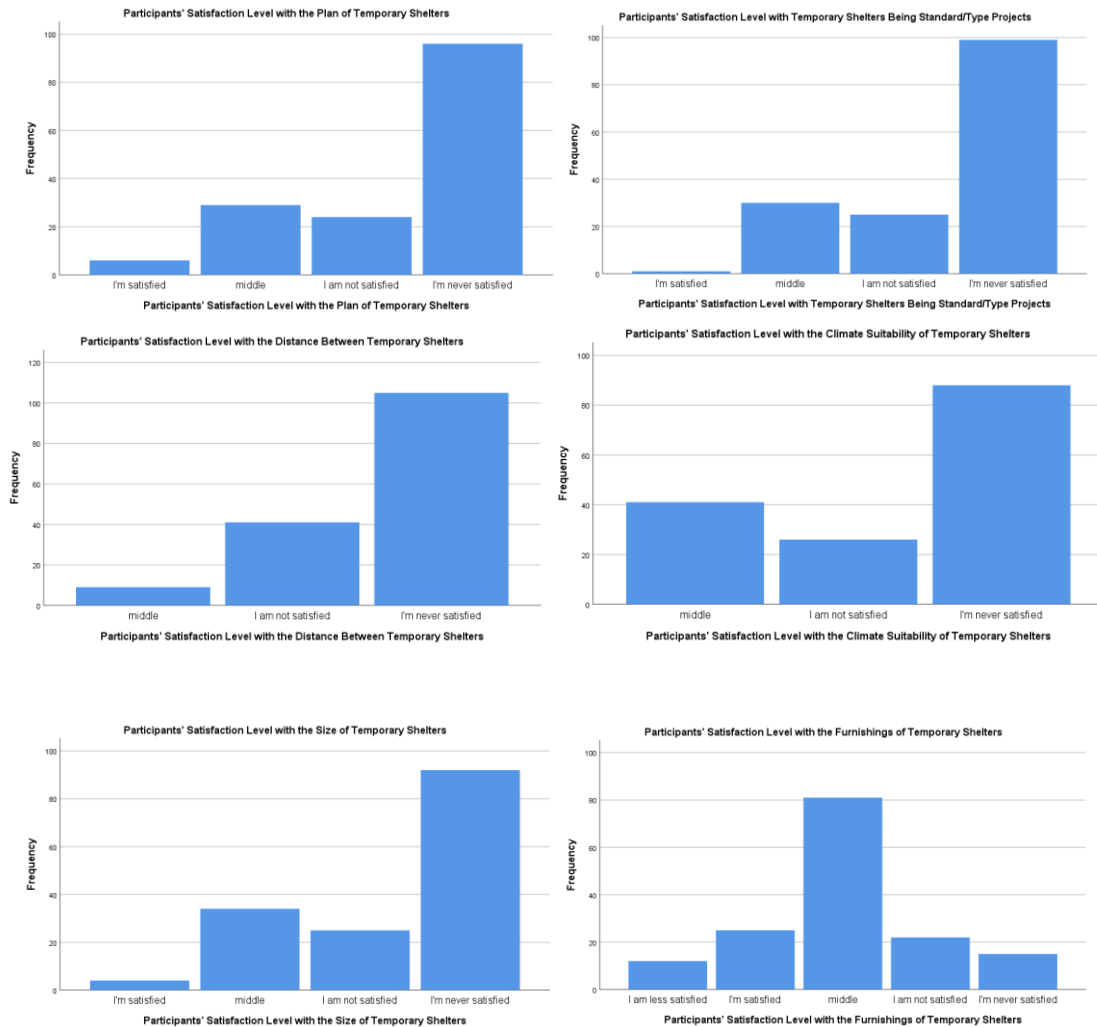




Analysis of Data for Temporary Shelter Residences

In the survey, the participants were asked questions and their satisfaction levels about their residences were tried to be determined. In this context, it was found out that the participants were not at all satisfied with the container plan and the standard/type project of the containers, the distance between the containers, their suitability for the climate, and their size. During the face-to-face interviews conducted in temporary shelters, it was learned that giving the same m2 container to a family of 2 and a family with 5 children was one of the issues that were criticized. The participants stated that their satisfaction level with their furnishings in temporary shelters was moderate.

Table 3. Analysis of Data on Temporary Shelter Residences



5. Results and Assessment

The subject of the study is the assessment of temporary shelter structures and areas created after the earthquake. Therefore, it was aimed to test the suitability of the temporary shelter area established in Osmaniye after the 2023 Pazarcik earthquake. The method application in the study was carried out in two stages. In the first stage of the method, experts used the Delphi technique to identify the criteria of high significance in temporary shelter areas (suitable size/capacity, accessibility, geology, infrastructure, elevation/slope, shelter type/model and climate) and their significance levels. Then, these criteria were tested on the container city established in Osmaniye city center/adjacent to the southern ring road, which constitutes the population of the study, and the suitability of this area was analyzed. In this context, the answers given by the experts who know Osmaniye well within the scope of the 3rd stage of the Delphi technique revealed that the area was not suitable for the establishment of temporary shelters after the earthquake.

In the second stage of the method, the area assessed by the experts was also wanted to be tested from the perspective of the users. In this regard, a face-to-face survey was conducted with 155 users of the area. As a result of the surveys, it was determined that earthquake victims were not satisfied with the area and the residences. It was concluded that most of the participants were not satisfied at all, especially with the proximity of the houses, their plans, the distance between the containers, the fact that they were not designed for the climate, the hygiene of the area, the infrastructure and the ground value.

As a result, the temporary earthquake area in Osmaniye is considered to be unsuitable by experts and users who know the region well.

Well-located and well-planned residential areas create a healthy environment where people can live in peace and security (Şahin, 2017). Therefore, while selecting and planning the residential area after the earthquake, within the existing conditions, the priority criteria for each region are different and it is of great importance that they are determined by the experts in the region and the local people who are the users. The areas created accordingly will not cause dissatisfaction by their users.

Well-located and well-planned residential areas create a healthy environment where people can live in peace and security. It is very important to optimally improve the living conditions of earthquake victims, especially those who suffered many losses during the earthquake (Şahin, 2017). In this context, when selecting and planning residential areas after the earthquake, the studies need to be handled regionally since the priority criteria of each region are different. Another important topic is that the site selection should be carried out urgently without victimizing the earthquake victims. In this regard, the fact that the Delphi Method aims to produce results within the opinions of those who know the region well and produces a quick result shows that it is an applicable method for all post-earthquake temporary shelters. In addition, within the current conditions, it is of great importance to include the users of the area in these studies and not to ignore their needs.

This study aims to create a road map that will guide temporary area and residence designs to be used to meet the post-earthquake shelter needs in the future.

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