

An Evaluation of Design Proposals for Temporary Shelters Focused on Vulnerable Groups in Post-Disaster Situations

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Abstract

Vulnerable group-oriented temporary space design considers the unique needs and challenges specified groups face during emergencies and aims to create a supportive environment that promotes safety, comfort, and accessibility both physically and psychologically. In this study, the vulnerable group was addressed to women, and a literature study was conducted covering the design of temporary spaces in emergencies and the requirements of the identified group. Alternative temporary space designs were analyzed according to criteria determined from the literature study, and examples were examined with the space syntax method via Depthmap software. As a result, it was suggested that the role of architecture is a significant factor in improving the living conditions and welfare of vulnerable groups, especially women in post-disaster environments, considering different socio-demographic structures and many problems can be corrected with the determined design criteria.

Keywords: Vulnerable groups, emergencies, temporary shelter, socio-cultural differences.

Afet Sonrası Kırılgan Grup Odaklı Geçici Barınma Mekanlarının Tasarım Önerilerinin Değerlendirilmesi

Öz

Kırılgan grup odaklı geçici alan tasarımı, acil durumlarda belirli grupların karşılaştığı özel ihtiyaçları ve zorlukları dikkate alan, fiziksel ve psikolojik olarak güvenliği, konforu ve erişilebilirliği destekleyen geçici barınma mekanları yaratmayı amaçlamaktadır. Bu çalışmada kırılgan grup olarak kadınlar ele alınarak, belirlenen grubun ihtiyaçlarını ve gerekliliklerini kapsayan bir literatür çalışması yapılmıştır. Oluşturulan alternatif geçici mekan tasarımları, literatür çalışmasından ve incelenen örnekler ile belirlenen kriterlere göre mekan sentaksı (space syntax) yöntemiyle analiz edilmiştir. Sonuç olarak, farklı sosyo-demografik yapılar dikkate alındığında, afet sonrası durumlarda kırılgan grupların yaşam koşullarının ve refahının iyileştirilmesinde mimarlığın rolünün önemli bir faktör olduğu ve karşılaşılan birçok problemin belirlenen tasarım kriterleri ile minimize edilebileceği öne sürülmüştür.

Anahtar kelimeler: Kırılgan grup, olağanüstü durum, geçici barınma mekanı, sosyo-kültürel farklılıklar

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1. Introduction

In emergencies, vulnerable groups such as older adults, children, women, and disabled individuals are at a higher risk of harm and displacement. During or after emergency situations, they may experience problems such as limited mobility, difficulty in obtaining food or nutrition, social introversion, and psychological difficulties. Temporary space design specifically oriented towards these groups can help mitigate the risks and provide a safe haven for those in need.

Vulnerable group-oriented temporary space design considers the unique needs and challenges these groups face during emergencies. It aims to create a supportive environment that promotes safety, comfort, and accessibility. In such cases, physical security and an environment that is mentally safe and comfortable are essential.

Vulnerable groups are at a higher risk of being negatively impacted by natural disasters. At that point, the definition of the group varies according to the literature because there is no definite limit to restrict the group. While there is a general agreement on some groups that are considered vulnerable, such as older adults or people with disabilities, there may be some variation in how different individuals or organizations define and identify vulnerable groups. The definition of vulnerable groups may also depend on the specific context, such as the region, country, or culture in which they are located.

As in many emergency situations and post-disaster situations in the world, after the earthquake that occurred in Turkey on 6th February 2023, challenges and many problems were faced, especially by women who are part of a vulnerable group. Although there are many studies for women in many areas, since there is not much research and study done in post-disaster situations, these situations remain unresolved, and many people become victims or even suffer harm. Therefore, the study focuses on women as a vulnerable group.

In post-disaster situations, the conditions available in the place where women are sheltered are very important to meet their needs and re-adapt to life quickly. Once their physical needs are met, they can recover faster psychologically and take a more active role in society. In this case, it is important for children, another vulnerable group, to continue their lives in a physically and mentally healthy way. In other words, women are an important part of this circle and are one of the most important vulnerable groups.

The study aims to identify difficulties by the chosen vulnerable group in extraordinary situations and research their needs to find out how and where a temporary place can be created for better living conditions.

The criteria and the proposed method determined in this study can be applied not only in Turkey but all over the world. Because women's needs are almost the same everywhere. Some criteria may vary depending on socio-demographic structure. When this situation is taken into consideration when designing a shelter in post-disaster situations, the design can be revised according to space syntax data, or its deficiencies can be identified and supported externally. Moreover, during the literature research, the shortage of studies in this field was noticed.

Women have influenced and continue to influence architecture in terms of style and function from past to present (Soyluk & Ilerisoy, 2019). Considering women's contribution to architecture, the vulnerable group, which is defined as women, should be considered, and supported architecturally throughout the design process, not only in disaster and post-disaster situations, but in all areas of life, and more studies should be done on this subject.

1.1. Definition and Needs of Vulnerable Groups

There are various approaches to definition and limitations for vulnerable groups. From one perspective, vulnerable population are defined as groups or communities at higher health risk because they are challenged in social, economic, political, and environmental resources, in concurrence with limitations caused by a disease or disability (National Collaborating Centre for Determinants of Health, n.d.). From a larger perspective, a vulnerable group is a population living in areas targeted by a project for specific reasons that make it more at risk of falling into poverty. The group includes older adults,

the mentally and physically disabled, children and youth at risk, former combatants, internally displaced persons, returning refugees, individuals and households affected by HIV/AIDS, religious and ethnic minorities, and, in some communities, women (Vulnerable groups, 2016). According to the literature review, vulnerable groups are those who have limited access to resources and are more likely to be negatively impacted by disasters. This includes people living in poverty, older adults, children, and individuals with disabilities. These groups may have but are not limited to summarized as older adults, children and youth, people with disabilities, pregnant women, homeless individuals, refugees and immigrants, low-income families, LGBTQ+ individuals, ethnic and racial minorities, and people with chronic illnesses or mental health conditions.

As a similar definition, vulnerable groups who are physically, mentally, or socially disadvantaged persons may be unable to meet their basic needs and may, therefore, require specific assistance. They are exposed to or displaced by conflict or natural hazards, which may also be considered in the group. They may experience a higher risk of poverty and/or social exclusion (Inter-agency Network for Education in Emergencies, n.d.).

Although various definitions exist for the groups, the United Nations emphasized “No universally accepted approach for measuring vulnerability” (Yao, 2019). According to the UN, women are categorized under social vulnerability. Women are also considered a vulnerable group due to their societal status and lack of access to resources, which can make them more sensitive to the negative impacts of natural disasters. Because women are ignored in emergencies and post-disaster situations, even though they experience many physical and mental problems, and there are not many studies on this subject, women were chosen as a vulnerable group for the study. It is crucial to design temporary places that cater to the needs of these vulnerable groups to ensure their safety and well-being in post-disaster situations.

1.2. Design Considerations in Emergency Circumstances

Space is a built or unbuilt environment where people communicate, establish relationships, and have shared and experienced memories (Ünkaracalar, 2022). In other words, spaces are living organisms in which individuals interact, and spaces of different typologies in these spaces are essential for individuals to be together effectively and socially. In post-disaster situations, people need spaces that allow more supportive communication with each other, cooperation, and private places as their necessities. In this context, there is a requirement for design criteria that enable all individuals to be together and ensure equal use of space, supporting accessibility and social interaction (Şahin Körmeçli & Uslu, 2021). Temporary accommodation areas and spatial units can be considered public spaces according to their population. There are many regulations and application rules for designing these spaces designated as public spaces. The planned temporary shelters are configured, shaped, and formatted by architects or urban planners in accordance with regulations and special necessities.

The Disaster and Emergency Management Presidency (AFAD) and local governments in Turkey are leading organizations that regulate and manage temporary shelters after emergencies. They provide rapid response to establishing temporary shelters after an emergency. Design methods and strategies depend on the type and scale of the emergency and the resources available (AFAD, 2015). They could include rapidly assembling temporary structures, containers, and tents and converting existing buildings. Also, they provide safety, hygiene, accessibility, and meeting the social needs of communities.

2. Material and Method

This study conducted a literature review to define the vulnerable group. Based on this literature review and research, the scope of the analysis was limited to the identified group. The impact of this group following the earthquakes in Turkey was determined through news reports, information obtained from social media, and qualitative research methods such as observation. Additionally, how this group, specifically women, was affected and how interventions were conducted in other extraordinary situations worldwide were investigated. The findings from these studies were summarized in a table, highlighting the needs of women in temporary shelter areas.

Regarding the location and establishment of temporary shelter areas in extraordinary situations in Turkey, action plans of leading organizations such as AFAD and the Chamber of Urban and Regional Planners were examined. Criteria were established based on the analyzed studies and reports. Furthermore, considering the changes in priorities due to the socio-demographic structure of the vulnerable group, potential scenarios were developed for two different locations.

Using the data, two temporary shelter designs were created using AutoCAD software. Then, space syntax is applied. Maps were created via DepthMap software to evaluate the data. These analyses were considered regarding accessibility, density, security, and social needs of temporary housing for vulnerable groups. A method has been created using data, literature review, news, social media, observation, and information obtained from international emergency cases and space syntax.

The study can be thought of as a part of comprehensive research to improve the design and management of temporary shelters, focusing on the needs of vulnerable groups, especially women.

3. Findings and Discussion

Based on the literature review, the specific needs of the vulnerable group and the criteria for temporary housing were researched and discussed in a case study.

Determined criteria contain various objectives such as spatial organization, shelter size, sanitation facilities, accessibility, and social amenities. These criteria were held by existing literature, research studies, and examples from similar situations. Standards and guidelines were formulated to ensure adequate and sustainable living conditions within the tent city.

They were applied to a case study scenario to validate the effectiveness of these criteria. By evaluating the case study, insights were gained on the efficacy and applicability of the proposed criteria and potential fixes and improvements in future emergency response and shelter planning efforts, especially for vulnerable groups.

3.1. Designing Temporary Places in Türkiye

There are some studies and reports on temporary accommodation after an emergency in Turkey. The most detailed one is "How Should the Site Selection and Layout of Temporary Accommodation Areas Be?" which belongs to the Chamber of City Planners. Here, many factors, such as the ideal dimensions of the tents, the functions that should be, and the population, are detailed. In this study, designs were made with the place dimensions given there.

Several main criteria need to be considered in terms of temporary shelter areas. According to the guide (Chamber of City Planners, 2023), these criteria include accessibility, connections with existing infrastructure, utilization of undamaged public property, a minimum size requirement of 500 square meters, a distance of at least 3 meters away from rainwater basins, a slope between 2% and 6%, consideration of wind direction, availability of infrastructure such as electricity, clean water, and drainage systems, provision of sanitation facilities including garbage disposal, laundry, showers, and toilets, the ability to accommodate future expansion with additional tents, the inclusion of essential facilities such as a health center, market, dining hall, management center, security measures, education center, and a recreation area of at least 45 square meters per person. Additionally, the presence of parking spaces is also significant. These criteria serve as guidelines for selecting and designing temporary shelter areas.

In the case of a tent city, specific criteria have been outlined as follows: Everyone should be allocated a minimum of 3.5 square meters of space (for families, a minimum of 10.5 square meters) using either tents or containers, with a minimum of 2 meters between each unit. The units should be organized in bands or clusters, consisting of at least 16 units. A sanitation center should be located at the center of the bands, while garbage centers should be on both sides. There should be a minimum distance of 6 meters between the bands, with a sub-road measuring at least 10 meters between the four bands. Furthermore, a main road should be at least 15 meters in width to connect the different groups. The various groups, bands, and units should be appropriately named for identification purposes. The tent city's overall population capacity should be at least 2500 people (Chamber of City Planners, 2023).

These criteria serve as guidelines for planning and organizing a tent city's layout to ensure adequate living conditions for the affected population.

However, there is a tent city example in the Iskenderun district of Hatay, one of the provinces most affected by the high-intensity earthquake that occurred on 06 February 2023. In the past, many devastating earthquakes occurred in Hatay and its surroundings (Korkmaz, 2006). The region with seismic activities throughout history became one of the most damaged places in the earthquake on February 06. After the quake, many buildings, including residences, public facilities, and hospitals, regardless of their history, construction year, function, or size, collapsed or damaged in Iskenderun. For this reason, many tent cities were urgently needed. One of the most central and significant of these is on Prof. Muammer Aksoy Street.



Figure 1. Tent city on the Prof. Muammer Aksoy Street, Iskenderun / Hatay (Google Maps, nd.)

When this place was examined, it was observed that it did not comply with many of the criteria specified. According to the data obtained from the news, many problems such as security, victimization of women, hygiene problems, and the flooding of the tents have aged in the tent city. For this reason, the aim is to minimize the issues mentioned above in a planned tent city by applying the specified method.

3.2. Designing Temporary Places for The Group

Even though the study has many different vulnerable groups, it is primarily focused on women. After the 6th of February, it was realized that women face several challenges during and after natural disasters, including a lack of access to healthcare and sanitation facilities, limited mobility, and increased risk of sexual violence. Thus, it is crucial to design places that cater to the needs of these vulnerable groups, especially women, to ensure their safety and well-being at the figure which shows where women felt unsafe women. The following questions were asked of women to create Figure 2.

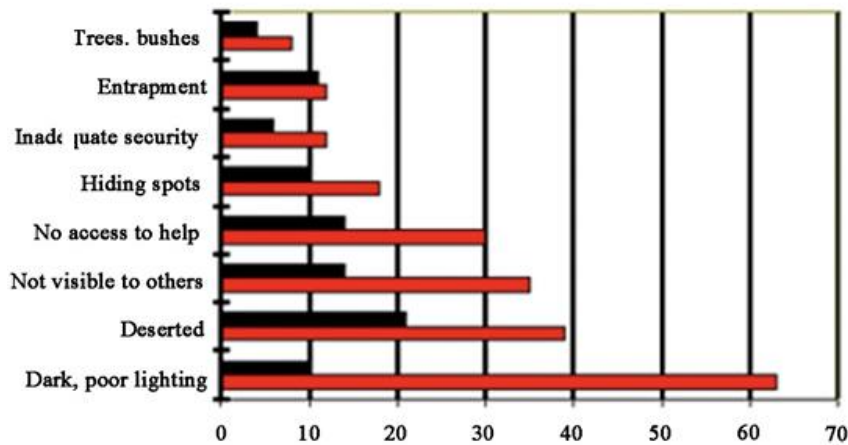


Figure 2. The problems faced by the group Urban public space designing criteria for women (Jahanbakhsh Alamdari & Habib, 2012)

Some categories are summarized which show women's main problems after an earthquake. Then, when designing places after a natural disaster, it is essential to take into account the specific needs of vulnerable groups. This includes providing separate sleeping and sanitation facilities, ensuring adequate lighting and security measures, and creating safe spaces for women and children. By designing places that cater to the needs of women, we can ensure their safety and well-being and help them recover from the impacts of natural disasters.

Categories	Sub-categories
Neglecting the health needs	Inappropriate access to the bathroom, limited access to sanitary napkins and failure to change them, and lack of proper underwear
Tension in Family and Marital Relations	Emotional disturbance in the relationship, sexual dysfunction with the spouse, increased physical violence in the family, increased abusiveness by the people they know
Gender inequality in the provision of assistance	Prioritizing the demands of men over women and providing services and equipment based on demand rather than necessity
Feeling insecure	The entry of strangers into the traditional atmosphere of the village and fear of disturbance
Ignoring the ruling culture of the region	The incompatibility of the sent clothing and food with the native culture of the region, provision of health services such as baths and so on, regardless of the native culture of the region
Concealing needs for fear of stigmatization	Concealing needs for fear of stigmatization
Incoherent mourning	Longing for seeing the loved ones who died in the earthquake, and continued mourning for the loved ones

Figure 3. Necessities of the group (Yoosefi Lebni, Khorami, Ebadi Fard Azar, et al., 2020)

The study also shows the challenges faced by women. Feeling insecure, health needs, gender inequality, inappropriate regional and cultural atmosphere, and inability to recover from psychological factors are mainly felt problems than physical problems.

There is an example to show design based on the group, which is the Haiti Earthquake (UN Women, 2021). The 2010 earthquake in Haiti was particularly devastating for women, who faced increased risks of sexual violence and had limited access to healthcare and sanitation facilities. To address these challenges, organizations like the International Rescue Committee, UNICEF, and UN Women worked to design safe spaces for women and children, provide healthcare services, and distribute hygiene kits to help prevent the spread of disease (created women-centered friendly spaces). Women learned basic skills that could help them get jobs like hairdressers, manicurists, or tailor.

The other example is the Nepal earthquake. Nepal, after the 2015 earthquake - After the earthquake that struck Nepal in 2015, the International Federation of Red Cross and Red Crescent Societies designed temporary shelters for displaced persons designed to meet the needs of vulnerable groups.

The shelters included separate sleeping areas for men and women, accessible toilets, and private areas for breastfeeding mothers. After the earthquake in Nepal, the importance of menstrual hygiene management emerged among women and adolescent girls (Rajbhandari, 2016).

Following Hurricane Katrina in 2005, the Louisiana Recovery Authority developed a program to provide temporary housing for displaced persons, including vulnerable groups. The program included the construction of modular housing units designed to be accessible and adaptable to the needs of different individuals and families (Zoraster, 2012).

Therefore, there are some criteria for designing temporary places focusing on women's security and feeling safe, access to help, lighting, privacy, hygienic places, and socializing.

3.3. Alternative Tent City Design: Considering Vulnerable Group

Table 1 was created according to the criteria determined during the research, according to this table and the guide obtained from the chamber of city planners, two different tent cities were planned to be analyzed with measurements.

Table 1. The criteria while the tent cities evaluated

Mandatory necessities	Necessities of the group	Cultural Aspects
Tent	Security	Religion
Food	Access to help	Communication with man
Infrastructure	Lighting	Specific daily routines
Sanitation	Privacy	Occupation
Security	Health needs	Children
Recreation		
Carpark		

For drawings, tent and sanitation areas, consisting of the same units and sizes, were positioned in a different way. In Case 1, the market, dining area, storage area, management center, security guard, etc. more public spaces are placed in front of the accommodation units. In Case 2, a space is created in the middle of the accommodation units and functions that will be considered public are located there.

The space syntax analysis method is the set of techniques supported by theoretical approaches that are used for describing and examining interaction through the social structure of describing spatial models of regions, cities, built environments, and groups of buildings at different scales (Gündoğdu, 2014). Space syntax method has been developed to help spatial reading by analyzing the circulation in place (Hillier, Penn, Banister, & Xu, 1998). The axial map is defined in the Glossary of Space Syntax website as something that is constructed by taking an accurate map and drawing a set of intersecting lines through all the spaces of the urban grid so that the grid is covered and all rings of circulation are completed (Axial Map, n.d.). Axial maps provide the researcher with an opportunity to describe the space via basic lines. Also, they are the basis of more analyses such as integration, connectivity, and intelligibility. People always prefer to walk in linear spaces such as corridors, streets, and boulevards to minimize the distance. Linear spaces (straight lines) can be called potential movement behavior and are represented by axial lines. Consequently, axial lines demonstrate urban form, movement behavior, and spatial cognition in a simplified way (Long, Baran & Moore, 2007). Axial lines do not have any units of measurement. It is a comparative measurement system. In other words, it analyzes the relations of drawn axes to each other.

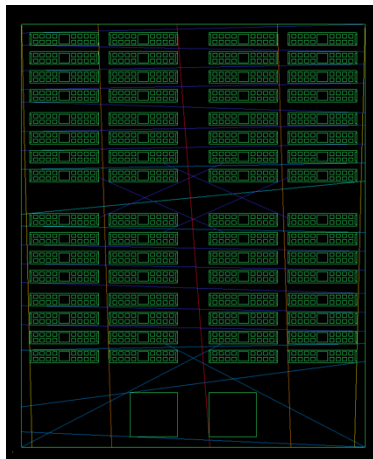


Figure 4. Axial line map of case 1

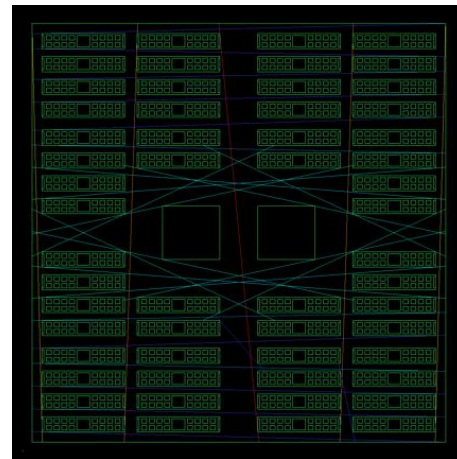


Figure 5. Axial line map of case 2

A huge number of lines which show / represent possible straight lines were created automatically by the program. Lines are colored from red to blue in a way that from the point where they are in the longest visibility range to the shorter. It is seen that most of the intersections in the longest visibility range are in the middle of the tent city and public space (market, recreation area etc.) at the bottom of the map. It is seen that most of the intersections in the longest visibility range are in the middle of the tent city in both cases.

According to Hillier & Hanson, “connectivity analysis measures the number of spaces immediately connecting a space of origin” (Hillier & Hanson, 1984). The connectivity map was automatically generated by selecting the connectivity option over the map and running the analysis in the software.,

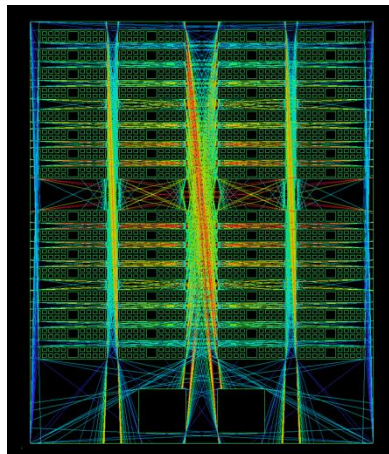


Figure 6. Connectivity analysis of case 1

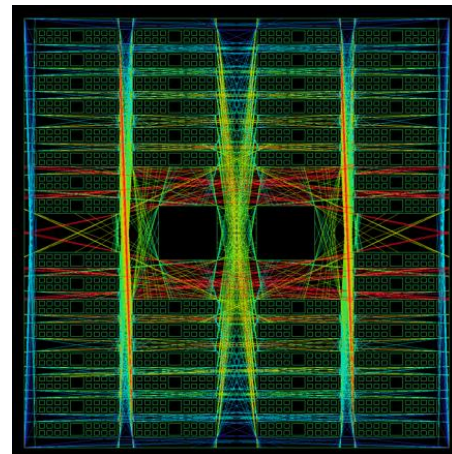


Figure 7. Connectivity analysis of case 2

Connectivity analysis shows the connection of the linear lines of the site. The analyses do not only focus on the intersections, but they also include all links between streets. Most intersected points are considered as the most accessible areas of the site. To interpret, high values indicate strong connections, while low values indicate poor connections. In these cases, locating public units in the middle of the tent city provides easy accessibility from almost all tents and creates a more communicative place as in the case 2. On the other hand, tents have more private places in case 2 than case 1.

Based on the analyses, it was determined that most of the tents in case 1 were suitable for accommodating the vulnerable group in terms of their lodging needs. However, in case 2, tents located in the corner areas were found to be less suitable in terms of security, lighting, and accessibility.

Considering the socio-demographic structure, in case 1, the layout was more suitable for cultures where women prefer higher levels of privacy and engage in conversations and activities within their own group. On the other hand, in Case 2, the layout provided more suitable spaces for communities where women require equal conditions and visibility and have a greater need for social interaction.

These findings highlight the importance of considering both the physical characteristics of the shelter space and the socio-demographic aspects of the target group when designing women-centered temporary shelter solutions. By aligning the spatial layout with the specific needs and cultural preferences of the vulnerable group, more effective and belonging environments can be created, promoting their well-being, privacy, physical needs, and social interactions.

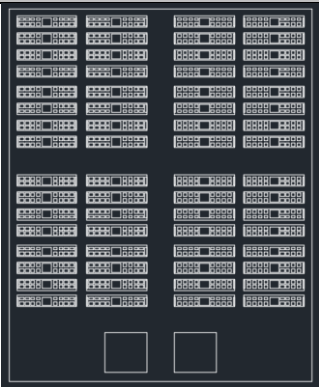
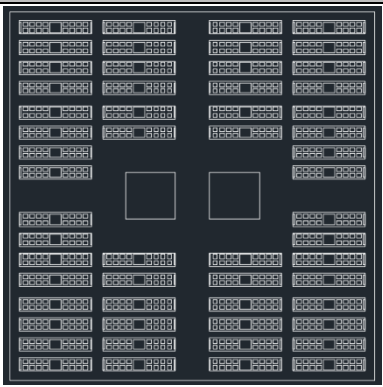
4. Conclusion and Suggestions

This study is affected by difficulties experienced by women living in temporary places after the earthquakes in Turkey. The aim was to explore criteria for temporary spaces and to examine and analyze to gain insights into successful approaches and strategies used to address the needs of women in emergency shelters in similar contexts around the world. In light of the literature review and research findings, several criteria have been determined, including facilities, accessibility, privacy, spatial layout, security, and socializing places.

Space syntax analysis provides an examination of the connectivity, accessibility, and spatial qualities of both cases. The evaluation computes placement, clustering of facilities security and privacy. The strengths and weaknesses of each design approach were identified, to give decisions and recommendations for creating more suitable, healthier, safer, private, and supportive environments for women in temporary shelters via the method.

Women are more vulnerable in post-disaster situations in many aspects such as the role of care, responsibility, unequal working conditions, lack of security, exclusion from decision-making mechanisms, and access to opportunities (Laska, Morrow, Willinger & Mock, 2008). For these reasons, for women to recover faster, a suitable environment should be provided in post-disaster housing by decreasing their disadvantages with a rebuilt environment, especially in security and social life.

Table 2. Comparison of cases

Criteria	Case 1	Case 2
Tent Food Infrastructure Sanitation Security for the area Recreation		
Security of tents	There is no dramatic decrease in the connectivity value as it is increased from the tents close to the center to the tents close to the main axes to the edges. For this reason, almost all tents show similar features in terms of security. A woman living on the mainline is almost equally concerned about safety as a woman living on the corner.	It has been concluded that the tents close to the center are safer due to the connectivity value. In this case, the level of anxiety that women will feel will increase as they go from the tents to the edges. Therefore, more lighting should be provided near the corner tents.
Privacy in social life	The area planned as a socializing one is located outside the tents, and this makes individuals from culture or religion who tend to communicate within themselves feel more comfortable. Because the visibility of this region is lower than the other case.	Places that serve the community such as socialization and recreation are gathered in the middle. This situation increases the visibility and interaction in the tent city. It is suitable for communities where men and women socialize in the

		same place and where women play a more active role in the social environment.
Privacy around the tents	Privacy is also nearly the same across all tents, as there is no dramatic difference in the connectivity values of the tents. However, if the sanitary center in the middle of the tent units is moved to the edges, these areas will be located in the low-connectivity area and the privacy of these areas will increase.	The privacy of the spaces increases from the center to the corners.
Accessibility	Almost all tents have similar accessibility. This indicates that they are almost all equal in case of an emergency or access to the tent from the main area.	Tents and social areas have a high accessibility value. This makes it easy to access when any help is needed.

According to the determined criteria, different plans respond to the changing needs according to the needs of the women of the region. It is important to organize suitable temporary accommodation areas for women in emergencies so that they do not experience physical and mental problems and overcome existing ones more easily. These proposed plans were made to demonstrate and prove the established method. As can be seen, case 1 and case 2 are suitable for women who lead different lives in terms of different criteria. At the same time, according to the results obtained from these analyzes, it can be predicted that more security, lighting, more isolated sanitation areas, and different social spaces are needed. Thanks to these predictions, potential problems are avoided. By differentiating and multiplying these plans and criteria, temporary accommodation areas can be arranged where women from different socio-demographic structures can lead a safe and healthy life.

This research contributes to ongoing efforts to improve the living conditions and well-being of vulnerable groups, particularly women, in emergency settings. By integrating knowledge from international experience and with quantitative and qualitative methods, the study offers guidance for the design and planning of temporary spaces that prioritize the specific needs and challenges faced by specially women. In future studies, studies can be conducted with this method developed for certain places and possible groups defined as emergency areas, and individuals can be accommodated in more suitable conditions in case of an emergency.

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The article complies with national and international research and publication ethics. Ethics Committee approval was not required for the study.

Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

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