# POST - DISASTER RECOVERY & ‘TEMPORARY’ LIVING

Aftermath of an earthquake in an urban district, İzmir, Türkiye

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# ABSTRACT

This thesis examines the integration of post-disaster recovery into urban renewal to foster a more sustainable district. The complex and multidimensional nature of post-disaster recovery necessitates a comprehensive understanding of various disciplines. Instead of focusing solely on physical reconstruction, this research seeks to enhance temporary living conditions by considering the entirety of the recovery process, analyzing both short and long-term impacts, and developing comprehensive strategies that extend beyond shelter and housing. By broadening the scope to include values such as tradition and comfort while critically evaluating the notion of **temporary** this study aims to provide a holistic approach to temporary living.

A key focus of this thesis is the pressing need for strategic site selection and temporary housing in the aftermath of earthquakes in Türkiye. By reevaluating the post-disaster recovery process and exploring the relationship between disaster recovery and urban design, the design proposal concentrates on integrating post-disaster living scenarios at the early stages of urban design in order to assess their feasibility. Emphasizing the potential of strategic site selection and district-scale development, this approach aligns with post-disaster scenarios while enhancing the everyday urban life of the selected area.

Furthermore, this thesis project encompasses design interventions at various scales, with a specific emphasis on a proposal aimed at improving collective living culture through sustainable urban design strategies. By creating social spaces for survivors not only within the temporary housing area but also in the surrounding vicinity, the design proposal facilitates psychosocial recovery and encourages survivors to reintegrate into an active urban life.

In summary, this thesis contributes to the field by advocating for the strategic inclusion of post-disaster recovery in urban renewal, underscoring the importance of strategic site selection, and proposing sustainable urban design strategies that enhance overall recovery and the well-being of affected communities. By addressing the challenges of post-disaster recovery comprehensively, this research aims to provide valuable insights and practical recommendations for creating more sustainable and resilient regions.

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# ACKNOWLEDGEMENTS


This thesis has been a transformative journey, reminiscent of returning to the place where I grew up. As a child, I always pondered the meaning and significance of a home, seeking to understand the essence of feeling truly at home. Growing up in an earthquake-prone region has left lasting impressions on my personality, instilling a desire to comprehend and contribute to the resolution of the very events and destruction that once frightened me. As an architect and urban designer, I have reexamined the purpose and role of my profession within the context of post-disaster recovery through this thesis. However, this journey would not have been as meaningful without the remarkable individuals who have played pivotal roles along the way.

Foremost, I am deeply grateful to my advisors, Mattias Kärrholm and Laura Liuke, for graciously accepting to collaborate with me throughout this journey and for offering invaluable perspectives that expanded my horizons, despite their demanding schedules. They consistently listened to my thoughts and ideas, while providing invaluable support throughout the entire process. Their belief in me and their guidance have been the driving force behind the completion of this thesis.

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# Chapter I:

## INTRODUCTION





**Keywords:** natural disaster, post-disaster recovery, temporary housing, earthquake, sustainability, urban design.

### 1.1 Disasters & Temporary Housing

Hazards can be defined as natural or man-made conditions that have the potential for social, infrastructural, or environmental damage.
(Coppola, 2011, p. 1)

In order to understand how natural hazards can cause disasters, it is crucial to examine certain circumstances closely from a temporal perspective and their interactions with human systems. A disaster is typically described as a disruption in the normal functioning of a community or society at a specific time, where the consequences exceed the ability to cope with the situation. (United Nations Office for Disaster Risk Reduction [UNDRR], 2022)

The causes and effects of a disaster are strongly interconnected in a complex manner, requiring a thorough understanding of the process. While a disaster strikes at a specific point in time, its effects extend along a broader timeline. The extent of damage resulting from disasters varies depending on factors such as location, population, and the context of discussion/in question. One of the major challenges that emerge in the context of disaster recovery is the issue of housing. Residing in a 'home,' which is often expected to be permanent and encompasses various aspects of human life and dignity, holds significant importance for the individual and in social spheres.

When a disaster strikes, numerous individuals are left homeless, and displaced in the process. In response, communities swiftly undertake measures to address the issue, often focusing on providing immediate and 'temporary' housing solutions. However, what truly matters is the questions posed during this process and the earlier consideration of the role of temporary housing within urban design and planning. Such inquiries leave a lasting impact on the present and future.

There is an urgent need to comprehensively understand, and respond to recovery process more efficiently and expeditiously. Additionally, it is crucial to enhance the capacity of current and future generations to better cope with disasters.

### 1.2 Aims

Post-disaster recovery is a multifaceted process that necessitates a comprehensive understanding of the interplay between various concepts, theories, practices, and disciplines. While this process may appear complex, and certain terminologies used may even be subject to controversy within the field, it is crucial to illustrate and discuss them to ascertain the role of architects and designers during this period. This understanding helps to bridge the gap between the literature and practice.

Considering post-disaster recovery as a long process, which encompasses several phases rather than merely providing physical construction, this thesis focuses on enhancing temporary living as a holistic approach. It aims to analyze the short and long-term impacts of disaster and develop strategies to address them. It primarily emphasizes the necessity for looking beyond the concepts of shelter and housing, expanding its scope to encompass broader values and applications, such as the importance of tradition and a sense of comfort. Furthermore, it questions the notion of 'temporary' itself. By undertaking this comprehensive perspective, it aims to provide insights into improving temporary living conditions, considering the multifaceted aspects of the recovery process.

The thesis emphasizes the essential requirement for temporary housing and its stages in the post-disaster recovery process in the context of destructive earthquakes in Türkiye. By reevaluating this process and identifying past challenges, it proposes an illustration of the relationship between post-disaster recovery and temporary housing within the context of urban design.

The design proposal will extensively explore integration strategies for incorporating post-disaster scenarios into urban design during the early stages of temporary housing. The feasibility and viability of these strategies will be tested via a pilot study throughout the design proposal. By reevaluating the disaster , it seeks to align with post-disaster scenarios while enhancing the daily urban life of the selected site.

Subsequently, the thesis project will limit its focus towards the implementation of a design proposal, rather than attempting to fully resolve the housing problem for all survivors affected by the disaster. Instead, it will concentrate on enhancing collective living culture and facilitating psychosocial recovery or development. This purpose will be achieved by creating social spaces within the temporary housing area, thereby fostering improved temporary living conditions for the survivors.

To fulfill the primary objective of the thesis, the design proposal will encompass interventions at various scales within the selected site. Design strategies will be implemented, taking into account the specific considerations of each scale.

### 1.3 Data Collection

This project employs three primary methods for data collection: intensive literature review, historical studies, and case study analysis.

The rationale for selecting these methods is explained in detail below.

Intensive literature review serves as a crucial approach in exploring the urban process under examination. This method entails establishing a specific definition for shelter and housing, which forms the foundation for the project and its proposal. Moreover, it is essential to emphasize that natural events occur frequently in various locations worldwide; however, not all of these places experience natural disasters.

Incorporating historical studies, this research delves deeper into the realm of (former) temporary and permanent housing in post-disaster scenarios, specifically focusing on the duration of the temporary housing phase until permanent construction was completed.

Historical studies can be categorized into two distinct categories, which shed light on the significance of the temporary housing process within the context of Türkiye. Furthermore, by showcasing examples from major earthquakes, this categorization serves to illustrate the relevance and importance of the discussion.

The first category  encompasses two disaster cases from different time periods worldwide, enabling a discussion on diverse post-disaster recovery scenarios. These scenarios include two and three-stage recovery processes, which is explored and detailed in Chapter II: Literature Review, specifically in Section 2.4

The second category specifically focuses on earthquake cases selected from Türkiye, aiming to establish a connection between the geographical location and the proposal. These past earthquakes have been investigated from the duration of different stages within the temporary housing phases.

Finally, considering the insights gained from historical studies, I visited the İzmir Bayraklı Temporary Housing Centre, which was established after the October 30, 2020 earthquake in İzmir, Türkiye. This earthquake stands as one of the most devastating seismic events in recent years that occured in the country. It should be noted that some survivors of the earthquake still reside at the site three years later. During my visit, I conducted an interview with the center's directors, as well as facilitating further on-site investigation.

This case study presented a valuable opportunity to observe and assess the real-life significance of temporary housing. Within this context, I formulated interview questions that focused on various aspects, including site selection methods, early infrastructure preparations, and the types and materials of the provided temporary housing units.

The utilization of the above mentioned methods as a framework for the thesis project enabledexamine and evaluate the process from a broader perspective and explore new approaches, such as questioning the role of urban design in disaster resilience.

"There is nothing worse than answering well the wrong question."

– Alejandro Aravena

*Fig.1: Disaster and Destruction*

## 1.4 Research Questions

This thesis addresses the following research question:

**- How can post-disaster recovery be effectively integrated into urban design, and how can the implementation of sustainable urban design strategies enhance the quality of temporary living arrangements in the context of a disaster?**

For the purpose of addressing the research question in a more elaborate way, three sub-questions will be posed in relation to e how the relations between site selection, development of design strategies, and design proposals for a temporary living can be improved.

**1-)** How can the strategic integration of the post-disaster recovery process into the urban renewal process on a district scale enhance sustainability and improve disaster management?

**SITE SELECTION** 1

**2-)** How does the integrated approach of these strategic areas, included in the temporary housing process and considering their future use as part of an overall sustainable strategy, impact the urban process?

**SUSTAINABLE URBAN DESIGN STRATEGIES** 2

**3-)** How can the loss of urban identity after natural disasters and the development of collective living culture be reconciled in the context of living in temporary housing? What are the spatial implications?

**DESIGN PROPOSAL FOR TEMPORARY LIVING** 3



## 1.5 Earthquakes & Geographical Area

One of the limitations of the project is that the post-disaster recovery process has only been investigated in the context of earthquakes, chosen as the primary natural hazard. One of the main reasons for this choice is that earthquakes are significant natural disasters, contributing significantly to the occurrence of post-disaster housing issues worldwide and within the selected project area.

Although earthquakes occur within a brief timeframe, they leave long-lasting and devastating effects on many countries. The negative consequences of the responses to the housing problems that arise after the destructive impact of earthquakes, which were attempted to be addressed through hasty and inadequate planning, continue to affect cities and residents in both the short and long term.

Post-earthquake destruction and the impact of disasters may vary between developed and developing countries. While pre-disaster preparation and planning strategies are essential for initiating action, post-disaster urban planning and the provision of temporary housing are crucial to enhance the ability to cope with the resulting problems. The contextualization of post-disaster recovery and the urban design process must be analyzed as multidimensional concepts, particularly in response to the aftermath of devastating earthquakes.

This project places a strong emphasis on the analysis and findings related to the issue of temporary housing that arises after disasters. It highlights the significance of focusing on enhancing housing solutions at the district level and developing strategies for the site selection of temporary housing units. These efforts are vital as they have the potential to improve living conditions for survivors during the post-disaster recovery process.

The project's strongest motivation is to integrate the post-disaster recovery process into urban design. This involves determining scenarios for the strategic utilization of selected areas both after a disaster and during normal daily life. The aim is to continuously activate these areas in relation to various urban processes.

Furthermore, the project does not solely focus on solving the housing problem that arises after disasters. Instead, it specifically concentrates on enhancing temporary living conditions during the temporary housing phase. This approach acknowledges the reality that permanent construction often takes longer than initially planned. By addressing this aspect, the thesis aims to improve the overall living conditions for survivors.

## 1.6 Thesis Outline

This thesis will be divided into eight chapters. The outline of the thesis is presented as follows:

**Chapter I** will provide a descriptive introduction to the existing problems related to disasters and temporary housing. It will outline the research aims, and questions, and discuss the chosen data collection methods for the study. Additionally, the chapter will address the limitations and introduce the geographical area, aiming to establish a comprehensive understanding of the site selection and the subsequent design proposal stages of the thesis.

**Chapter II** will present an extensive review of the literature, focusing on the following sub-topics:

2.1 The Term Sheltering & Housing in Disasters

2.2 Temporary Housing & Permanent Housing

2.3 Phases of Temporary Housing

2.4 Models of Post-Disaster Recovery Scenarios

Each sub-topic will be explored from a different perspective, contributing valuable insights to the site selection, site analysis, and design proposal stages of the thesis.

**Chapter III** will include historical studies to provide examples of temporary housing solutions and site selection in the process.

The first group of historical studies will showcase examples from around the world, highlighting different disaster recovery scenarios and their relation to temporary and permanent housing. The second group of examples will specifically focus on Turkey, investigating the most devastating earthquakes that occurred within the last century.

This chapter will primarily describe the extent of the damage and the number of survivors in need of housing after each disaster. Additionally, it will analyze the duration of temporary housing centers established in different locations.

**Chapter IV** will present a case study conducted in the temporary housing center provided in 2020 for earthquake survivors in Izmir, Türkiye. The case study will include a site visit, observations of the temporary housing center, and interviews with the area directors.

**Chapters V** and **VI** will explain the developed strategies for site selection in the design proposal, emphasizing their importance during the post-disaster recovery process. These chapters will include a detailed site analysis aimed at re-evaluating the current situation and considering post-disaster recovery as an ongoing process. Furthermore, they will explore the future potential uses of the selected area, emphasizing its contribution to overall sustainable urban design strategies.

**Chapter VII** will outline various design intervention strategies to be implemented on different scales. The macro-scale design intervention will primarily focus on the phases of development and establishing connections between the project site and its immediate surroundings, it will activate the site for various scenarios, both during post-disaster recovery and normal urban life. A master plan for the site on a larger scale will be provided, ensuring its functionality in the context of post-disaster recovery while also catering to daily urban life.

Furthermore, the micro-scale design intervention will assess the practicality of temporary housing units and the unique characteristics of the spaces in between, encouraging socialization and collective living. It will explore how the selected site can activate itself during both post-disaster recovery, and normal daily urban life.

Lastly, **Chapter VIII** will serve as a conclusion through summarizing the research findings, site analysis, and design proposal. It will also provide recommendations for future researchers and designers embarking on similar thesis projects within this field.

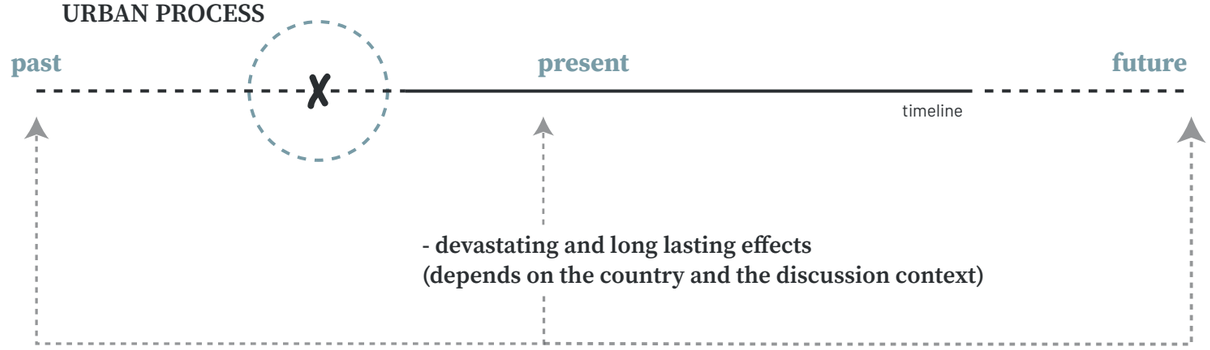


## Why earthquakes?

**- Aftermath of an earthquake in an urban district**

**'right of housing'**
**'temporality'**

*The Subject of the Study*




*The Timeline of Earthquake Impacts from the Past to the Future*

**past**
- initial action
- pre-disaster preparation and planning

**present**
- managing crisis and tackling difficulties
- rebuilding and replacement

**future**
- guide and strategy for future disasters

*The Importance of Study on Earthquakes*

# Chapter II:

## LITERATURE REVIEW



**“sheltering“**

- act of staying in a place immediately after the disaster situation

- day routines are discontinued for a certain time or NOT prioritized

?

**“housing“**

- a gradual return to daily activities

- school, cooking, and work

*Shelter and Housing*

# Chapter II

This chapter will discuss temporary housing in relation to different terms and contexts. It aims to differentiate various terms and reconsider them, considering the time perspective, within the discussion of the post-disaster built environment.

### 2.1 The Term Sheltering & Housing in Disasters

In order to understand temporary housing as a holistic process in disaster recovery, it is essential to introduce the terms 'sheltering' and 'housing' in a specific manner within the context of natural disasters.

While 'sheltering' and 'housing' have often been used interchangeably in the post-disaster recovery process for conceptualization, 'temporary housing' has also been employed by several researchers, sometimes carrying different connotations. Below, the available definitions are discussed and examined in accordance to the nuances in the way they are identified, while elaborating on their function for the research project further: According to Quarentelli (1995, pp. 45-50), the term 'sheltering' refers to the immediate act of finding a place to stay immediately after a disaster situation.

While it was initially believed that this period would be short, ideally lasting a few hours overnight, the duration can vary depending on specific hazard conditions and the dynamics of the affected population. Recent findings indicate that sheltering can extend to weeks or even longer in some cases. During this time, sheltering involves providing immediate help and quick short-term solutions, without a specific focus on the future. Regular daily routines are often disrupted or deprioritized during this period.

In contrast, the term 'housing' signifies a gradual return to daily activities, which distinguishes it from 'sheltering.' It involves the resumption of household activities and responsibilities. Survivors who reside in temporary housing provided during the recovery process can reestablish regular day-to-day routines, such as attending school, cooking, working, and maintaining a social life, while they wait for permanent housing.

### 2.2 Temporary Housing & Permanent Housing

While the term 'temporary housing' can have various meanings, it is commonly used interchangeably with transitional housing.

This term typically refers to a stage within the post-disaster or recovery process where survivors are provided with a temporary residence, both in terms of the social process and the physical type of housing.

Temporary housing, from a social perspective, refers to providing short-term accommodation where individuals can resume their normal daily activities after a disaster. It plays a crucial role in facilitating a faster recovery by enabling people to regain a sense of autonomy, even if permanent reconstruction efforts have just begun. During the temporary housing phase, families typically have private living spaces and cooking facilities, which contributes to their ability to resume their daily routines. (Felix et al., 2013, p.136)

Permanent housing construction takes place in the final stage of the post-disaster recovery process. During this stage, survivors may either return to their existing houses if the damage is not severe and repair is feasible, or they may be relocated to entirely new housing, sometimes in a different location that could be far from their previous residence before the disaster.

Permanent housing plays a crucial role in achieving long-term disaster resilience in affected communities and building local capacities. (Charlesworth & Ahmed, 2015; Tran, 2015)

### 2.3 Phases of Temporary Housing

The four phases of post-disaster recovery and the stages of temporary housing can be defined as described by Johnson (2007, pp. 436-437) in the following order:

**1. Emergency shelter** refers to temporary accommodation provided by public services, staying overnight at a friend or family member's residence, or taking immediate shelter under a makeshift cover, such as a plastic sheet, during a crisis. As this emergency typically lasts for a short duration, there may be limited provisions for stocked food or long-term medical services, which may not be available or given priority.

**2. Temporary shelter** is a form of accommodation provided to the public following a disaster, often in the form of tents or designated facilities. It serves as a temporary residence for a few weeks after the event. During this stage, the individuals staying in temporary shelters receive emergency assistance, including food, water, and medical support, with the help of aid providers.

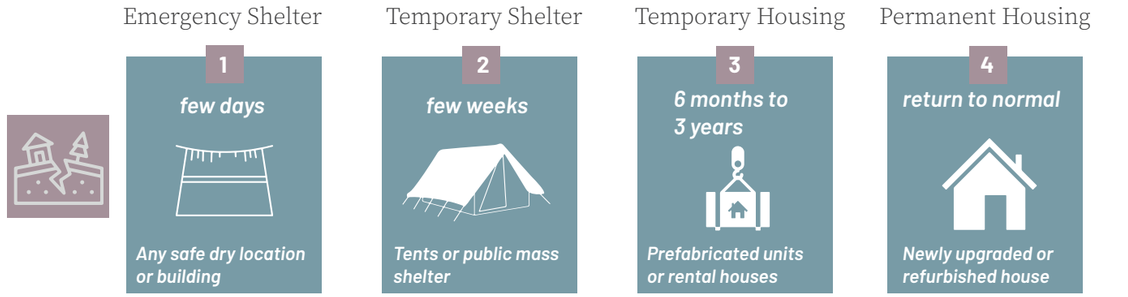
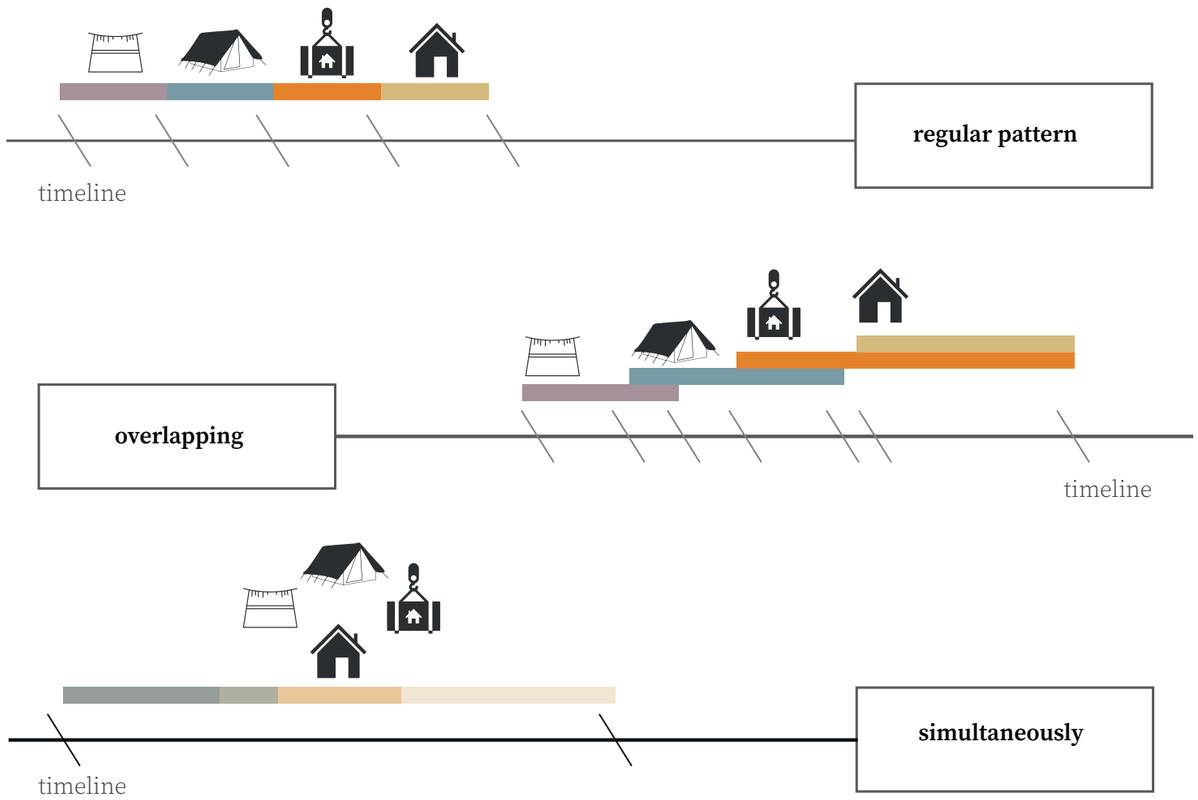



*Fig.2: Stages of Post-disaster housing (modified from the original source)*



**3. Temporary housing** is typically linked to the period of waiting for a permanent residence and involves a gradual transition back to regular daily routines, including home life, work, and schooling. The implementation of temporary housing can take various forms depending on the context, such as rented apartments, prefabricated homes, or makeshift shelters like shacks or containers.

According to Arslan and Ünlü (2008, p.2), the post-disaster period typically consists of four overlapping phases as described below: The first phase lasts approximately 72 hours and focuses on providing emergency shelter until the situation stabilizes. The second phase includes/refers to the initial 60 days, during which temporary shelter is provided along with essential needs like food for displaced survivors. The third phase, which constitutes the final phase,involves 'interim housing,' which refers to the period when temporary housing is provided for a year or more until suitable permanent housing becomes accessible.

According to Johnson (2007, p.437), the progression of phases experienced by disaster victims may not always follow a standardized pattern. Depending on the extent of damage to their homes, different population groups may go through all these stages, while others may only experience individual stages or transition to different stages in a non-linear manner. These stages may typically occur in a specific sequence during the post-earthquake management process, but there can also be instances of overlapping or simultaneous processes before one stage concludes.

It is commonly observed that individuals who have experienced significant damage from disasters may spend weeks, months, or even years in the transitional housing stage.

### 2.4 Models of Post-Disaster Recovery Scenarios

In the post-disaster recovery process, various scenarios can be applied or different strategies can be developed depending on the scope of the damage, as well as the conditions (e.g. geographic, demographic, socio-political, and economic) under which different countries operate. The most common recovery scenarios can be categorized as two-stage and three-stage post-disaster recovery, which will be explained in detail below.

**Scenario I: Two-stage recovery:** This recovery scenario can be chosen when there has been prior preparation for the potential damage caused by a disaster or when successful pre-planning actions have been taken.

If there are sufficient resources available, the survivors will need to be efficiently prepared to live in provided tents, available hotels, second homes, or with families willing to host them. In this case, the transitional housing stage discussed earlier will not be implemented. Choosing and implementing this scenario, if feasible, can lead to significant long-term cost savings.

Although this option requires early preparation to provide survivors with a safe place until permanent construction is achieved, it is also necessary to prioritize rapid reconstruction as a key component of the ongoing post-disaster recovery process.

One of the key principles in this scenario is to avoid wasting money on providing transitional housing and to utilize building materials that will not be needed after the disaster situation. Additionally, it is important to ensure that available sites, which could already be used for permanent housing reconstruction, are not occupied by temporary housing.

**Scenario II: Three-stage recovery:** Despite the importance of early preparation, past studies following major disasters have shown that governments can be unprepared for the full scale of damage caused by natural hazards and their impact on survivors. Indeed, preparedness involves engaging various stakeholders, e.g. governments, site owners, planners, architects and survivors, and addressing topics such as revising regulations, confirming properties, and assigning building contracts, which often take longer than expected, before permanent housing reconstruction begins.

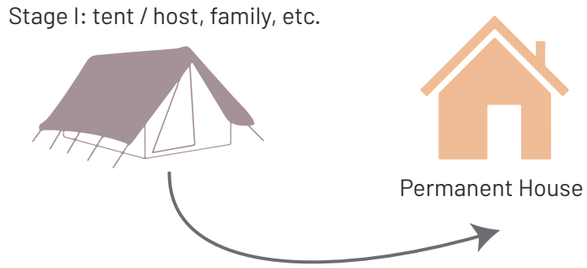
In such cases, it is crucial to provide transitional housing to survivors in need until permanent housing is ready. This housing, although temporary, should be more substantial than basic shelters or tents. Transitional housing is especially important in harsh climates or when there was insufficient preparation to address the long-term impacts of the disaster, offering protection to individuals and families.

It has been stated that in industrialized societies, survivors, depending on their social class, demand more from their governments than tents or basic shelter structures in the long term. Communal sleeping areas might not be convenient in the long term, and these needs make transitional housing as necessary as permanent housing. (Summarized from: Davis, I., & Alexander, D. (2016). Recovery From Disaster, pp.197-253)



# SCENARIO

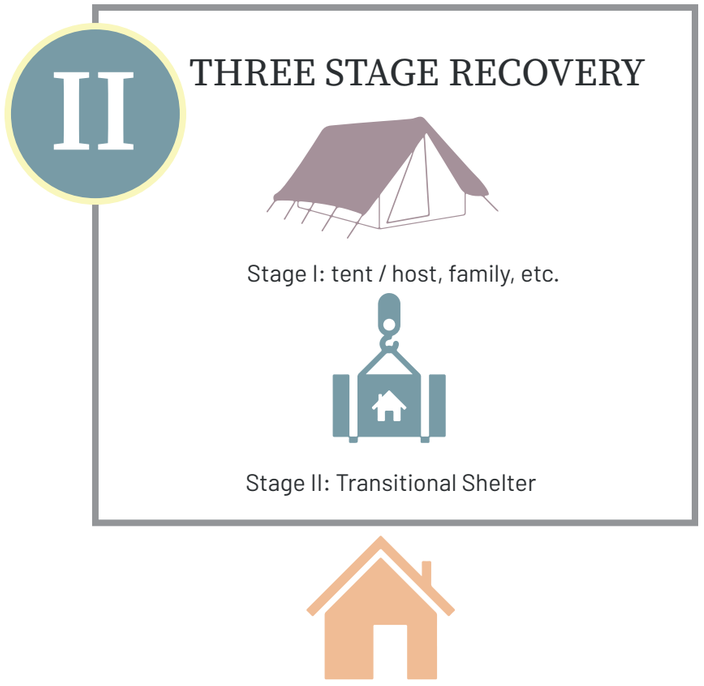

TWO STAGE RECOVERY




*by extending sheltering in Stage I and by advancing Stage III through rapid construction*

# SCENARIO

Türkiye Context



# Chapter III:

## HISTORICAL STUDIES





In this chapter, two post-disaster recovery scenarios from around the world will be presented. The focus will then shift to temporary housing examples, considering the duration of extreme temporary housing experienced by survivors following multiple earthquakes in Türkiye. The objective is to explore different disaster recovery approaches implemented by different countries and reevaluate the concept of temporary by examining the living conditions in temporary sites within the post-disaster-built environment in Türkiye.

### 3.1 Examples from Other Parts of the World

- 1985 Mexico Earthquake: Two-stage Recovery

A devastating earthquake occurred in Mexico City and its surrounding areas on September 19, 1985. The earthquake had a magnitude of 8.0 and caused severe damage and loss of life. Many buildings, including both residential and public structures collapsed as a result of the earthquake ("Mexico City earthquake", 2023).

Following the earthquake, Mexico adopted a two-stage recovery approach instead of providing transitional shelters. This decision was influenced by several factors:

**Efficiency and speed:** Combining immediate emergency response with long-term reconstruction planning streamlined the recovery process, minimizing delays and allocating resources effectively.

**Resource constraints:** The extensive damage and need for reconstruction required strategic resource allocation. Efficient resource utilization was ensured by prioritizing immediate relief efforts during the first stage, while prioritizing long-term reconstruction in the second stage.

**Integrated planning:** The two-stage approach facilitated coordination among stakeholders, through addressing immediate needs while also setting up an agenda planning for long-term resilience. Adding an additional stage could complicate coordination efforts.

**Prioritizing long-term solutions:** Focusing on comprehensive reconstruction aimed at creating a safer, resilient city rather than relying on temporary shelters or quick fixes. This approach was aligned with sustainable solutions and mitigating future disasters.

The choice of a two-stage recovery approach was specific to the circumstances and priorities of the 1985 earthquake in Mexico. The appropriateness of the recovery approach can vary depending on the nature and scale of the disaster, available resources, and the specific context in which it occurs.

- 2004 Indian Tsunami: Three-stage recovery

The 2004 Indian Ocean tsunami was a catastrophic disaster triggered by an undersea earthquake off the coast of Sumatra, Indonesia, on December 26, 2004. It resulted in widespread devastation across several countries, including India. The Indian government implemented a three-stage recovery approach in order to address the aftermath of the tsunami ("Indian Ocean tsunami", 2023). Following the disaster, India adopted a three-stage recovery approach. This decision was influenced by several factors:

**Immediate response and relief:** Emergency response, search and rescue, and distribution of essential supplies.

**Transitional shelters:** Provision of temporary housing for displaced individuals.

**Permanent housing and long-term recovery:** Reconstruction of infrastructure, housing, and public facilities for sustainable recovery.

The decision to adopt a three-stage recovery approach in India was influenced by the scale of the disaster, the significant number of people displaced, and the need for a comprehensive recovery process. By including transitional shelters and temporary housing as a separate stage, India could address immediate shelter needs while simultaneously planning for long-term reconstruction. This approach aimed to provide a more sustainable recovery through the well-being and safety of the affected population over the long term.

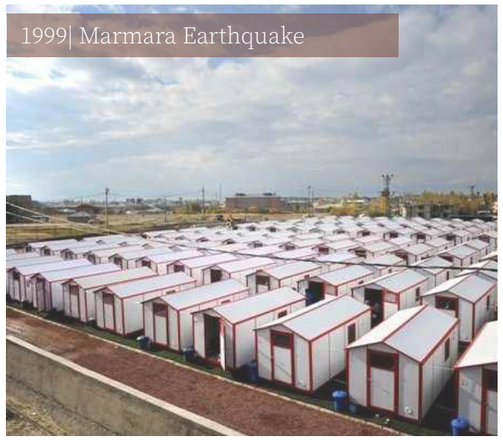



*Fig.3: Temporary Housing in Marmarma Region, 1999*


*Fig.4: Temporary Housing in Van, 2013*


*Fig.5: Temporary Housing in Elazığ, 2021*

### 3.2 Examples from the earthquakes in Türkiye

**The 1999 Marmara earthquake**, also known as the İzmit earthquake, was a devastating seismic event with a magnitude of 7.6 that struck northwestern Turkey on August 17, 1999. ("İzmit earthquake", 2022)

The earthquake caused a widespread destruction and loss of life in the densely populated areas around İstanbul, İzmit, and Adapazarı. The Marmara earthquake resulted in the collapse of numerous buildings, including residential structures, factories, and infrastructure. In the aftermath of the earthquake, many people were left homeless due to the destruction of their houses. As a result, transitional shelters were set up to provide temporary housing for the affected population.

Although the original plan for transitional shelters was for two years, some people lived in containers for approximately 14 years following the 1999 Marmara earthquake. While the duration varied for different individuals and communities, there were cases where people resided in container homes for an extended period of time as reconstruction efforts took place.

**The 2011 Van earthquake**, also known as the Van-Hakkâri earthquake, occurred in Eastern Turkey on October 23, 2011. The earthquake had a magnitude of 7.1. It brought significant damage to buildings and infrastructure in the region, resulting in loss of life and displacement of many residents. (The Strategy and Budget Office (SBO) of the Presidency of the Republic of Türkiye, 2023, pp. 20-22) Despite the initial plan for a one-year duration of transitional housing following the Van earthquake, the/several interviews conducted with earthquake survivors revealed that the process lasted approximately 12 years for some individuals. ("12 yıl geçti", 2023)

**The 2020 Elazığ earthquake**, also known as the Sivrice earthquake, occurred on January 24, 2020, in the Elazığ province of eastern Turkey. The earthquake had a magnitude of 6.8 and caused significant damage to buildings and infrastructure in the region. After the earthquake, temporary housing solutions such as tents and container homes were provided to those affected. (Bayrak et al., 2021, pp. 1944-1945) People are still living in containers as temporary housing following the 2020 Elazığ earthquake for approximately 3 years. It shows that the process of transitioning them to permanent housing has taken longer than anticipated.




*Fig.6: Temporary Housing in İzmir, Türkiye, 2021*

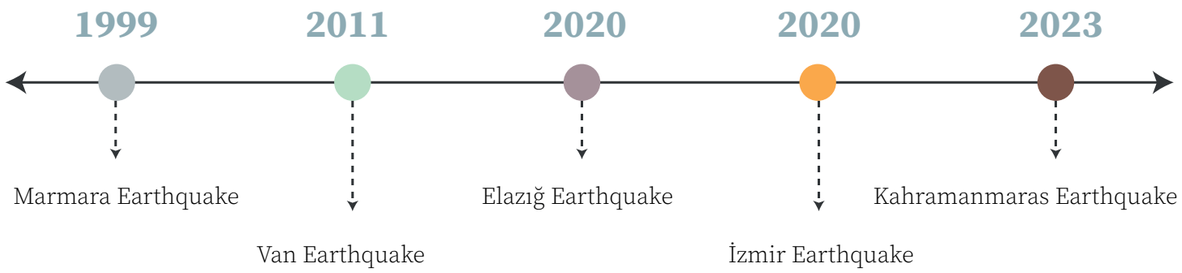

*Fig.7: Temporary Housing in Osmaniye, Türkiye, 2023*

**The 2020 İzmir earthquake,** also known as the Aegean Sea earthquake, occurred on October 30, 2020, in the Aegean Sea off the coast of Türkiye, particularly affecting the city of İzmir. The earthquake had a magnitude of 7.0 and caused significant damage and loss of life in the region. Following the earthquake, immediate rescue and relief efforts were initiated to assist those affected. Temporary housing solutions, including tents and container homes, were provided as transitional shelters to accommodate people who had lost their homes (Altunişik et al., 2021, pp. 1-2).

Several people are still living in containers as temporary housing following the 2020 İzmir earthquake for approximately 3 years.

**On February 6,** 2023, two earthquakes occurred in Kahramanmaraş, specifically in the Pazarcık and Elbistan districts. The magnitudes were recorded as 7.7 and 7.6 respectively. Another earthquake with a magnitude of 6.4, centered in Yayladağı, Hatay, took place on February 20, 2023. These earthquakes resulted in significant destruction across 11 provinces. In terms of intensity and affected areas, these recent events have been unprecedented disasters. (The Strategy and Budget Office (SBO) of the Presidency of the Republic of Türkiye, 2023, pp. 6-7.)

Although it is promised by the government that permanent housing will be provided to disaster survivors within a year, considering the scope of the damage, experts argue that temporary housing duration for some survivors will take more than 10 years.




*Examples from the earthquakes in Türkiye*

# Chapter IV:

# PLANNING & ASSESSMENT OF TEMPORARY HOUSING IN POST-DISASTER RECOVERY





Post-disaster recovery requires a tailored approach that considers the specific context, geographical location, and extent of damage in each affected area. While certain principles and general guidelines exist, there is no universally applicable solution. This thesis advocates for a three-stage recovery approach, with transitional housing as a crucial component, for İzmir, while acknowledging the potential effectiveness of a two-stage recovery approach in specific situations. The following are the underlying rationales for this decision:

**1. Magnitude of the damage:**

Earthquakes in Türkiye, particularly in highly seismic regions like İzmir, can yield extensive and substantial damage. The magnitude of destruction and the impact on numerous communities necessitate a systematic and comprehensive recovery process that addresses both immediate needs and long-term reconstruction.

**2. Urban Environment:**

In Türkiye, particularly densely populated urban areas, face complex challenges in terms of infrastructure, housing, and public facilities. These complexities require careful planning, coordination, and engagement with various stakeholders, which a three-stage recovery approach can accommodate better.

**3. Societal Expectations:**

In Türkiye, survivors of earthquakes often have higher expectations from the government and seek more substantial solutions beyond temporary shelters or basic housing. A three-stage approach allows for the inclusion of transitional housing, which provides survivors with more dignified and sustainable living conditions during the recovery process.

**4. Climate Considerations:**

Türkiye experiences diverse climate conditions, including harsh winters and hot summers. Transitional housing, which is a part of the three-stage approach, can provide better protection against extreme weather compared to temporary shelters or tents, ensuring the well-being and comfort of survivors throughout the recovery process.

**5. Comprehensive Planning and Participation:**

The three-stage recovery approach allows for thorough planning and engagement with affected communities, local authorities, and other stakeholders. It ensures that the recovery process considers the specific needs, aspirations, and concerns of the communities, besides fostering a sense of ownership and promoting more resilient and sustainable outcomes.

# Chapter V:

## CASE STUDY|

## BAYRAKLI TEMPORARY HOUSING, İZMİR, TÜRKİYE

# Chapter V

## TEMPORARY HOUSING CENTRE, İZMİR, TÜRKİYE

In the previous chapter, various earthquakes and their recovery stages were discussed to examine the concept of 'temporary' housing within a broader post-disaster context. This chapter focuses on conducting a detailed analysis of a specifically selected temporary housing center in İzmir, Türkiye. The analysis aims to understand the site selection strategy and its relationship with the surrounding area, examine the initial preparations made prior to the natural disaster (if applicable), explore the decision-making process regarding the proposal of temporary housing units, and provide insights into the social life and experiences of survivors in temporary housing from the author's perspective.

Although the Izmir earthquake on October 30 happened almost three years ago, the temporary housing in Bayraklı is still being utilized by some survivors. This indicates that the temporary housing phase has not yet been completed. However, it remains a relevant and significant case study aiming to develop earlier design strategies for future proposals, especially considering the specific location in Izmir.

A field trip was conducted on February 1, 2023, in order to visit the temporary housing area and assess the living conditions. During the visit, an interview was conducted with the site directors at the center. The site visit and interview lasted approximately four hours in total, during which various questions were asked to gain a comprehensive understanding of the temporary housing process.

The following subsections will address different dimensions for the discussion of the Bayraklı Temporary Housing Centre:

### Earthquake Impact and Bayraklı Temporary Housing Centre: A Comprehensive Overview

On October 30, 2020, a devastating earthquake struck the western part of Turkey, specifically in Izmir. Following damage assessment studies conducted by the Minister of Environment, Urbanisation, and Climate Change of the Turkish Republic, it was announced that 17 apartment buildings were destroyed in the Izmir earthquake. Additionally, 506 severely damaged buildings were identified as requiring urgent demolition. (Turkish Red Crescent, 2020, p. 1)

Although it was reported that approximately 15,000 survivors were in need of housing after the earthquake, the focus of the analysis was on the temporary housing center in the affected district of Bayraklı. Considering a typical Turkish family with four members and four flats on each floor of a five-story building, it was roughly estimated that around 1,400 survivors required housing in the specific area.

The temporary housing center was situated on a surface area of 46,000 m2, and the original plan included the placement of 1,000 containers divided into four islands to accommodate 4,000 survivors. Initially, only 500 containers were utilized, providing housing for 1,000 survivors, and this number gradually decreased over time.

As of 2023, it has been noted that 110 containers are still in use at the temporary housing center, accommodating approximately 540 survivors. These containers are predominantly occupied by families with four members, including two children, which is a common arrangement. The initial plan for the temporary housing center was to be utilized for a maximum of one year until permanent construction was ready. or some survivors; however, the temporary housing phase has not yet been completed even after three years.

### 5.1 Site Selection & Surroundings| Overall Asessment

According to the site directors, the chosen location for the temporary housing units was not specifically planned or studied in advance. The site was an old agricultural area owned by Ziraat Bank, which belonged to the state during the 2000s. Although there was no official policy or prior plan to utilize these lands in case of an emergency, the state had the authority to include them in the disaster management process. After one month following the earthquake, a site selection investigation was conducted, leading to the decision to establish temporary housing facilities on that site.

One of the main reasons for selecting this site was its proximity to the collapsed buildings. It was in the area that suffered the most significant damage, and survivors expressed a desire to be close to their former residences.



Additionally, the site's central location within the Bayraklı district of the city was noted. It was near other facilities and had a nearby primary school for children. Furthermore, the flat terrain of the land made it easier to position the containers. Although there are no official regulations regarding the selection of areas for post-disaster use or early preparations in specific cities, the option of utilizing government-owned lands in emergency situations has facilitated the choice of this particular area.

The choice of location prevented the relocation and settlement of the earthquake-affected individuals and survivors to a completely different area . In this way, they were given the opportunity to remain close to their original neighborhood. It is believed that this familiarity with the disaster-stricken district could have a positive impact on the recovery process following the earthquake. The utilization of undamaged buildings and schools within the district to continue their functions also has the potential to expedite the return to normal daily life in the long run.

However, while the site selection proved strategically appropriate in terms of proximity to the affected district, it was observed that the connection of this area with the rest of the district was not adequately planned in the initial stages of the disaster recovery process. Despite the advantage of a central location and proximity to various urban amenities, the lack of additional planning for street connections or potential transportation arrangements has resulted in the temporary housing area being somewhat isolated from the rest of the district.

### 5.2 Preparation of the Land for Use| Overall Assessment

During the interview, it was mentioned that no infrastructure work had been commenced or completed on the land before the earthquake occurred. Following the selection of the area post-earthquake, infrastructure development began. The infill ground preparation was also carried out, which took approximately one month to complete. As a result, the temporary shelter phase, which initially involved survivors staying in tent areas and tent cities, was extended to 30 days. At the end of this period, the shipping container units, which were intended to serve as temporary housing units,

were transported to the designated area and positioned according to the pre-planned layout.

### 5.3 Temporary Housing Unit Proposal: Containers & Technical Specifications| Overall Assessment

During the interview, the decision to use containers as temporary living units was attributed to several factors. These included the ease of access and distribution, the ability to transport them quickly by railway or road, the option to store them before and after use, the potential for reusability, and cost-effectiveness.

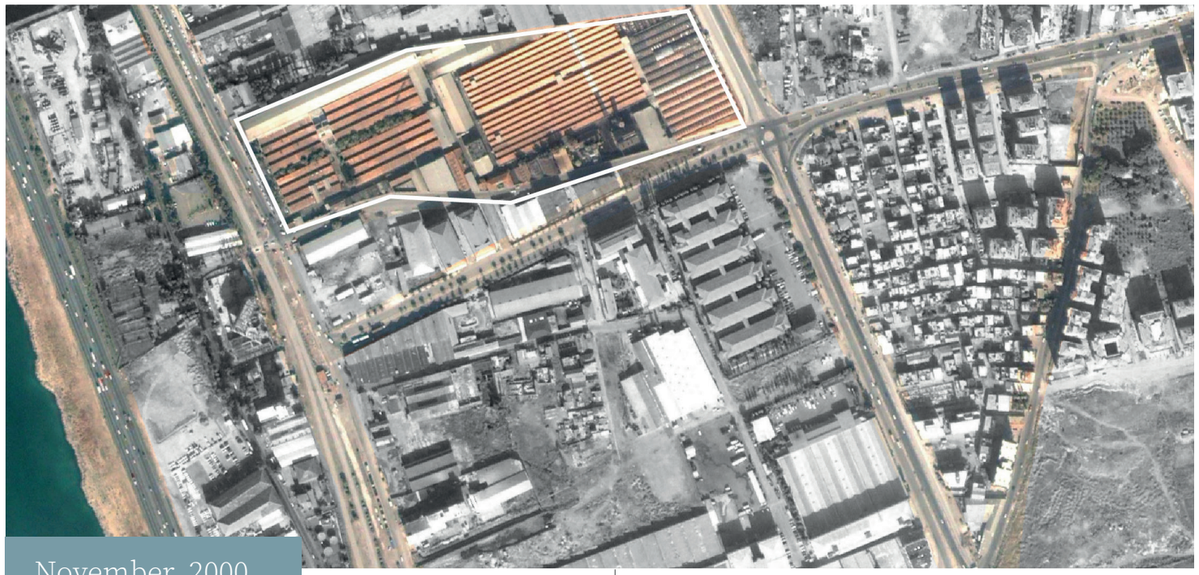
All containers were reported to be of the same size, measuring 21 $m^2$, and adhered to the same standards in terms of interiors and entrances. Initially, each family or single survivor (up to a maximum of 6 individuals) was provided with a single container.

As the process progressed, families with older children or young adults were allocated an additional container. It was noted that some survivors in the temporary housing center had specific requirements due to age or disability, such as wheelchair users. However, there were no containers specifically designed or produced for physical disabilities. Later in the process, a ramp was added to the entrance to accommodate wheelchair access.

Additionally, it was observed that the containers were elevated about 15 cm from the ground for technical reasons. Some survivors devised their own solutions and added an additional riser to facilitate access.

The uniform and standardized placement of containers, primarily for technical reasons and ease of installation, limited their functionality to serving as corridors for emergency use and circulation. These corridors, which have become small-scale streets in daily urban life, have provided a means for survivors to access outdoor areas and utilize these spaces beyond the confines of their indoor units. The survivors have sought to transform these in-between spaces according to their spatial needs.

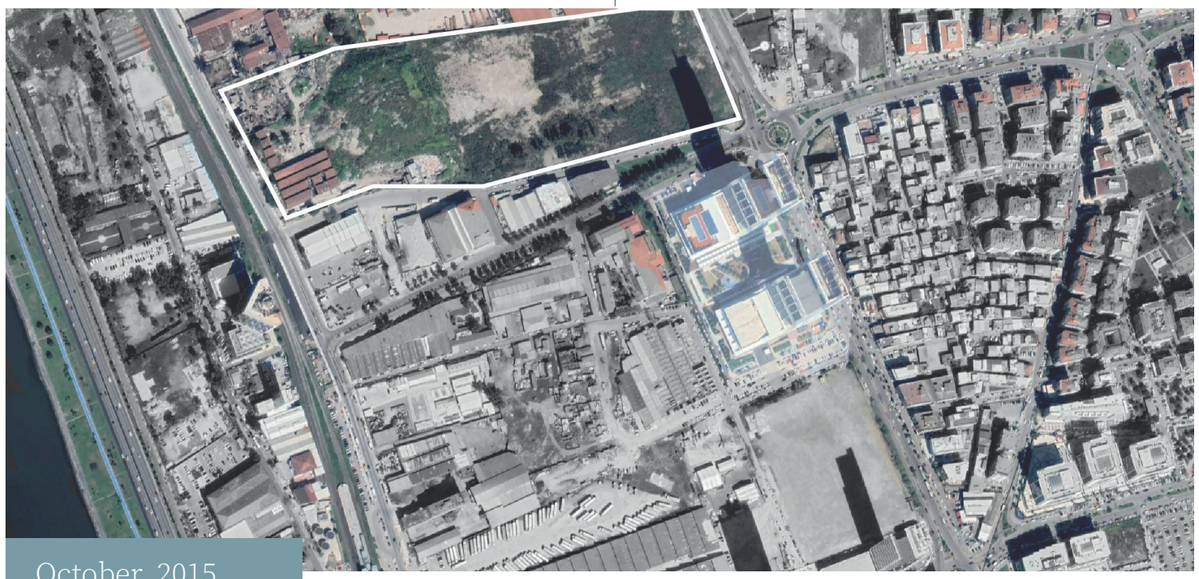
These in-between areas have been used as canopies, playgrounds for children, and places for drying laundry, among other purposes. However, they lack design elements that would enhance their usability, such as canopies or other amenities.



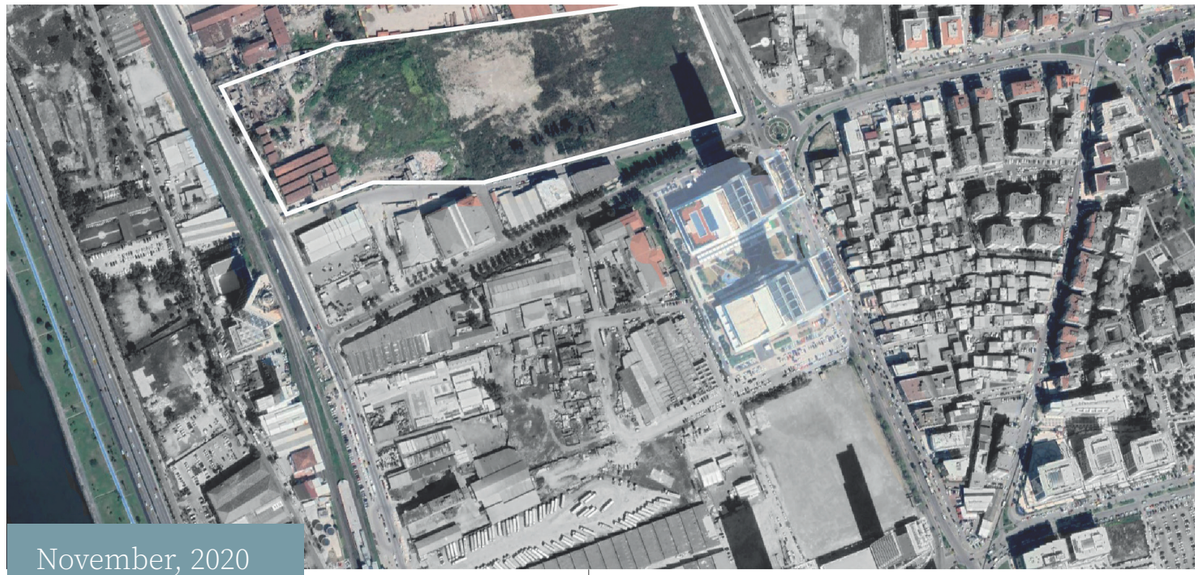
November, 2000

The first satellite image above shows the site in November 2000, when it was an old agricultural land. At that time, this site was part of the development areas in the district, and there were earlier plans to have residential and commercial buildings around the site.

The second satellite image below shows the site in October 2015, after the completion of the high-rise Folkat Towers building project. At the same time, the coastline features a public space character with pedestrian and cyclist paths. The site, however, appears as an isolated island without its previous function.



October, 2015



November, 2020

The third satellite image above shows the site in November 2020, just 30 days after the earthquake that occurred in İzmir, Türkiye in October 2020. It can be observed that no prior action was taken to utilize this site as a temporary housing location or to make earlier preparations.

The fourth satellite image below shows the site in August 2022, two years after the earthquake in October 2020. Following the concrete casting process for the ground, containers were repetitively placed. Nevertheless no site connections were developed at that point.

August, 2022

**WASTE MANAGEMENT:**

There was no specifically planned area for waste management; thereby, trash bins were randomly located around the containers. The situation made it difficult for survivors to develop conscious behavior for proper waste disposal, both for the longer-term use of the site and for the district as a whole.

**CORRIDORS:**

Although the in-between spaces in front of the containers had strategic importance in creating social life and improving connections between survivors, they were not planned to serve any additional function other than being empty axial corridors.

**PARKING:**

While having large corridors that made it easier for public cars to enter the area was a positive outcome, the lack of a parking plan resulted in unplanned and random parking locations, which obstructed circulation.

**SOLAR PANELS & WATER TANKS:**

Solar panels placed on the roofs, along with water tanks and additional heaters, were provided to the survivors by the municipality.

**DISADVANTAGED GROUPS:**

Due to the lack of earlier infrastructure and pipe system preparations, disadvantaged groups faced accessibility issues with regards to the interior of the toilets.

**DISADVANTAGED GROUPS:**

Additionally, the interior of the toilets was not accompanied by any additional adjustments in catering the needs of disadvantaged groups and elderly people.

**INDOOR CAPACITY:**

All containers were 21 $m^2$, with an additional room serving as the living and dining area. There was no flexibility or variation in indoor spaces to accommodate different needs of the survivors.


**ACCESSIBILITY:**

Since containers were raised from the ground with additional footings, some survivors had to solve accessibility issues by adding extra steps to their doors.


**LIFE IN 'IN-BETWEEN':**

The corridors, originally planned for easy placement and transportation of containers, were transformed by survivors into semi-private areas that reflected daily life in the temporary housing center.

**LIFE IN 'IN-BETWEEN':**

These spaces turned into places where survivors dried their clothes, had personal belongings and added some shadings due to not having any other structure that helps the area to protect from the sunlight and provide shading.




**PLACE MAKING:**

In cases where the provided interior space was not sufficient, especially for families with children or young adults, survivors gradually moved outside to the front part of the containers and placed personal belongings there.

**PLACE MAKING:**

Having personal belongings in front of the containers while place making, survivors defined this space as a private outdoor area to be used when the weather was nice or have belongings there to create wider space inside.


**DAILY URBAN LIFE:**

Due to the lack of clear connections and integration of the temporary housing center with the surrounding area, daily urban life was mostly absent within the temporary housing center.

**DAILY URBAN LIFE:**

The photo taken by the author shows a street vendor's car located outside the entrance to the temporary housing center, indicating its presence for the survivors.



**CONNECTIONS:**

The photo above taken by the author shows the street that goes to the entrance of the temporary housing centre. The road is mostly used by cars since there is no pedestrian pathway or cyclist lane.

**CONNECTIONS:**

Since there is no clear street connection to the temporary housing centre and its functions, this road poses a danger to kids when they go outside of the temporary housing centre. It also becomes a dark and dead space at night.


*Fig.8: Transportation to the earthquake affected area*

**TRANSPORTATION:**

Temporary housing units, transformed from shipping containers into living areas, were transported to the area from Yalova to Izmir using railway and road connections.

**TRANSPORTATION:**

Having shipping containers as a temporary housing unit made it easier to transport and assemble units  at the later stage to the selected site.



*Fig.9: Transportation to the earthquake affected area II*

**CURRENT FUNCTION:**

At the time of the site visit on February 1, 2023, the temporary housing center was still in use.

**RE-USE**

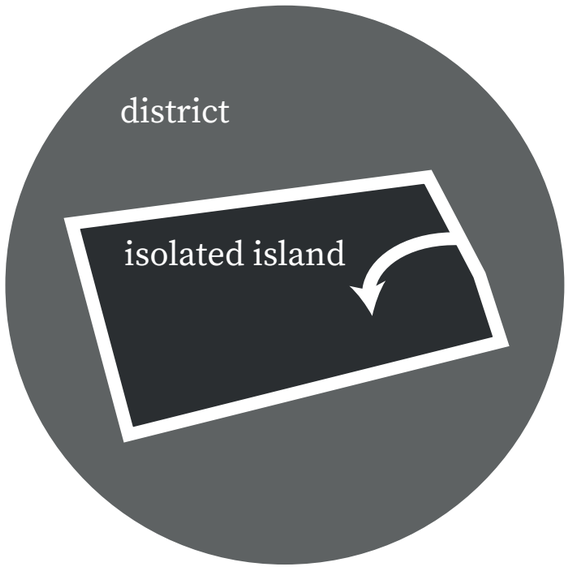
After a recent devastating event in Kahramanmaras on February 6, 2023, it was suggested to use some of the containers for current survivors. However, due to survivors' reluctance to leave their demolished houses or families, some of the containers were transported to the eastern part of the country to be located there.

# Chapter VI:

## STRATEGIC SITE SELECTION & SITE ANALYSIS



## CASE STUDY




## PROBLEMS

- CREATING NOT FUNCTIONING HOLES WITHIN THE CITY

- LOOKING FOR ISOLATED ISLANDS TO LOCATE DISASTER SURVIVORS IN NEED FOR TEMPORARY HOUSING

- CREATING BOUNDARIES AND PHYSICAL BARRIERS WITHIN THE CITY LIFE AND TEMPORARY HOUSING LOCATION

## DESIGN STRATEGIES

- SOFTENING THE EDGES
- FINDING AND PROTECTING STRATEGIC LANDS THAT WILL CONTRIBUTE TO THE OVERALL DEVELOPMENT FOR THE REST OF THE DISTRICT
- DECIDING CURRENT / FUTURE FUNCTION BEFORE OR AFTER NATURAL HAZARDS
- INCLUDING FUTURE DEVELOPMENT PROJECTS AROUND THE SITE
- IMPROVING PHYSICAL AND SOCIAL CONNECTIONS FROM SITE TO ITS SURROUNDINGS

# Chapter VI

After disasters, it is vital to take rapid actions; indeed, strategic site selection for temporary housing is one of the key elements to achieve a more efficient post-disaster recovery process.

The recovery and reconstruction period after a disaster is not a one-time event; rather it is a dynamic long term process that represents an opportunity for planners to design strong communities, reduce risks and vulnerabilities of beneficiary populations, as well as enhancing environmental sustainability.

The key points on the disaster recovery timeline ifocuses on actions to promote safer shelter sites for people and communities in order to provide opportunities for the environment.

### 6.1 Basic Principles

A new shelter should be in proximity to where residents previously pursued their occupations and secured their livelihoods. Sites distant from locations where livelihoods are secured tend to be abandoned or only partially used by intended residents.

Space for markets, live-stock handling facilities, and slaughterhouses should be included in a site plan.

The site selection and development timeline is based on a rapid onset event, such as cyclone or earthquake, and needs to be adapted to the local context.

Sustainable site selection and development should specifically avoid underestimating the physical space and environmental requirements of a community.

Recognizing the context during the site selection and development while considering the broader social and physical setting of the proposed intervention.

Based on the case study findings, it was identified as problematic to search for temporary housing locations after a disaster due to the unfamiliarity with the needs and the lengthy time it takes. Additionally, the discussed location in the case study was isolated from the rest of the district, lacking connections.

The project proposal aims to address these challenges by identifying physical spaces with similar characteristics, but integrating them into the district at earlier stages. This would ensure that these spaces can be utilized in emergencies if necessary, while also improving their connections and possibilities (March & Kornakova, 2017, pp.1-12).

### 6.2 Project Location: İzmir, Türkiye

Türkiye is an earthquake zone due to its geological location; thus, the frequency and sequence of earthquakes are relatively high. Many devastating earthquakes have been experienced throughout history, which resulted in loss of life and property.

In parallel with that, several studies and research projects have been conducted in the context of disaster management.

Izmir is a city located on the western coast of Türkiye, and it is one of the most earthquake-prone areas in the country. The region is situated on the North Anatolian Fault Zone, which is one of the most active fault systems in the world and has been responsible for numerous earthquakes in the past.

The most recent significant earthquake to affect Izmir occurred on October 30, 2020, when a magnitude 6.9 earthquake struck in the Aegean Sea, just off the coast of the city. The earthquake caused significant damage to buildings and infrastructure in Izmir and surrounding areas, and resulted in the loss of over 100 lives. (Altunişik et al., 2021, pp. 1-2).

In addition to the 2020 earthquake, there have been several other significant earthquakes in the history of Izmir. One of the most devastating earthquakes occurred in 1922, when a magnitude 7.3 earthquake struck the city and surrounding areas. The earthquake caused widespread destruction and resulted in the loss of tens of thousands of lives. (International Blue Crescent [IBC], 2020, p.4).

Along with the fact that the earthquake records in the Aegean region have a history of 2500 years, it is also known that the fault lines in this region are one of the most active regions on Earth in terms of causing devastating earthquakes. (Deniz et al., 2020, p.1)

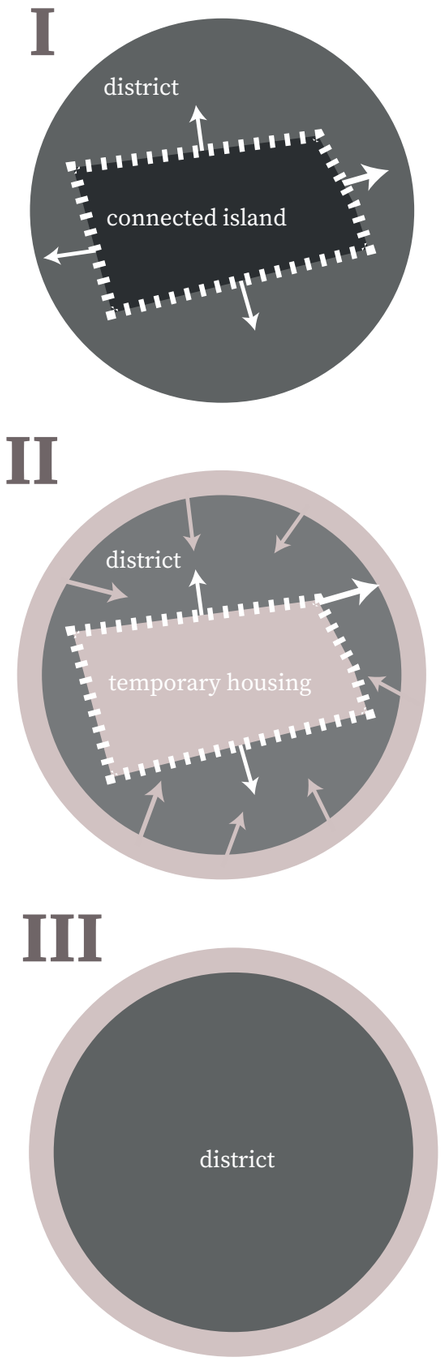


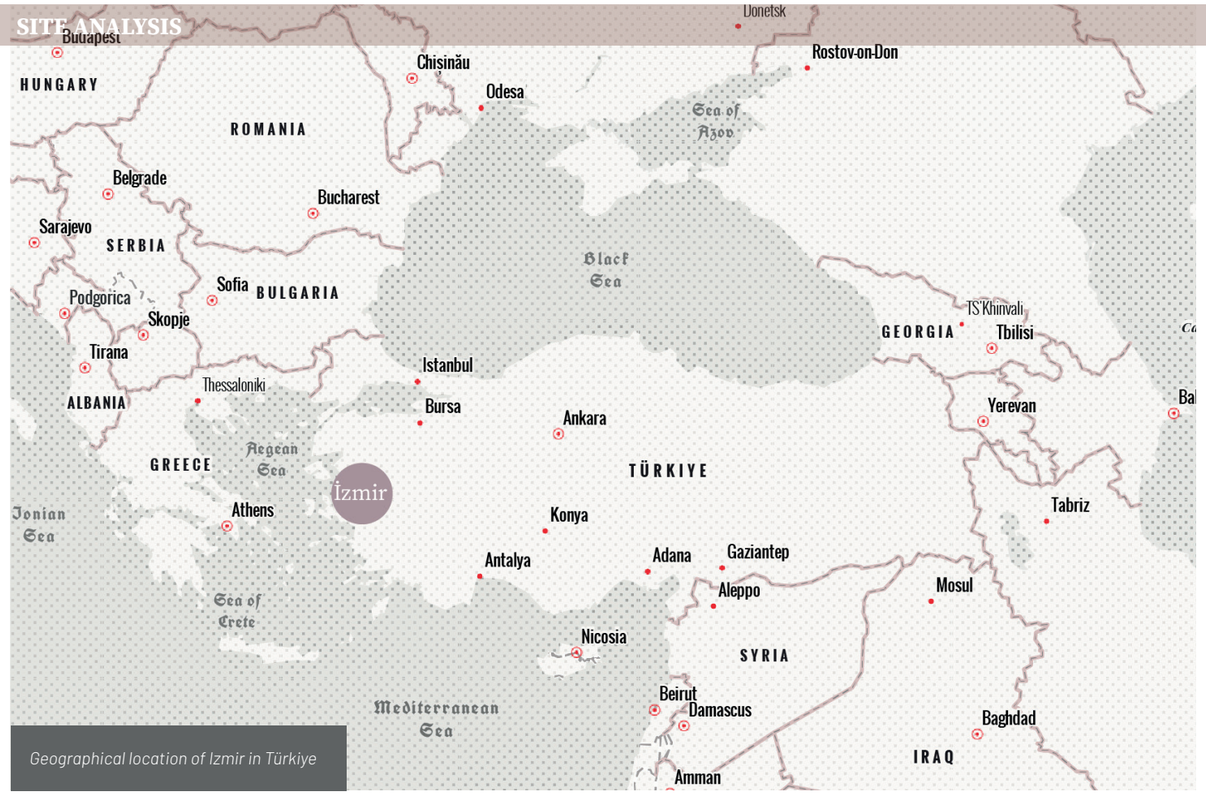
### 6.3 Vision: Disaster Recovery as Part of Urban Process

Given the high seismic activity in the region, it is important for Izmir and surrounding areas to have effective earthquake risk management strategies in place, including building codes and standards, emergency response plans, and community education and preparedness programs. These efforts can help reduce the impact of future earthquakes and improve the resilience of the region's infrastructure and communities.

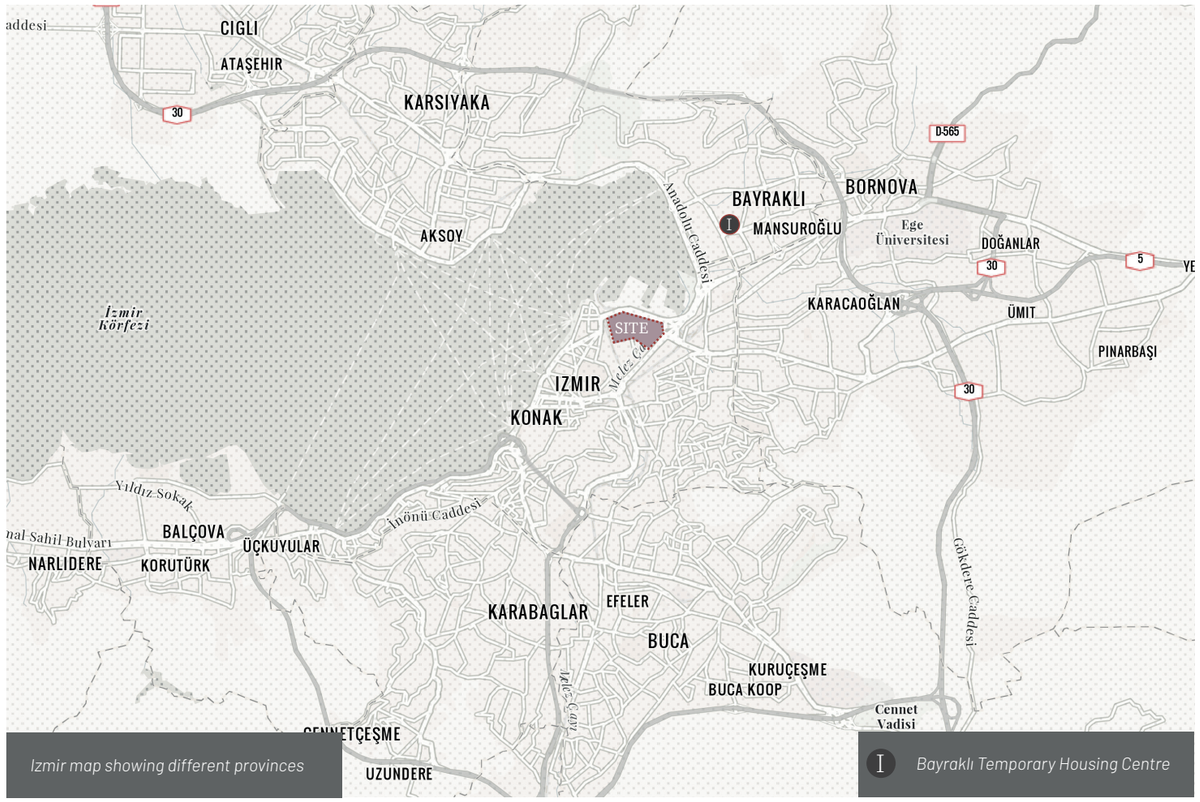
Finding strategically important locations before disasters and protecting these lands to be used in during the post-disaster recovery process should be the main target of experts and all decision making authorities that work or make decisions on disaster recovery planning.

This thesis suggests developing different post-disaster recovery scenarios on district levels rather than an expanded city level focus , especially when big cities are considered to have different characteristics on each district that makes it impossible to have the same type of approach or solution everywhere when it comes to crisis management. In this way, site specific solutions could be encouraged and these districts could be strategically improved through urban design when there is no disaster.






*Geographical location of Izmir in Türkiye*




*Izmir map showing different provinces*

I *Bayraklı Temporary Housing Centre*



## Map of Türkiye showing earthquake zones


**4th** frequency of the earthquakes around the world

**76%** LAST 60 YEARS

Out of the 650,000 buildings damaged by natural disasters in Türkiye over the last 60 years, 500,000 were due to earthquakes.

LEVEL I

**66%** - - - - - - - - - - - - - **90%**

earthquake surface impact area


LEVEL I earthquake zone

### 6.4 Ground Characteristics

Ground sensitivity value is an important factor in site selection for post-earthquake disaster recovery since it reflects the level of seismic hazard or risk at a particular location. Ground sensitivity value is a measure of how much a site is likely to be affected by ground shaking during an earthquake; it is based on factors such as soil type, depth of bedrock, and topography. (Tempa et al., 2022, pp. 1893-1900)

When recovering from an earthquake, it is important to select a site that is less vulnerable to seismic hazards, as this can help reduce the risk of further damage or loss of life in the event of future earthquakes. By using ground sensitivity value as a criteria for site selection, planners and engineers can identify areas which are more likely to be safe and resilient in the face of future seismic events.

Izmir has different ground characteristics, arising from different soil types, due to its large surface area. The levels and robustness of these characteristics that can be affected by earthquakes vary. In the map no.1 shown, the regions shown as Z4 the worst ground type.

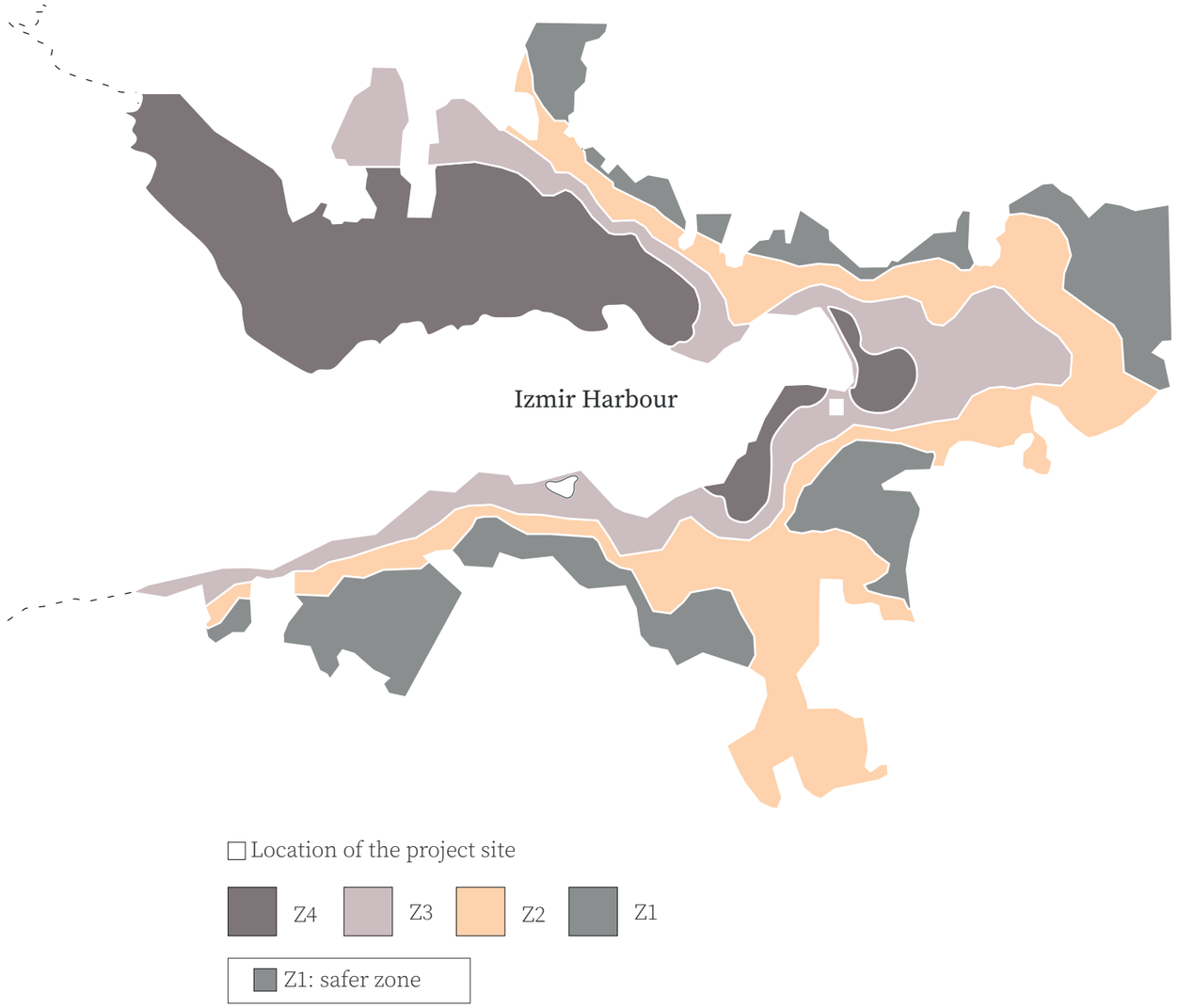
For this reason, these regions are the regions where the most building destruction is expected in the event of a devastating earthquake, if there are any poorly constructed buildings. Most of the residential buildings in İzmir, Konak-Alsancak province are located in the red zone.

Considering the fact that the safest zones are not in proximity to the risk areas and also has other provinces nearby, in the event of a disaster, Z3 ground type that is relatively safer could be further investigated while looking for sites locating temporary shelters and housing.

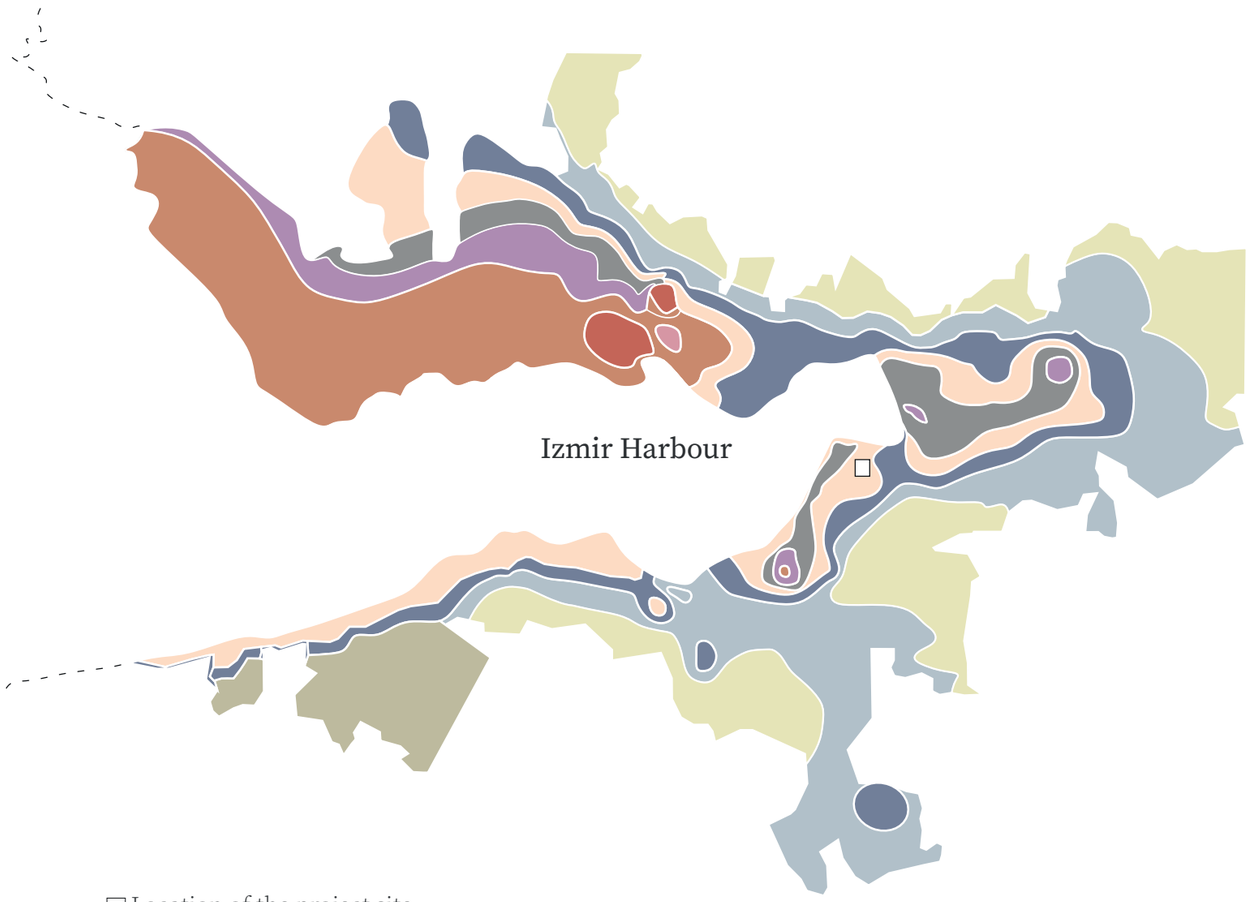
The map no.2 shows the ground sensitivity value in case of an earthquake. From 0 to 5, 5.0 has the highest value that increases the level of experiencing the earthquake. Suggested site has an optimal ground sensitivity value to locate a temporary housing centre.



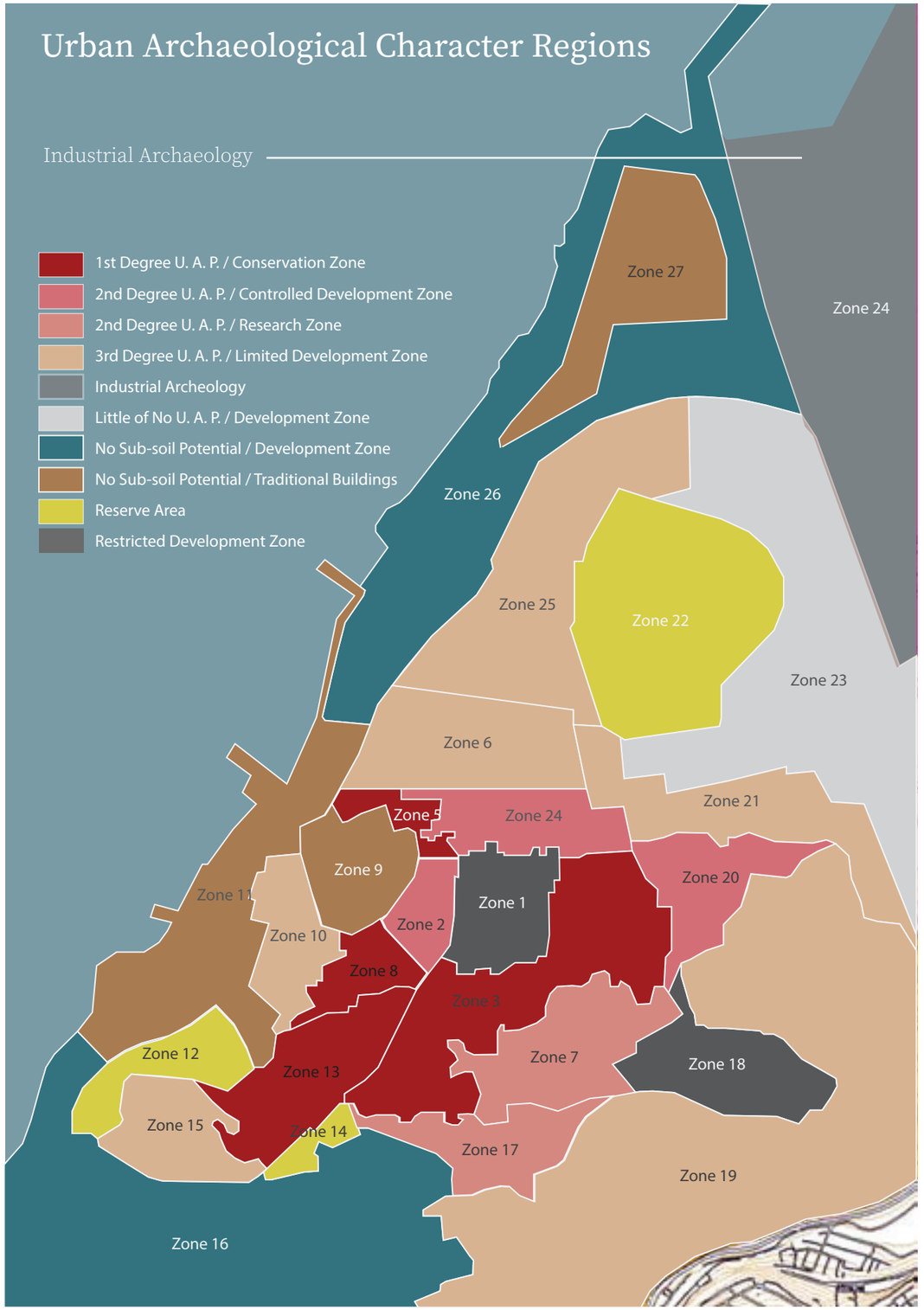
## Map no.1 of İzmir showing seismic hazard zones



# Map no.2 of İzmir showing ground sensivity value






*Urban Archaeological Character Regions*

Atatürk
Çiğli
Cigli
Ataşehir
Karsiyaka
Karşıyaka
Bornova
Bayrakli
Bornova
Mansuroğlu
site
old city centre
İzmir
Konak
Mustafa Kemal Sahil Bulvarı
Balçova
Üçkuyular
Narlıdere
Korutürk
Balçova
Karabaglar
Buca
Narlıdere
Cennetçeşme
Uzundere

Topographic map on city scale showing different provinces


Fig. 10 old izmir map

# Chapter VII:

## DESIGN INTERVENTION



# Chapter VII

### 7.1 İzmir Port-Hinterland Area

The İzmir Port Hinterland refers to the area surrounding the İzmir Port, which is a major seaport located in the city of İzmir, Türkiye. The hinterland area of a port includes the land and regions that are directly connected to and influenced by the port's activities (Karadağ & İncedere, 2020, pp. 59-60).

**The İzmir Port Hinterland holds significance in the context of disaster recovery for several reasons:**

The İzmir Port serves as a vital gateway for the import and export of goods, both within the region and on an international scale. The surrounding hinterland area functions as a central transportation and logistics hub, housing a range of distribution centers, warehouses, and industrial facilities. In the event of a disaster, this well-established infrastructure can be leveraged to ensure the efficient transportation and storage of relief supplies.

By utilizing this existing network, essential resources can be swiftly delivered to affected areas, facilitating timely assistance and support.

The İzmir Port Hinterland area benefits from its close proximity to a comprehensive transportation network encompassing highways, railways, and airports. This interconnectedness greatly enhances accessibility and enables the swift mobilization of resources and personnel during post-disaster recovery operations. The efficient transportation links within the hinterland area facilitate the rapid deployment of emergency response teams, equipment, and supplies to the affected regions.

The İzmir Port and its surrounding hinterland area hold great economic importance for both the local and national economy. Serving as a crucial trade gateway, the port supports various industries and generates employment opportunities. Following a disaster, the restoration of economic activities becomes a critical aspect of the recovery process.

The İzmir Port Hinterland, with its industrial facilities and business centers, plays a vital role in rejuvenating economic endeavors by offering employment prospects and facilitating the restoration of supply chains.

The İzmir Port Hinterland area possesses essential infrastructure and resources that can be effectively utilized during the process of disaster recovery. These include storage facilities, open spaces, as well as utilities such as water and electricity connections. Temporary shelters, distribution centers, and command centers can be established to coordinate and facilitate relief efforts by leveraging these existing resources.

**Having a pre-determined location for temporary housing on a district scale is important in İzmir, or any earthquake-prone area, for several reasons:**

**Rapid response:** In the event of an earthquake, it is crucial to have a plan in place for temporary housing so that people who are displaced from their homes can quickly and easily access a safe and secure location to stay. Having a pre-determined location for temporary housing on a district scale ensures that the response can be prompt and efficient, as resources and personnel can be mobilized to the location.

**Safety:** The pre-determined location for temporary housing on a district scale should be chosen based on factors such as geological stability, accessibility, and distance from potential hazards like landslides or liquefaction zones. This ensures that people staying in the temporary housing are safe and secure.

**Organization**: A pre-determined location for temporary housing on a district scale also helps prevent chaos and confusion in the aftermath of an earthquake. If people know where they should go for temporary housing, it can help keep them organized and calm during a stressful time.

**Planning:** Planning for temporary housing on a district scale also allows for better coordination between local authorities, emergency responders, and other organizations involved in the response to an earthquake. By having a plan in place, these organizations can work together more effectively to provide the necessary support and resources to those affected by the earthquake.

Overall, having a pre-determined location for temporary housing on a district scale is an essential part of earthquake preparedness in İzmir. It can help ensure a more efficient, organized, and safe response to an earthquake.

*Izmir Port Hinterland Area - Project Site / Disaster Recovery & Temporary Housing*

## 7.1 Macro Scale Design Strategies

This chapter will elaborate on the devised strategies on a macro-scale, encompassing various phases.

### Phase I |
### Selecting a location for temporary housing

Phase I begins with identifying potential sites for locating temporary housing units. During the initial site investigations, it was discovered that several predetermined temporary shelterlocations were already in place in the event of a disaster. The İzmir Alsancak Football Stadium serves as the nearest temporary shelter location to the selected temporary housing area, with a walking distance of only 3-5 minutes (350 m) between the two. This proximity minimizes the relocation efforts from Stage I to Stage II, allowing survivors in the district to easily transition from temporary shelters (tents) to temporary housing units when it becomes feasible.

The Alsancak Football Stadium spans a total area of 15,000 m2 and can accommodate up to 60 tents for earthquake victims. Considering an average family size with two children, a maximum of 240 people can be accommodated in the stadium during the temporary shelter stage. The stadium area already has planned infrastructure in place, including electricity, water mains connections, and transportation facilities.

The Sark Industrial Area has been selected as the location for temporary housing units and covers a total area of 45,000 m2. Initially, it was planned to accommodate a maximum of 250 shipping containers for temporary housing units. However, a careful examination of the case study has led to design decisions in creating larger social spaces and breaking away from the typical grid layout of temporary housing placement, the number of containers has been reduced to 170. This adjustment allows for additional public facilities and landscape elements to be integrated within the temporary housing center.

### Phase II |
### Including ongoing projects & completion and development

Phase II entails the finalization of ongoing projects within the project site. One early decision was to preserve the Daragac Neighborhood and incorporate it into the overall master plan proposal. This historic neighborhood is well-known for its vibrant street art community and holds significant importance for the district.

The Sark Industrial Area, suggested as a temporary housing location, faces mounting pressure for transformation from its surroundings. However, this area should be preserved and utilized temporarily in the event of a disaster. Therefore, the inclusion and development of other urban regeneration projects in close proximity to the site bolster the post-disaster recovery context.

An essential aspect is reclaiming the Meles Stream and relocating it closer to the site to transform it into a public space. This endeavor holds significant importance for the temporary housing location as it strengthens connections. Consequently, the national competition for regenerating the Meles Delta plays a vital role in contributing to the green network of the site.

Upon the completion of the Meles Stream and Meles Delta projects, the suggested temporary housing location will have the potential to extend its connections to these distinct surroundings. This will facilitate a smoother long-term disaster recovery process during the rehabilitation stage.

### Phase III |
### Improving connections: Before the earthquake and after the earthquake

Phase III is dedicated to enhancing specific connections within the project site and its surroundings, taking into account the pre-earthquake and post-earthquake situations.

The first crucial connection to establish is between the temporary housing location and the port area. This connection ensures easier access to immediate transportation for assistance and facilitates the swift movement of resources to the temporary shelter and housing location after the earthquake.

The second connection suggested is to create a link between the ferry station and the public park/gathering area. Although a street connection already exists, it is important to remove car parking spaces from that street to ensure a clear and unobstructed passage. This connection becomes vital as the ferry station can serve as an alternative route for emergency aid if other road connections from the city are inaccessible.

Establishing a connection from the international fair to the public park/gathering area enables the long-term use of these spaces as public areas for disaster recovery and rehabilitation. This connection also strengthens the bond between these public places.

Improving the street connection from Gündoğdu Square to the port axis facilitates rapid transportation for assistance and enhances mobility within the project site.

Lastly, Kıbrıs Şehitleri Street, known as the most vibrant public street in the district, should be connected to the suggested improvements to reinforce the daily urban life context.

The Meles Delta project from Phase II creates a significant opportunity to establish a green connection from the Delta to the Kordon Coastline public district.

While plans may be underway to remove the freight transport function of the port, it is suggested to retain at least one section for emergency use and to store temporary housing containers in that area.

### Phase IV |
### Mapping important buildings on the site for re-use & picking temporary shelter

Phase IV is dedicated to mapping important buildings within the project site and its surroundings, followed by the selection of temporary shelter locations that can be utilized as either indoor or outdoor spaces.

This phase holds significant importance as it involves mapping existing schools, hospitals, and other public facilities to assess the additional support required for providing temporary shelter. The goal is to encourage survivors to resume their daily lives as quickly as possible.

During this phase, it is suggested to utilize the yards of primary and secondary schools with sufficient capacity as outdoor tent areas. Additionally, certain building facilities such as mosques, hotels, volleyball stadiums, and old buildings without functions can be transformed into immediate temporary shelters, offering indoor spaces for those in need.

### Phase V: Completion of the overall master plan,

Phase V is focused on finalizing the overall master plan by integrating the earlier post-disaster recovery scenario into urban design strategies at the earlier stage.

Once the Sark Industrial Area has served its purpose as a temporary housing location, it can be transformed into a vital component of the green network and a public gathering point. The site's existing street network and trees will contribute to its potential as an important public space.

Using this site temporarily is of utmost importance, given its strategic significance and the limited availability of land for emergency situations and disasters.

# MACRO SCALE INTERVENTION

**PHASE I:** Selecting a location for temporary housing

1

Electricity

Water mains connection

Transportation

I ALSANCAK FOOTBALL STADIUM
Temporary Shelter (Phase I)


*Fig.11: Stadium Temporary Shelter Location Map*

TOTAL AREA: 15.000 m²

60

240

II SARK INDUSTRIAL AREA:
Temporary Housing (Phase II)

TOTAL AREA 42.000 m²

Temporary Housing Units

190

3-5 min.

350 m

# MACRO SCALE INTERVENTION

**PHASE II:** Completion of ongoing housing projects
Incl. Darağaç Neighborhood in the plan
Meles Delta & Meles Stream
Urban Regeneration Projects

2

DARAGAC NEIGHBORHOOD

2-3 FLOORS
TYPOLOGY

STREET ART
COMMUNITY HOUSES

green & blue corridor


*Fig.15: Meles Delta Competition*

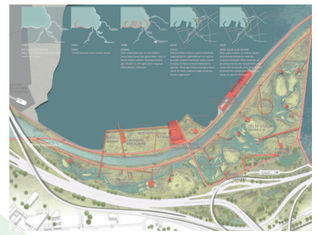


*Fig.16: Meles Delta Competition Project*

extending the
green & blue corridor

*Fig.12: Housing Projects I*

HIGH-RISE HOUSING PROJECTS

*Fig.13: Housing Projects II*

OLD EGE NEIGHBORHOOD /
NEW HOUSING PROJECTS

*Fig.14: Ege Neighborhood New Housing Projects*

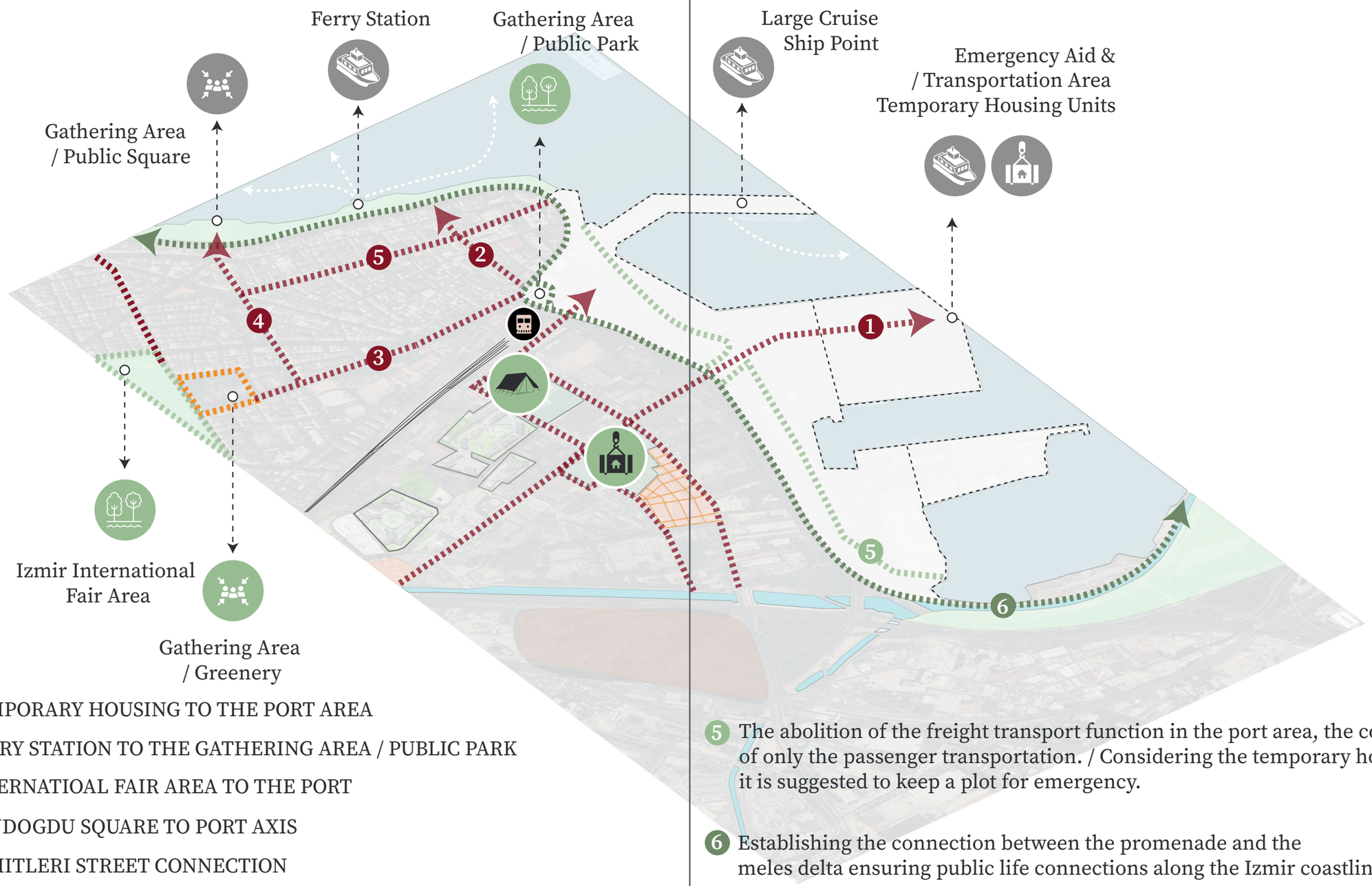
MAHAL BOMONTI PROJECT

*Fig.17: Mahal Bomonti Project*

# MACRO SCALE INTERVENTION

**PHASE III:** Improving Connections for immediate relief & post-disaster recovery process

3




1. FROM TEMPORARY HOUSING TO THE PORT AREA
2. FROM FERRY STATION TO THE GATHERING AREA / PUBLIC PARK
3. FROM INTERNATIOAL FAIR AREA TO THE PORT
4. FROM GUNDOGDU SQUARE TO PORT AXIS
5. KIBRIS SEHITLERI STREET CONNECTION

5 The abolition of the freight transport function in the port area, the continuation of only the passenger transportation. / Considering the temporary housing connection it is suggested to keep a plot for emergency.

6 Establishing the connection between the promenade and the meles delta ensuring public life connections along the Izmir coastline.

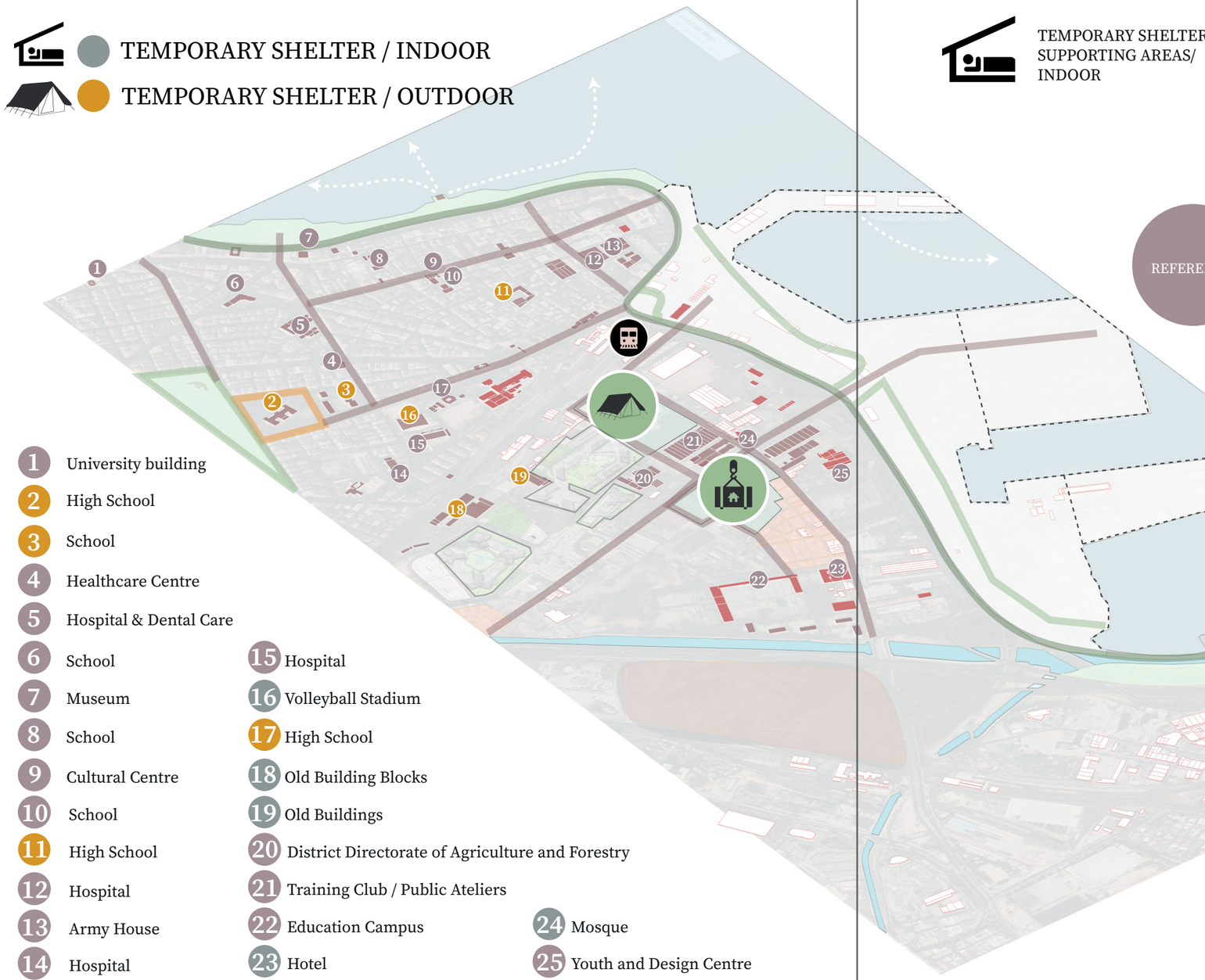
# MACRO SCALE INTERVENTION

**PHASE IV:** Mapping important buildings on site &
Picking additional temporary shelter locations

4

TEMPORARY SHELTER / INDOOR

TEMPORARY SHELTER / OUTDOOR



1 University building
2 High School
3 School
4 Healthcare Centre
5 Hospital & Dental Care
6 School
7 Museum
8 School
9 Cultural Centre
10 School
11 High School
12 Hospital
13 Army House
14 Hospital
15 Hospital
16 Volleyball Stadium
17 High School
18 Old Building Blocks
19 Old Buildings
20 District Directorate of Agriculture and Forestry
21 Training Club / Public Ateliers
22 Education Campus
23 Hotel
24 Mosque
25 Youth and Design Centre

TEMPORARY SHELTER
SUPPORTING AREAS/
INDOOR

REFERENCES

*Fig.18:*
Basketball Saloon / Turkey, 2023
/ Earthquake Victims

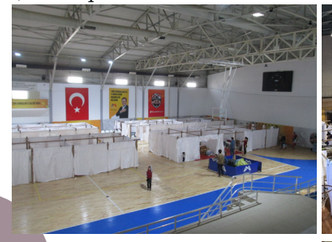


*Fig.19*
Elementary School / Japan,
2018 / flooding victims

*Fig.20:*
Silver Centre Koraku, Japan

REFERENCES

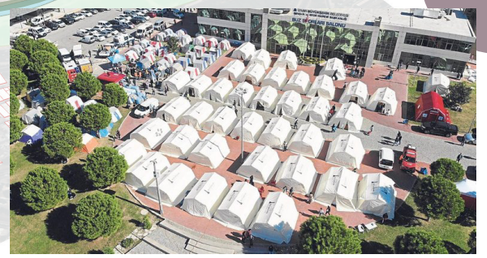


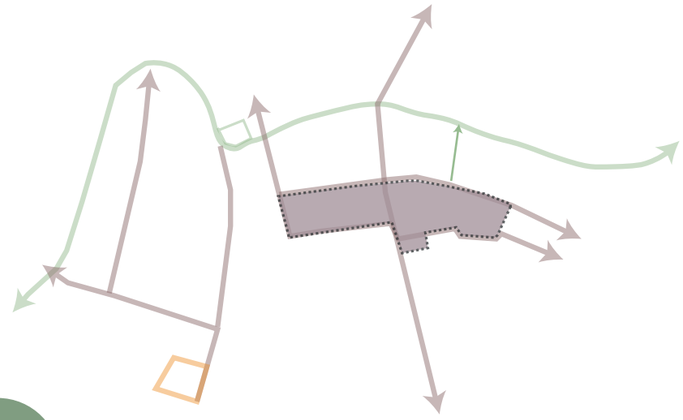
*Fig.21: Temporary Shelter Outdoor Example*

TEMPORARY SHELTER
SUPPORTING AREAS/OUTDOOR

# MACRO SCALE INTERVENTION

**PHASE V:** Overall master plan
Post-disaster recovery phase
Return to the daily life

5



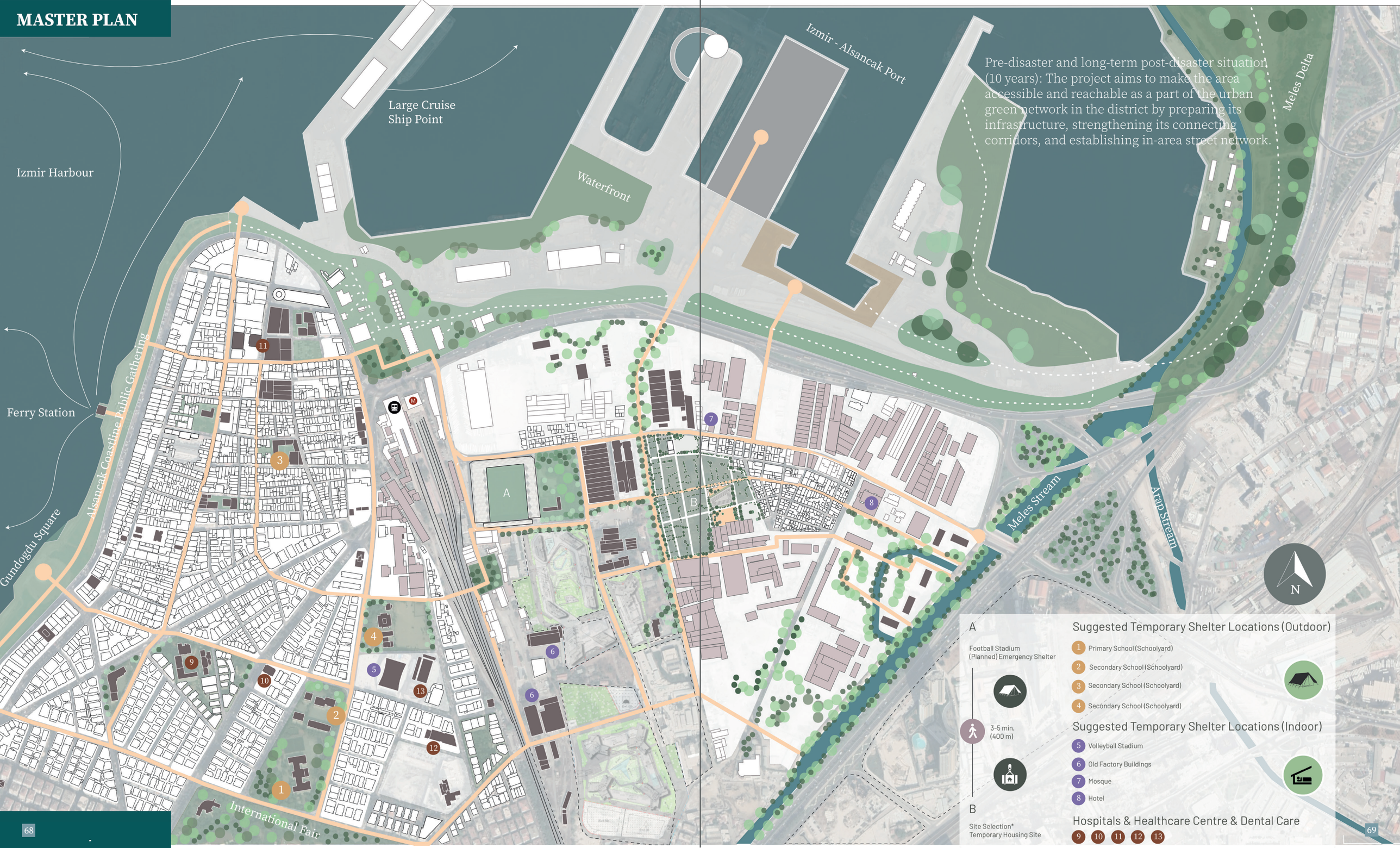






Temporary Housing Units
Park / Gathering Area

# MASTER PLAN


Izmir Harbour
Large Cruise
Ship Point
Waterfront
Izmir - Alsancak Port
Pre-disaster and long-term post-disaster situation (10 years): The project aims to make the area accessible and reachable as a part of the urban green network in the district by preparing its infrastructure, strengthening its connecting corridors, and establishing in-area street network.
Meles Delta
Ferry Station
Alsancak Coastline Public Gathering
Gundogdu Square
International Fair
A
B
Meles Stream
Atatürk Stream
N
A
Football Stadium
(Planned) Emergency Shelter
3-5 min.
(400 m)
B
Site Selection*
Temporary Housing Site
Suggested Temporary Shelter Locations (Outdoor)
1 Primary School (Schoolyard)
2 Secondary School (Schoolyard)
3 Secondary School (Schoolyard)
4 Secondary School (Schoolyard)
Suggested Temporary Shelter Locations (Indoor)
5 Volleyball Stadium
6 Old Factory Buildings
7 Mosque
8 Hotel
Hospitals & Healthcare Centre & Dental Care
9 10 11 12 13

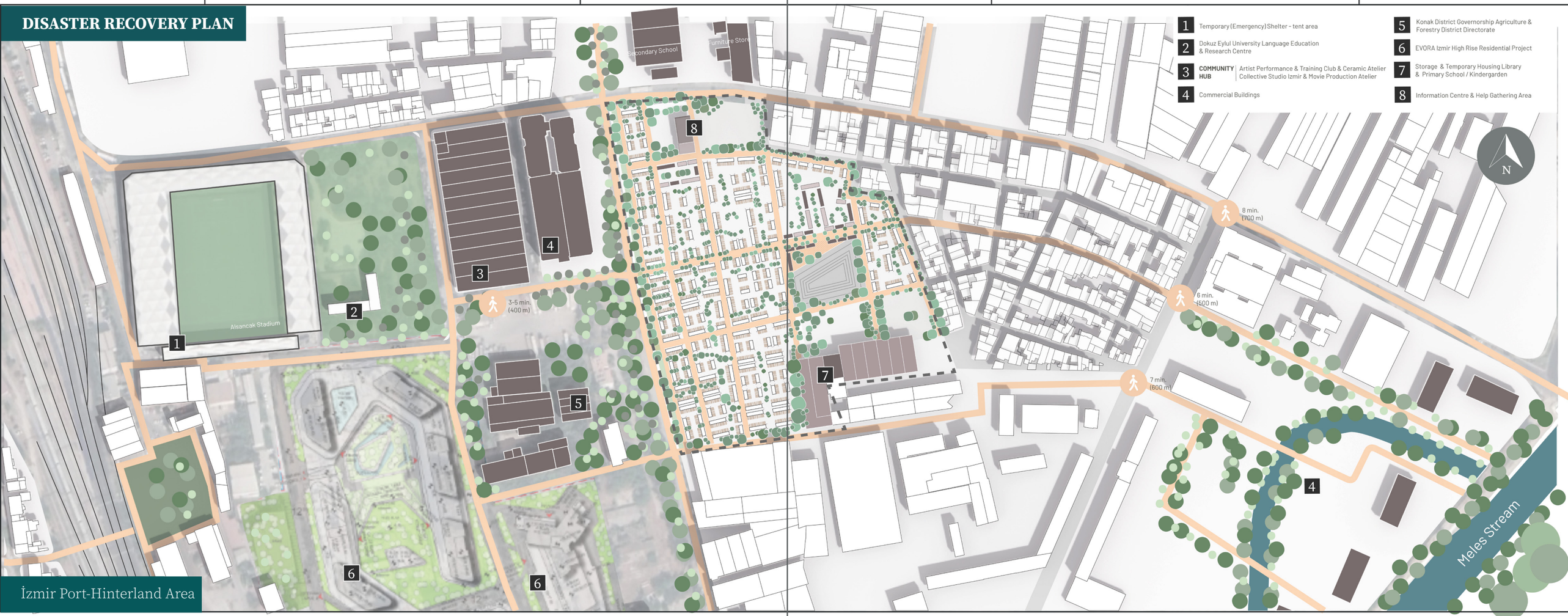
**Stage I: Alsancak Stadium** will serve as a temporary shelter location during the first stage, providing survivors with a safe space equipped with tents until the temporary housing location is ready. Alsancak Stadium's positioning creates a secure buffer zone, with a railway on the left and a research center with a large open green space on its right side.

**Stage II: Sark Industrial Area** will function as the temporary housing location during the second stage, accommodating survivors within the first two weeks after the earthquake. This area will provide a safe space furnished with containers, allowing for a maximum two-year period of comfortable and flexible living arrangements while awaiting permanent construction.

**Daragac Collective Art Neighborhood:** The preservation of the existing street network in the old neighborhood and the extension of its connections to ensure continuous circulation to the temporary housing area were prioritized during the early stages of master plan development. This connection is further extended through the football stadium, which serves as the temporary shelter location, leading to the Meles Stream.

Certain sections of the existing building number 7 are designated for storage, allowing disaster survivors to easily and safely access their belongings and household items saved from the earthquake. Other sections are planned to be repurposed as a library, study areas, and workspaces.

## DISASTER RECOVERY PLAN




İzmir Port-Hinterland Area

TOTAL SURFACE AREA OF THE PROJECT SITE

42.000 m²

CONTAINERS

186

PARKING LOT I

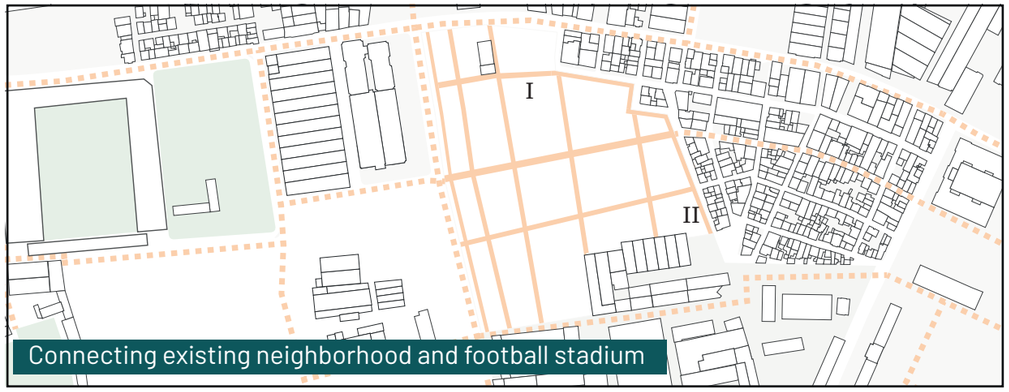
2000 m²

PARKING LOT II

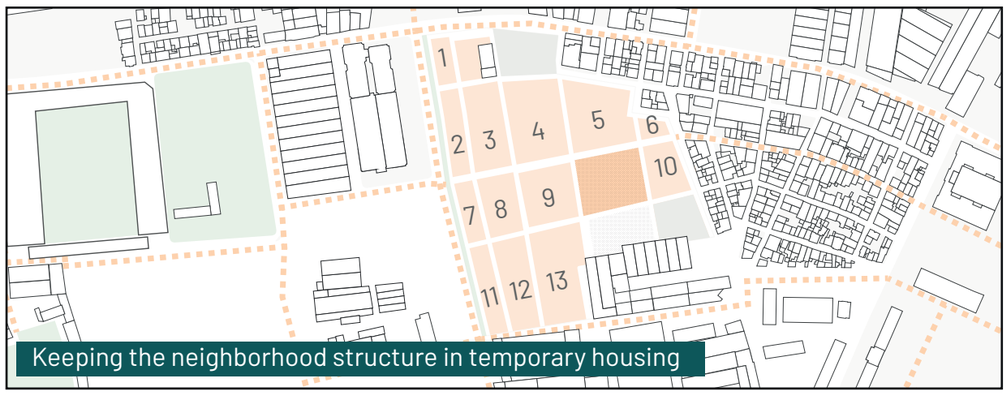
1500 m²

After the immediate earthquake: Temporary shelter, temporary housing & living space established.

**Maximum capacity: 530 survivors**




Connecting existing neighborhood and football stadium




Keeping the neighborhood structure in temporary housing

ZONE 1: 6 containers

ZONE 2: 12 containers

ZONE 3: 12 containers + 7 laundry units

ZONE 4: 19 containers

ZONE 5: 8 containers + 15 need units

ZONE 6: 3 containers

ZONE 7: 7 containers

ZONE 8: 13 containers

ZONE 9: 20 containers

ZONE 10: 11 containers

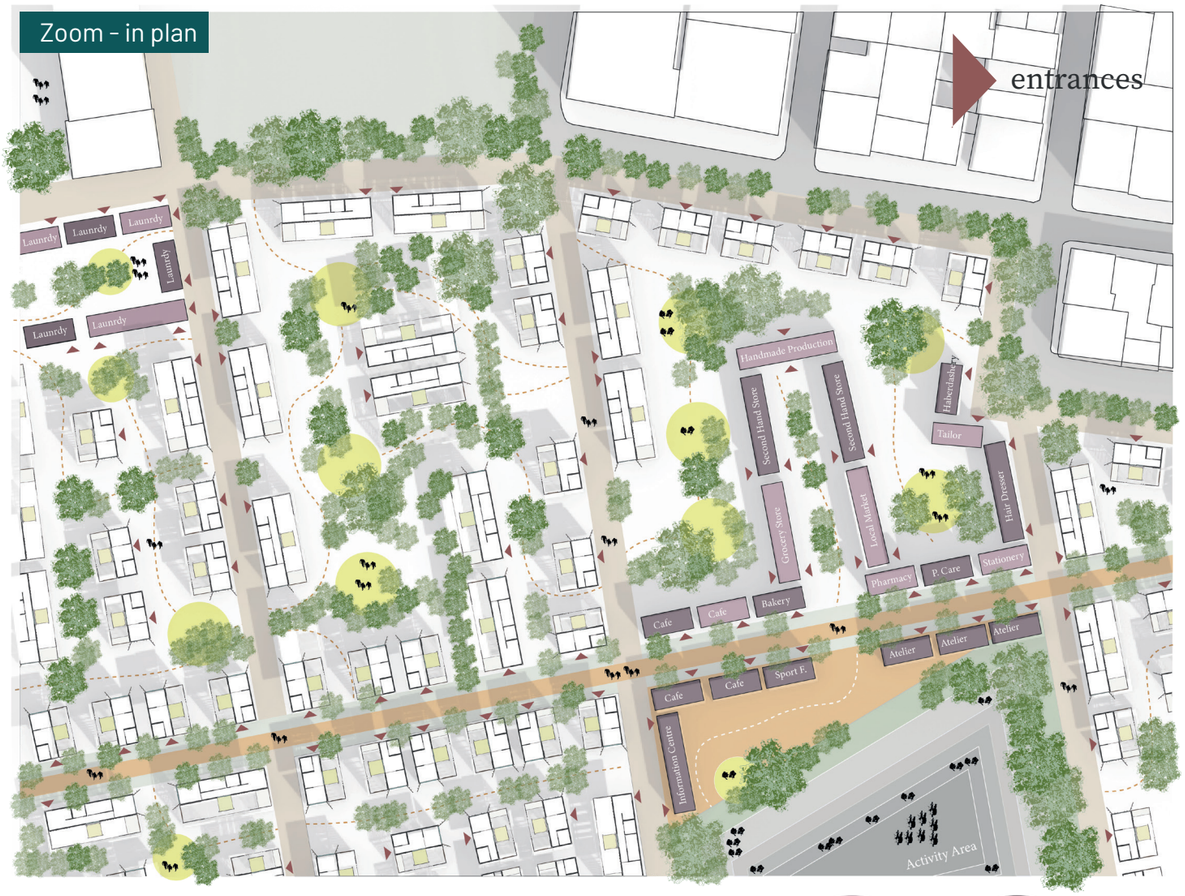
ZONE 11: 12 containers

ZONE 12: 16 containers

ZONE 13: 25 containers



Zoom - in plan




"Units Providing Services Catering to the Needs of Survivors"

TAILOR

GROCERY STORE

LOCAL FOOD M.

EVENT SPACE

CAFE

SECOND HAND S.

LIFELONG LEARNING C.

PHARMACY

STORAGE

ATELIER

STATIONERY

BAKERY

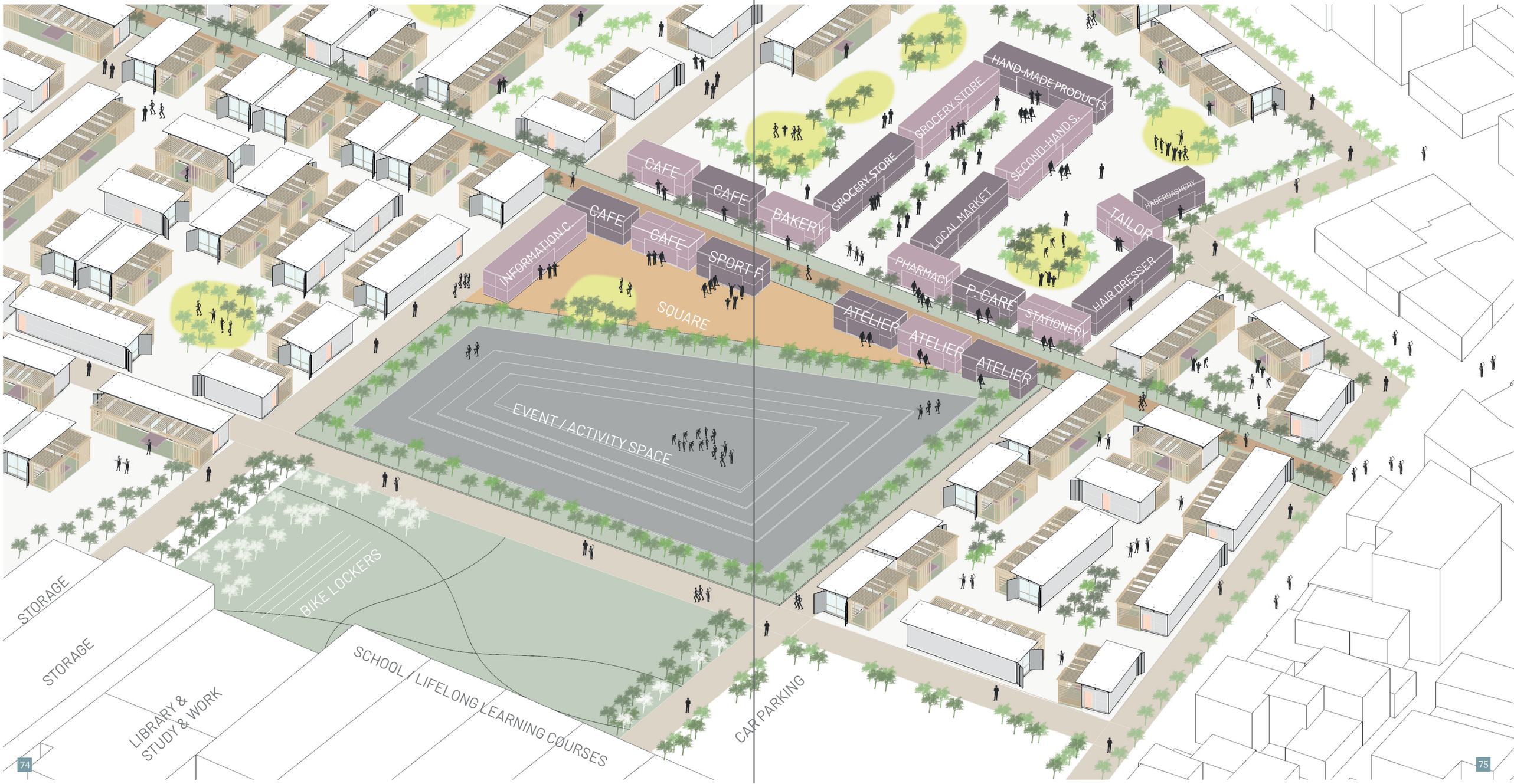
PERSONAL CARE

HAIR DRESSER

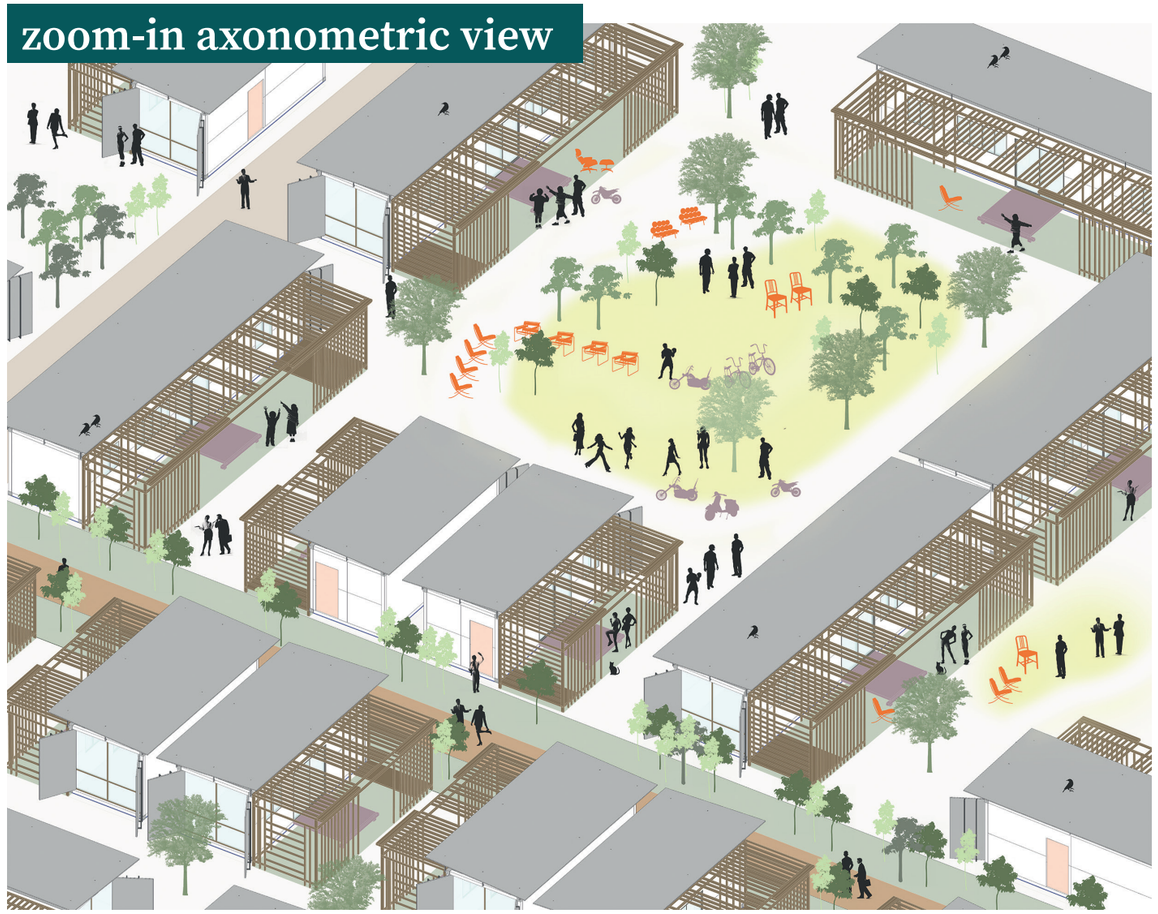
HAND-MADE PRODUCTION

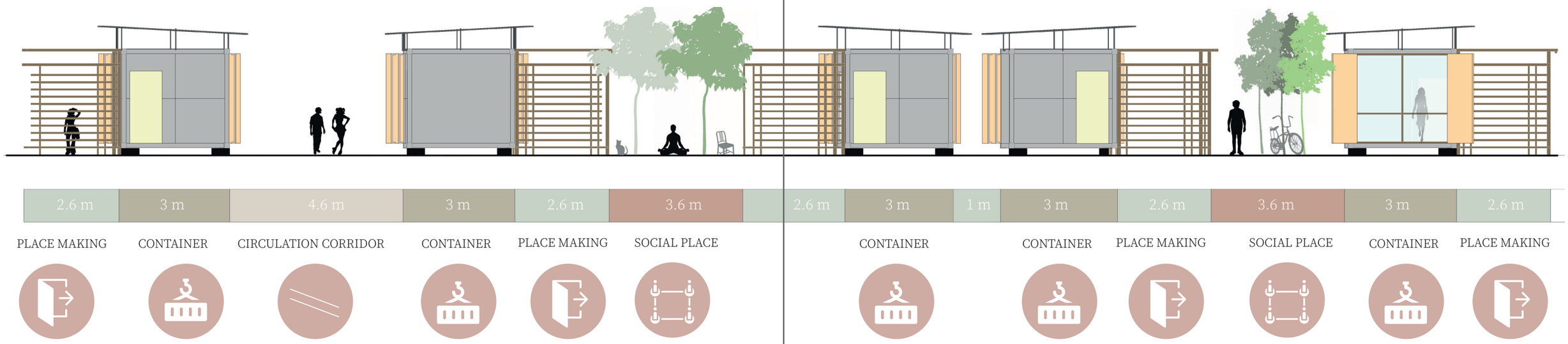
"Units Providing Services Catering to the
Needs of Survivors & Strengthening Social Life"

# Axonometric View



## zoom-in axonometric view








### 7.2 Micro Scale Design Strategies

Choosing shipping containers as temporary housing units in İzmir after earthquakes can be a particularly advantageous solution for several reasons:

**Structural Integrity:** Shipping containers are designed to be structurally strong and durable. Made of steel, they offer resistance to extreme weather conditions, fire, and earthquakes. Given İzmir's location in an area with a high earthquake risk, the use of shipping containers can provide a safe and secure temporary housing solution.

**Availability and Mobility:** İzmir being a port city ensures a large number of shipping containers readily available in the area. Moreover, shipping containers are designed for easy transportation, making them a convenient option for emergency housing after an earthquake. This is especially crucial in İzmir, where swift and efficient access to temporary housing is essential.

**Cost-effectiveness:** Shipping containers are relatively inexpensive compared to other types of housing. In İzmir, where many people may have lost their homes and require temporary shelter, the use of shipping containers can offer a cost-effective solution.

**Customization:** Shipping containers can be easily modified to create comfortable and functional living spaces. They can be equipped with insulation, ventilation, and plumbing systems, thus making them suitable for long-term temporary housing.

**Sustainability:** Shipping containers are a sustainable option for temporary housing as they can be repurposed and reused for other purposes after the earthquake recovery effort is complete.
Overall, utilizing shipping containers as temporary housing units in İzmir provides a practical, durable, cost-effective, and environmentally friendly approach to address the immediate housing needs following earthquakes.

# TYPE I: 21 m²

Individuals

Couples

CUSTOMIZATION

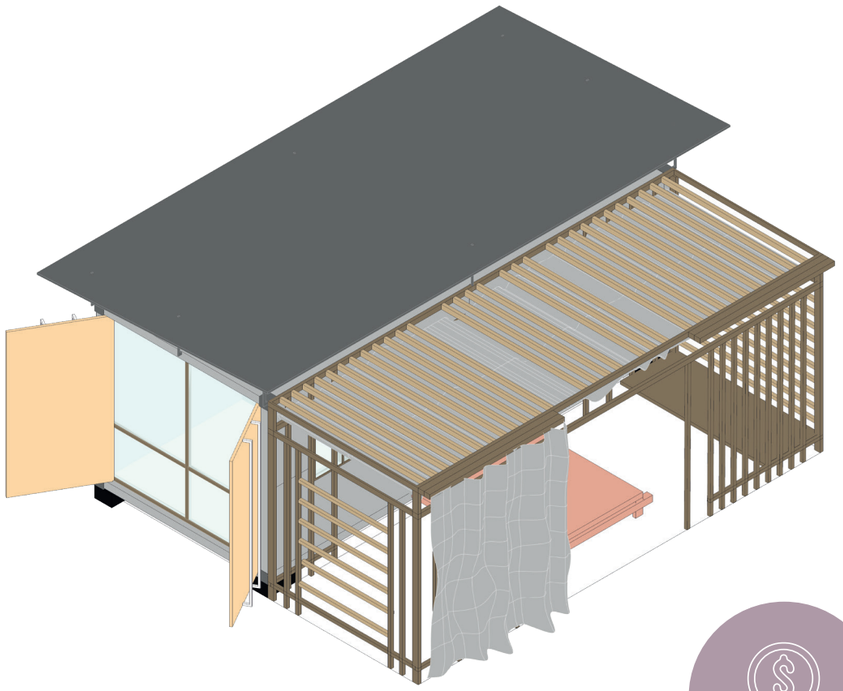
STRUCTURAL INTEGRITY

AVAILABILITY

MOBILITY

SUSTAINABILITY

COST - EFFECTIVENESS



The first container option is 21 m2 and is designed for individuals and couples without children. While the interior plan remains the same for this type of container, there are two different versions on the site with different entrance sides to improve accessibility.



# TYPE II: 42 m²

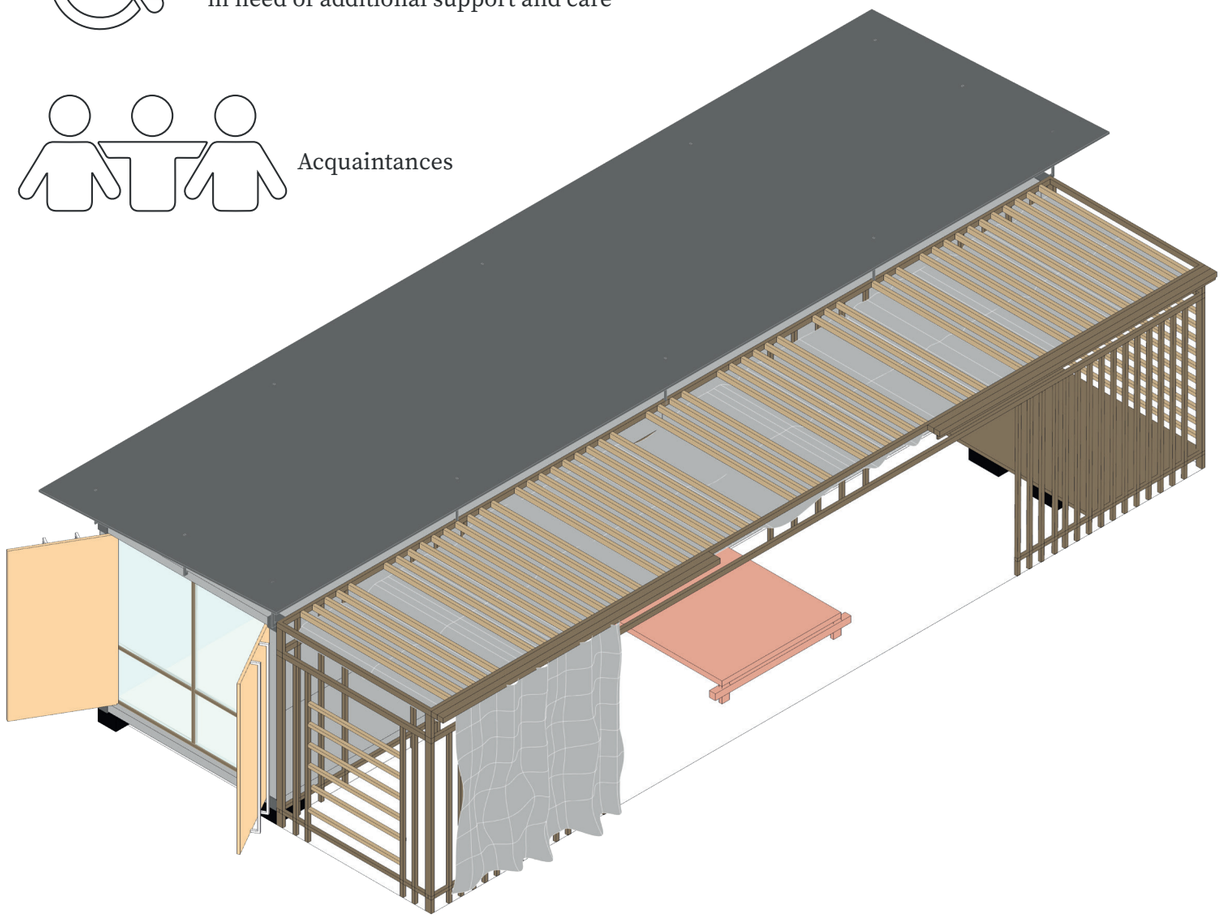
Typical Family Profile incl. kids

Disadvantaged individuals
in need of additional support and care

Acquaintances

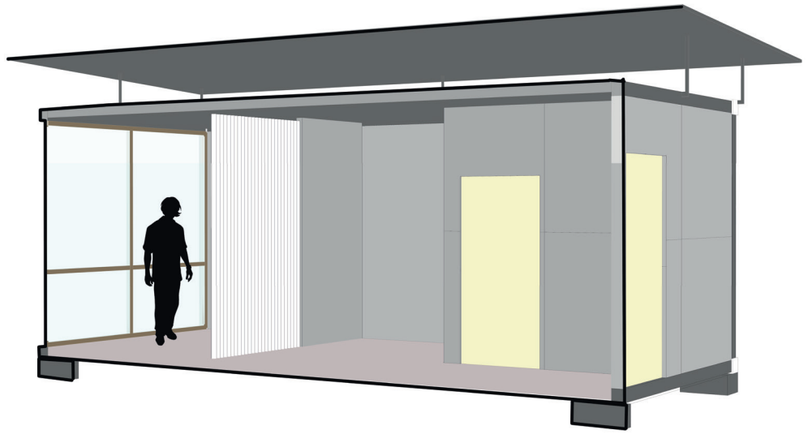
In order for shipping container houses to be viable options for housing large numbers of people after disasters, they need to be modified and repurposed to provide comfortable living conditions.

For this reason, considering the different needs of families and individuals, two types of shipping containers were planned for use on the project site. This approach allowed for the accommodation of various space requirements and the creation of sufficient social spaces throughout the site.

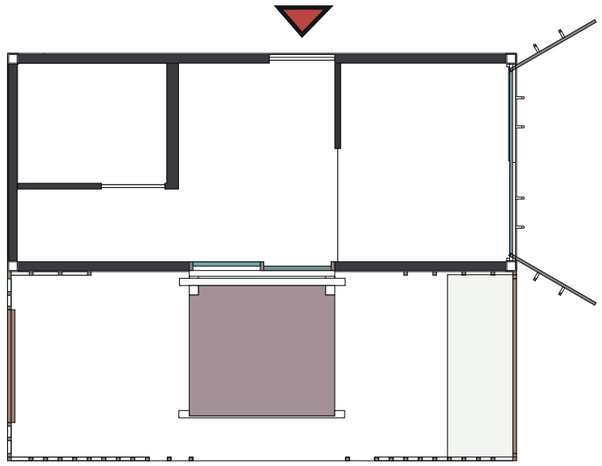


The second container option is 42 m2 and is intended for families with two or more children. Similar to the first container, the interior plan is the same, but again, there are two different versions on the site.

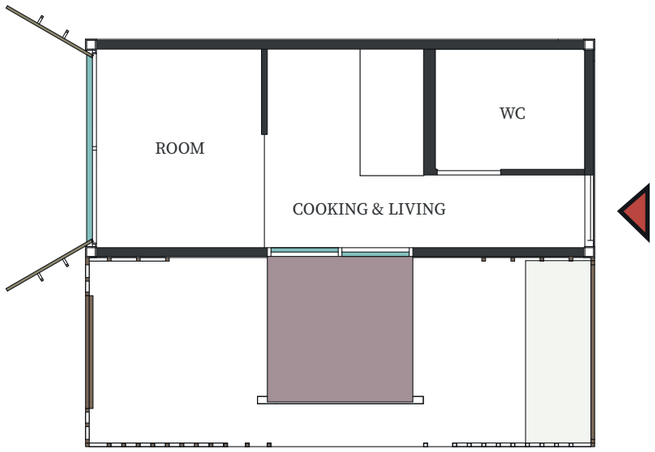
# TYPE I PERSPECTIVE SECTION:



OPTION I:
ENTRANCE FROM THE LONG SIDE

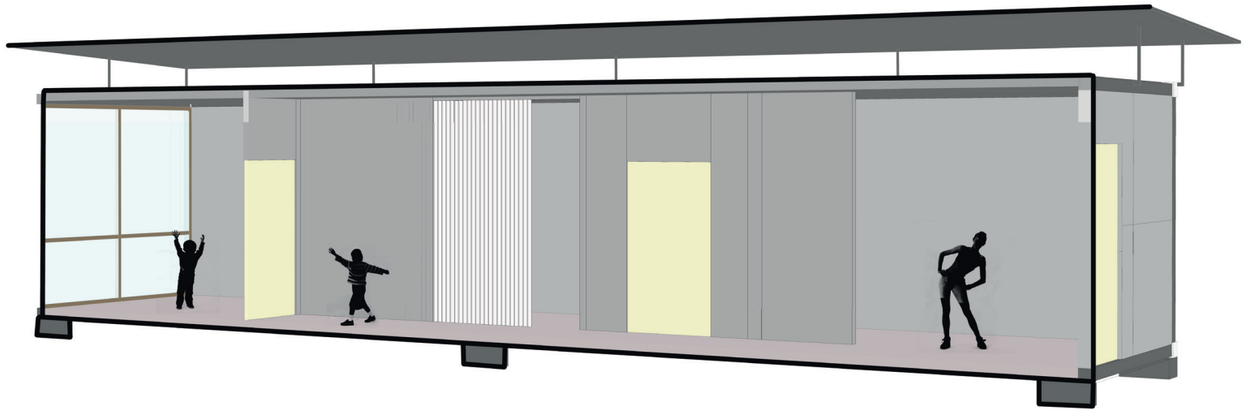


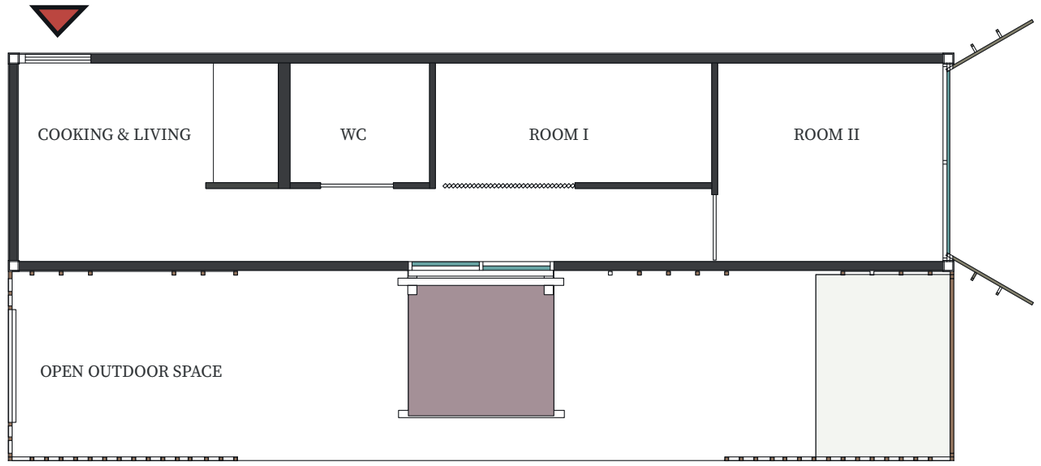
OPTION II:
ENTRANCE FROM THE LONG SIDE

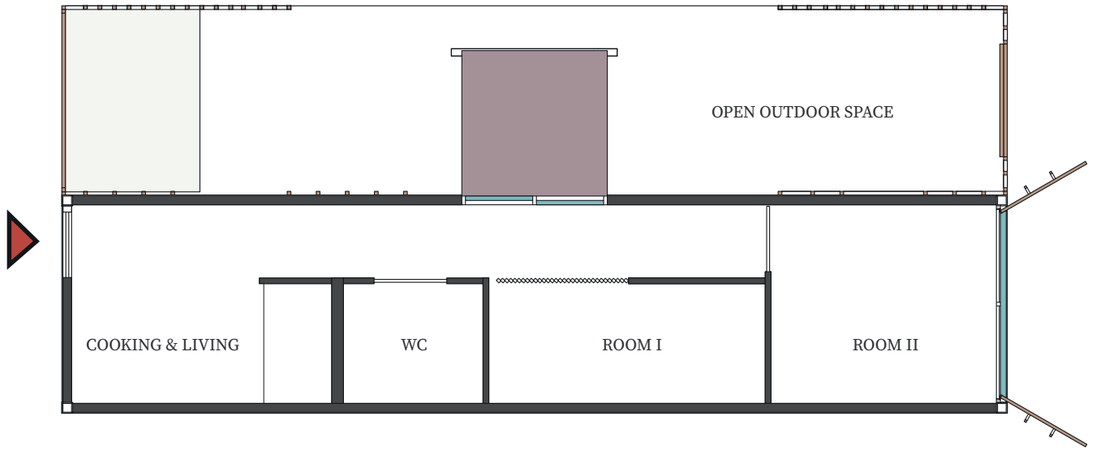




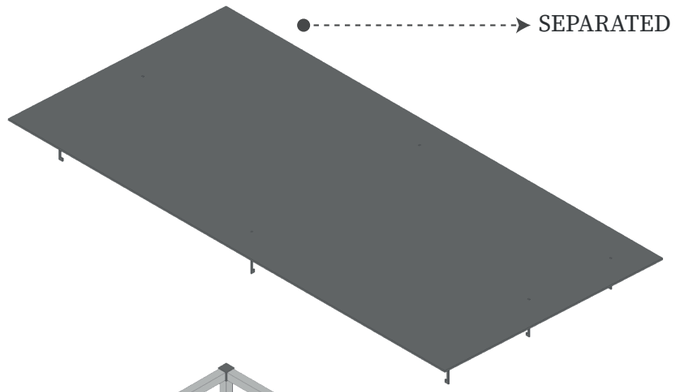

# TYPE II PERSPECTIVE SECTION:





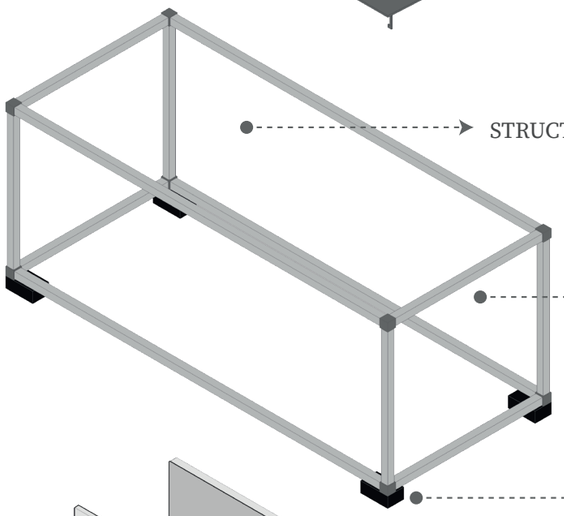



# Small-scale design intervention



SEPARATED METAL ROOF

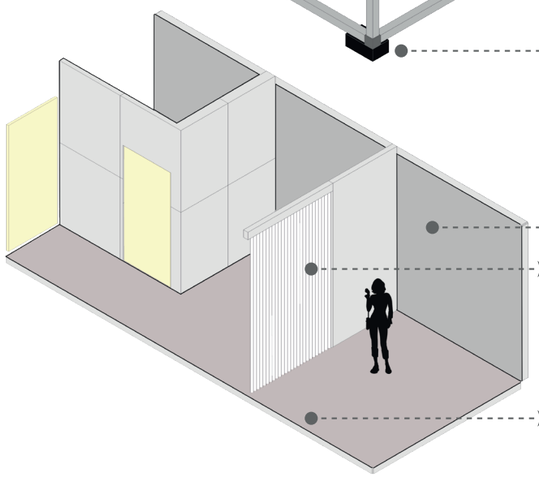
- improved insulation
- better ventilation
- increased durability
- reduced noise



STRUCTURAL ELEMENTS

STEEL FRAME

FOOTINGS

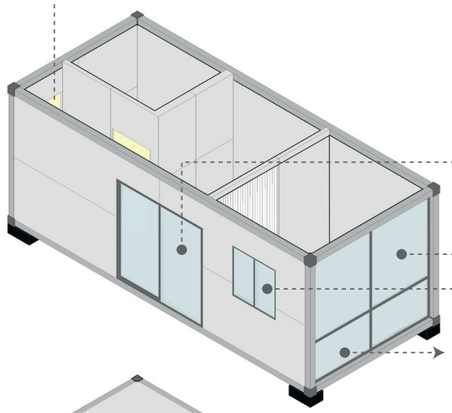


INNER INSULATION

MOVABLE PARTITION WALL

GROUND INSULATION





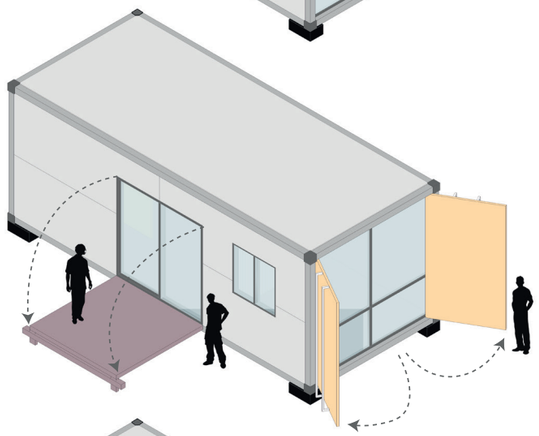
ENTRANCE

SLIDING DOOR

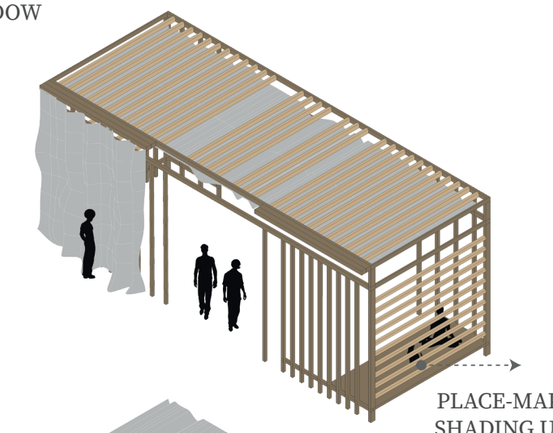
OPENING WINDOW

OPENING WINDOW

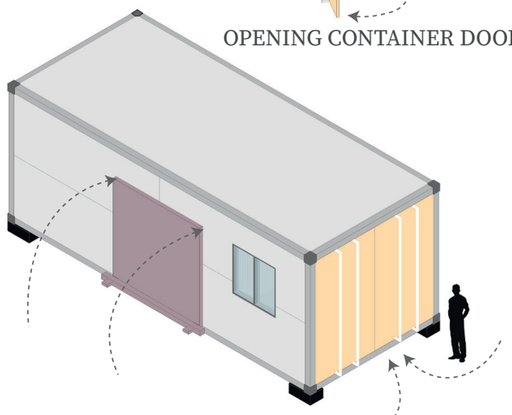
FIXED WINDOW



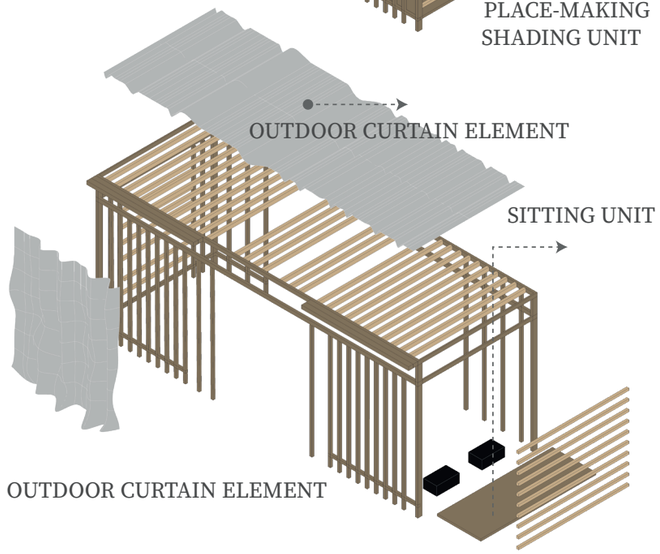
OPENING CONTAINER DOORS



PLACE-MAKING
SHADING UNIT



CLOSED CONTAINER DOORS



OUTDOOR CURTAIN ELEMENT

SITTING UNIT

OUTDOOR CURTAIN ELEMENT

"life in-between"

“live and play“

‘’life in-between‘‘

”shared space“

“passage“

"transition"

# Chapter VIII:

## CONCLUSION

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## Conclusion

As an architect and urban designer, my objective in leading this study was to contribute to the field and benefit colleagues and individuals interested in post-disaster recovery and temporary living units. In accomplishing this, I conducted a comprehensive process that commenced with an extensive literature review, examination of past historical events, and on-site analysis through fieldwork. Subsequently, I integrated location selection strategies within the city and developed a design proposal specifically for Alsancak, İzmir, incorporating design strategies at different scales.

The research, conducted to enhance the sustainability and effectiveness of the post-disaster recovery process, holds an enduring importance and value, as does the accumulation of new knowledge and recommendations.

In this master's thesis, my objective was to comprehensively explore the post-disaster recovery process, with a specific focus on earthquakes, and propose improvements and design suggestions within the designated area. While addressing the reconstruction of temporary living units provided after earthquake-related destruction, I examined the notion of temporariness and investigated ways to cultivate a culture of communal living through diverse spatial manifestations in design.

Based on my research and case study investigations, I advocate for a primary focus on the neighborhood scale in post-disaster planning.

This includes early planning of temporary housing areas, strategically selecting locations, and integrating them into the fabric of urban life. By doing so, earthquake survivors can transit from passive states to active roles in the process of returning to urban life, fostering a sense of empowerment and resilience.

This is particularly important in large cities that face natural disasters such as earthquakes, as different needs can emerge during the phases of destruction and post-disaster recovery.

I argue that early planning of strategic areas for temporary housing and the reinforcement of their significance in urban design can greatly contribute to the recovery process. By integrating these areas into urban life from the early stages and making them an integral part of daily life and post-disaster planning, substantial benefits can be achieved.

This approach not only addresses immediate housing needs but also fosters resilience, community cohesion, and the cultivation of a shared culture of resilience. Ultimately, a neighborhood-scale focus offers a promising avenue for enhancing post-disaster recovery efforts and promoting long-term sustainable development.

Strategic site selections should be preserved as publicly accessible parks and gathering spaces, and should not be opened up for permanent housing or any other purposes. These places should be protected since they hold a significant potential for long-term sustainable recovery planning. Furthermore, establishing necessary connection corridors facilitates efficient movement and enhances accessibility within the temporary housing site.

The placement study of the selected pilot temporary housing units represents a significant step towards rebuilding the culture of communal living. Moving beyond traditional grid planning, the emphasis on units and corridors allows for flexibility, adaptability, and the provision of communal areas that foster social interaction and support.

Overall, these strategies contributed to both the emergency response phase and long-term sustainable recovery planning. The neighborhood-scale approach, accompanied by risk analysis, early planning, and public awareness, holds great importance in post-disaster scenarios. By prioritizing the needs of the community and promoting a culture of resilience, these efforts pave the way for a more resilient and cohesive urban environment.

The proposed design incorporates simple design element additions to facilitate the possibility of individuals moving outside when facing interior space constraints and creates shared spaces that can be used by everyone.

Small streets and squares are created within the clusters, and social units are added to enhance integration with the neighboring community. These units not only address the needs of earthquake survivors but also serve to reinforce the culture of communal living. The belief in overcoming social traumas together has influenced every decision made throughout this study.

The recommendations presented in this study aim to contribute to the fields of disaster recovery and urban design. By promoting sustainable practices and resilient strategies, communities can be better prepared to face future disasters and recover in a more efficient and effective manner.

It is important to note that the implementation of these proposals should consider the specific local conditions as well as the unique needs of the affected communities.

Further research and practical implementation are necessary to refine and expand upon the findings and recommendations of this study. Continued investigation into post-disaster recovery processes will contribute to the ongoing development of more sustainable and resilient communities.

By learning from past experiences and embracing innovative approaches, we can work towards creating environments that are better equipped to withstand and recover from disasters, ultimately improving the well-being and quality of life for individuals and communities.

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