Research Article GU J Sci, Part B, 13(3): 527-542 (2025)

Gazi University

Journal of Science

PART B: ART, HUMANITIES, DESIGN AND PLANNING

http://dergipark.gov.tr/gujsb

A Study on the Permanent Housing Expectations of Earthquake Survivors after the February 6, 2023 Kahramanmaraş Earthquakes

Abdullah Selim TAFLI[1], Figen BEYHAN[2,*]

[1] *0000-0001-7749-6161, Gazi University, Graduate School of Natural and Applied Sciences*

[2] *0000-0002-4287-1037, Gazi University Department of Architecture*

Article Info

Received: 18/08/2025
Accepted: 29/09/2025

Keywords

Earthquake, Earthquake survivors, Post-earthquake permanent housing, Earthquake housing expectations

Abstract

Earthquakes are among the natural disasters whose timing cannot yet be precisely predicted. The extent of casualties and damage caused by earthquakes varies depending on several parameters such as the earthquake's epicenter and its proximity to fault lines, geological and ground conditions, groundwater and soil properties, site selection and land use, population density and building concentration in the affected area, as well as the quality of design and construction. On February 6, 2023, at 04:17 and 13:24 local time in Türkiye, two major earthquakes with magnitudes of Mw 7.7 and Mw 7.6 struck Pazarcık (Kahramanmaraş) and Elbistan (Kahramanmaraş), respectively. As a result of these devastating earthquakes, thousands of people lost their lives, tens of thousands of buildings collapsed, and hundreds of thousands of housing units were rendered uninhabitable due to severe or moderate damage, even if they did not collapse entirely. Following these two major earthquakes, there emerged an urgent need for housing for millions of people. Traditional solutions such as tents and container units were employed to address this need temporarily. This study aims to examine the existing housing conditions and the housing expectations of earthquake survivors in the 11 provinces declared as disaster zones after the February 6, 2023 Kahramanmaraş earthquakes. The research employs a retrospective survey model, one of the general survey models within the scope of quantitative research methods. The study group consists of 203 earthquake survivors residing in the 11 provinces designated as disaster areas following the earthquakes. Data were collected through a questionnaire designed to assess the housing needs and conditions of earthquake survivors before and after the disaster. Findings from the study indicate that participants generally do not prefer the use of reinforced concrete systems in the construction of new permanent housing post-earthquake, do not wish to reside in buildings taller than three stories, and can tolerate a maximum waiting period of six months to access permanent housing. Moreover, the data suggest that survivors value neighborhood relations, prefer buildings consisting of at least three independent units, and believe that container housing does not adequately meet the need for permanent accommodation.

1. INTRODUCTION

Throughout human history, shelter has been one of the most fundamental needs. The nomadic lifestyle, which began with hunter-gatherers, ended with the transition to settled life, leading to the creation of permanent dwelling spaces. Simply put, shelter structures, commonly referred to as housing, have continuously evolved from the past to the present due to changing sociological, technological, and economic needs and possibilities. While life continues, unexpected disasters occurring at unforeseen times and conditions alter these comfort conditions according to general environmental changes and structural damage. Therefore, the concept of disaster directly and negatively affects shelter activities.

A disaster is defined as destruction caused by various natural events (TDK, 2020). According to another source, it is described as a natural or human-induced event that disrupts the functioning of a society, causes loss of life and property, and leads to economic and environmental catastrophes that societies generally cannot cope with (IFCR, 2014). In the broadest sense, a disaster is defined as a disruption or

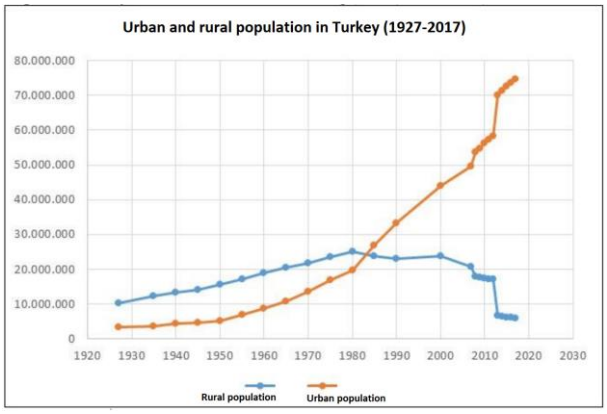
* Corresponding author: fbeyhan@gazi.edu.tr

radical change in expectations occurring in the social context where individuals and communities sustain their lives (Songür, 2000).

Disasters cause loss of life and property and negatively affect countries economically and socially. Natural disasters cannot be fully predicted or prevented, but their destructive effects can be mitigated through preventive measures. For an event to be considered a disaster, it must cause loss of life and property in the affected area (Kiper, 2001).

Due to its topography, geological formation, and climatic characteristics, Turkey is a country that experiences many natural disasters causing loss of life and financial damage (Kiper, 2001). Earthquakes constitute 61% of the damage occurring after disasters, followed by landslides at 15%, floods at 14%, rockfalls at 5%, fires at 4%, avalanches, and meteorological events at 1% (Kocaman, 2012). Earthquakes, as one type of disaster, suddenly affect the vital human need for shelter and expose the physical and social vulnerabilities of settlements in full detail (Karaduman, 2002).

Most of the destruction following earthquakes occurs in residential buildings. For instance, in the 1999 Marmara earthquake, nearly 90% of damaged buildings were residential structures (Savaşır, 2008). Following a disaster, shelter needs are often met by tents or temporary shelters. However, it is increasingly recognized that post-disaster sheltering should be regarded as a comprehensive process rather than merely meeting immediate shelter needs. Various parameters such as household preferences, demographics, resources and capacities, service life, and structural safety must be considered independently of the disaster. While roughly one-third of the world's population lived in urban areas in the first half of the 20th century, today, one in every two people lives in cities. Similarly, Turkey has shifted from a predominantly rural population to a majority urban population, with projections indicating that 90% of the population will be urban by 2050 (Yoloğlu, 2020).



Graph 1.1. *Urban and rural population changes in Turkey in 1927-2017 (Yoloğlu, 2020)*

The increase in urban population density also raises the potential loss of life and property in the event of a devastating earthquake.

On February 6, 2023, two earthquakes measuring Mw 7.7 and Mw 7.6 occurred at 04:17 and 13:24 local time, with epicenters in Pazarcık (Kahramanmaraş) and Elbistan (Kahramanmaraş), respectively. Thousands of people lost their lives, tens of thousands of buildings were destroyed, and hundreds of thousands of independent units sustained severe or moderate damage, rendering them unusable. Following these two major earthquakes, millions of people urgently needed housing. Although traditional methods were used to meet these needs, many essential parameters for adequate housing—such as hygiene, privacy, security, insulation, and comfort—were not sufficiently provided. Although the epicenter was Kahramanmaraş, due to the destruction and loss of life, 11 provinces (Adana, Adıyaman, Diyarbakır, Elâzığ, Gaziantep, Hatay, Kahramanmaraş, Kilis, Malatya, Osmaniye, Şanlıurfa) were declared as “Disaster Areas Affecting General Life” (URL-1).

After the earthquakes, sheltering in Turkey began with tent accommodations during emergency response, followed by improvements in temporary shelters and housing in the mid-term. The final phase involves the completion of permanent housing. Among these processes, permanent housing is the most time-consuming in terms of implementation (Karaduman, 2002). Temporary shelter needs occur primarily in emergency and subsequently in recovery phases. Despite using traditional sheltering methods in the 21st century, these methods do not meet optimal living conditions, adversely affecting disaster survivors throughout emergency and recovery phases. Considering Turkey's population, the high-risk status of housing stock, and economic factors, post-earthquake reconstruction requires significant labor, expenditure, and reproduction. Consequently, the organizational structure, preparation process, production variables, and implementation methods are critical. Therefore, addressing the sheltering needs emerging after an earthquake promptly and urgently becomes mandatory.

Traditional methods have been used for many years in Turkey for crisis and risk management after disasters to meet the sheltering needs of survivors. Although traditional approaches offer practical solutions, they are insufficient during the period needed for life to return to normal post-disaster. Solutions provided by traditional methods often become inadequate in the long term, losing functionality and adding economic burdens to the national economy.

Purpose of the Study
This study aims to reveal the current housing situation concerning the shelter needs of earthquake survivors in the 11 provinces declared disaster zones after the February 6, 2023 Kahramanmaraş earthquakes. Within this scope, the study intends to gather data regarding the demographic characteristics of survivors, information about their pre-earthquake housing, housing conditions post-earthquake, demands and expectations for temporary and permanent housing, as well as minimum spatial needs and features of permanent housing.

Research Problem
What are the housing needs and permanent housing expectations of earthquake survivors living in the 11 provinces declared disaster zones after the February 6, 2023 Kahramanmaraş earthquakes in Turkey?

Sub-Problems:
What information is available regarding the housing conditions of earthquake survivors prior to the earthquake?
What are the survivors' conditions related to temporary and permanent housing post-earthquake?
What are the expectations of earthquake survivors from temporary and permanent housing after the earthquake?
What are the survivors' views on minimum space requirements, new construction technologies, material properties, sustainability, and other aspects concerning permanent housing?

2. METHOD

Research Model: This study employs a quantitative research method, specifically the retrospective survey model from general survey models. General survey models are studies conducted on smaller representative samples from large populations to generalize findings. Retrospective survey models examine past situations or events based on the views and statements of individuals who experienced the specific time period under investigation (Karasar, 2006; Büyüköztürk et al., 2013).

Study Group: The study group consists of earthquake survivors residing in the 11 provinces declared disaster zones after the February 6, 2023 Kahramanmaraş earthquakes. Data were collected online via Google Forms from survivors living in these provinces who voluntarily participated in the survey. Frequency and percentage distributions of participants' gender, age, education level, family size, and the provinces they resided in during the earthquake are separately presented in tables. Accordingly, a total of 203 earthquake survivors volunteered to participate in the research, including 103 women and 100 men.

Table 1: *Frequency and Percentage Distribution of Earthquake Survivors by Gender*

Gender	Frequency (f)	Percentage (%)	Total
Female	103	50,7	203
Male	100	49,3	

The age group distribution of earthquake survivors participating in the study is presented in Table 2. Accordingly, 62 participants (30.5%) were aged between 18-23, 42 (20.7%) were aged 24-29, 68 (33.5%) were aged 30-44, 28 (13.8%) were aged 45-64, and 3 (1.5%) were aged 65 and above.

Table 2: *Frequency and Percentage Distribution of Earthquake Survivors by Age Groups*

Age	Frequency (f)	Percentage (%)	Total
18-23	62	30,5	203
24-29	42	20,7	
30-44	68	33,5	
45-64	28	13,8	
65 and over	3	1,5	

The educational levels of the earthquake survivors are shown in Table 3. According to this data, 12 participants (5.9%) had primary education, 34 (16.7%) had secondary education, 131 (64.5%) held undergraduate degrees, and 26 (12.8%) had postgraduate degrees.

Table 3: *Frequency and Percentage Distribution of Earthquake Survivors by Education Level*

Education Level	Frequency (f)	Percentage (%)	Total
Primary Education (Elementary/Middle School)	12	5,9	203
Secondary Education (High School)	34	16,7	
Undergraduate Degree	131	64,5	
Postgraduate Degree	26	12,8	

The family size of the earthquake survivors is presented in Table 4. According to the data, 15 participants (7.4%) had 2 family members, 38 (18.7%) had 3 members, 56 (27.6%) had 4 members, 44 (21.7%) had 5 members, and 50 (24.6%) had 5 or more family members.

Table 4*: Frequency and Percentage Distribution of Earthquake Survivors by Number of Family Members*

Number of Family Members	Frequency (f)	Percentage (%)	Total
2	15	7,4	203
3	38	18,7	
4	56	27,6	
5	44	21,7	
5 and over	50	24,6	

The residential distribution of earthquake survivors is shown in Table 5. According to the data, among the participants, 52 (25.6%) reside in Kahramanmaraş, 58 (28.6%) in Hatay, 20 (9.9%) in Şanlıurfa, 14 (6.9%) in Adıyaman, and the remaining 59 (29.1%) reside in other cities (Adana, Diyarbakır, Elazığ, Gaziantep, Kilis, Malatya, Osmaniye).

Table 5: Frequency and Percentage Distribution of Earthquake Survivors by Residential Cities

Residental City	Frequency (f)	Percentage (%)	Total
Kahramanmaraş	52	25,6	203
Hatay	58	28,6	
Şanlıurfa	20	9,9	
Adıyaman	14	6,9	
Others (Adana,Diyarbakır,Elazığ,Gaziantep,Kilis,Malatya,Osmaniye)	59	29,1	

Data Collection Tool and Data Analysis of the Study

Surveys are lists of questions prepared in accordance with the purpose of a particular research. Among research methods, the survey technique is one of the most frequently used methods. This is because conducting surveys is inexpensive, easy, and suitable for directly collecting information. When preparing a survey, the research hypotheses/research questions within the scope of the study are determined first, the methodology is defined, the question types are decided, and the survey is designed. A pilot application is conducted for the prepared survey form, it is revised based on feedback, and then it is finalized to be administered to the target group. Finally, the obtained data are analyzed and evaluated.

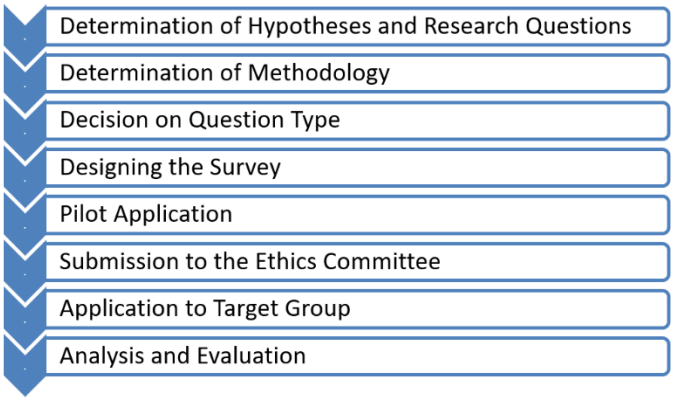
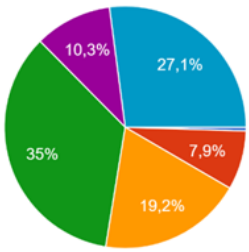


Figure 1. *Survey Preparation and Implementation Diagram*

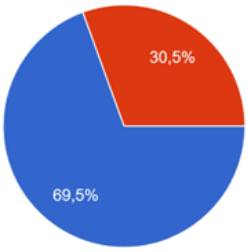
Within the scope of the study, questions forming the survey were created in the question pool, addressing not only the demographic information of the earthquake survivors but also information about their pre-earthquake residences, their housing needs in temporary/permanent accommodations after the earthquake, the housing problems they experienced, and their expectations from permanent housing. An appropriate question type was selected, and the draft version of the survey was prepared by consulting expert opinions. The prepared questionnaire draft has been presented to the three faculty members on the Thesis Monitoring Committee for their approval. A pilot application of the survey was conducted with 20 individuals, and the final version, which has been made clearer, was submitted to the Ethics Committee of Gazi University and approved with the letter number E-77082166-302.08.01-1144549. For data collection the final form was administered to earthquake survivors affected by the Kahramanmaraş-centered earthquakes that occurred in 2023. The data analysis was performed using SPSS 27.0.1 software, and percentage charts were obtained through Google Forms. Since independent responses regarding demographic information and personal opinions were collected from participants, no reliability assessment was conducted.

3. FINDINGS

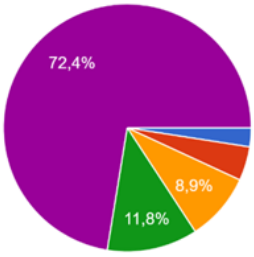
1- Questions aimed at revealing information about the residences where the earthquake survivors lived before the earthquake were calculated separately in percentage charts and presented accordingly. Based on this;

No	Information Regarding Pre-Earthquake Housing	
Graph 1		According to Graph 1, in response to the question regarding the design years of the buildings in which the earthquake survivors were residing during the earthquake, 0.5% stated that their buildings were designed before 1975, 7.9% between 1975 and 1998, 19.2% between 1999 and 2007, 35% between 2007 and 2018, and 10.3% after 2018. Meanwhile, 27.1% reported that they had no information about the design year of their buildings.

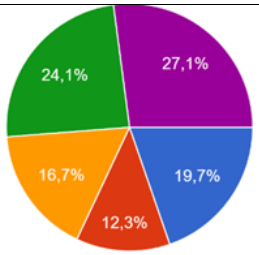
Graph 1 – Year of Design/Construction of Earthquake Survivors' Buildings

Graph 2		According to Graph 2, in response to the question regarding the ownership status of their residences prior to the earthquake, 69.5% of the earthquake survivors stated that they were homeowners, while 30.5% were tenants.

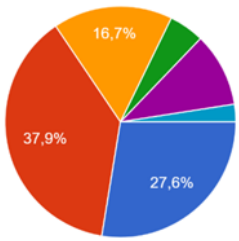
Graph 2 – Ownership Status of the Residences Occupied by Earthquake Survivors

Graph 3		According to Graph 3, regarding the duration of residence in their cities, 2.4% reported having lived there for less than 1 year, 4.5% for 1–3 years, 8.9% for 4–7 years, 11.8% for 8–15 years, and 72.4% for 15 years or more.

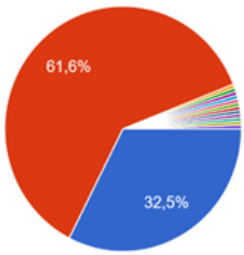
Graph 3 – Length of Residence in the City by Earthquake Survivors

Graph 4		According to Graph 4, in response to the question concerning the number of independent units in the homes they lived in before the earthquake, 19.7% reported 1 unit, 12.3% reported 2 units, 16.7% reported 3 units, 24.1% reported 4 units, and 27.1% reported 5 or more units.

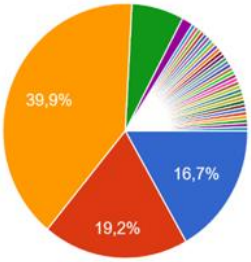
Graph 4 – Number of Independent Units in the Residences of Earthquake Survivors

Graph 5		According to Graph 5, when asked about their perception of the structural resilience of the buildings they were residing in during the earthquake, 27.6% believed their buildings were very durable, 37.9% said partially durable, 19.2% were unsure or had no opinion, 4.9% stated their buildings were not durable at all, and 10.3% indicated their buildings had collapsed.

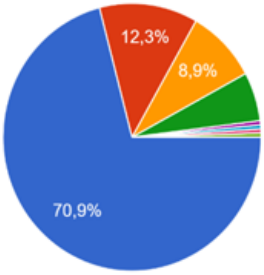
Graph 5 – Earthquake Survivors' Opinions on the Structural Resilience of Their Buildings

Graph 6		According to Graph 6, prior to moving into the residences they were living in during the earthquake, 61.6% of respondents reported not having investigated their building's earthquake resistance, 32.5% said they had, and 5.9% selected "other."

Graph 6 – Whether the Earthquake Resistance of Survivors' Buildings Was Assessed

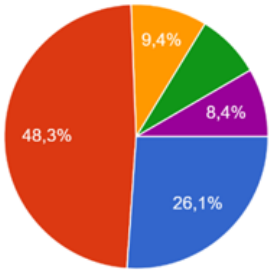
Graph 7		According to Graph 7, in response to the question about the most important factor considered when purchasing or renting their residence, 39.9% cited proximity to the city center, 19.2% affordability, 16.7% proximity to relatives, and 6.9% luxury. Additionally, 17.3% mentioned other factors such as structural safety, being in a quiet area, or proximity to their workplace.

Graph 7 – Factors Considered by Earthquake Survivors When Choosing Their Buildings

Graph 8		According to Graph 8, regarding opinions on the top priority for earthquake preparedness, 70.9% stated that building inspections should be ensured, 12.3% emphasized the need to improve disaster and crisis management, 8.9% highlighted the importance of post-earthquake education, and 5.9% noted the necessity of forming competent rescue teams and personnel. Furthermore, 2% of participants stated that soil and structural assessments should be conducted, and unsafe buildings should be demolished.

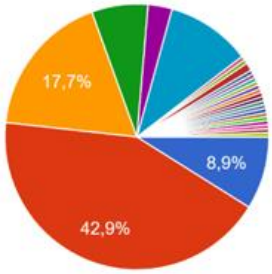
Graph 8 – Earthquake Survivors' Views on the Top Priority for Earthquake Preparedness

2- In order to reveal the information regarding the temporary/permanent housing of the earthquake survivors included in the scope of the study and their sheltering conditions after the earthquake, the responses to the relevant questions were calculated and presented in separate percentage-based graphs. Accordingly;

No	Information on Post-Earthquake Housing and Shelter Conditions	
Graph 9		According to Graph 9, 48.3% reported minor damage, 26.1% of earthquake survivors reported that their houses were undamaged, 9.4% reported moderate damage, 7.9% reported severe damage, and 8.4% stated that their buildings were destroyed.

Graph 9 – Damage Status of Earthquake Survivors' Homes After the Earthquake

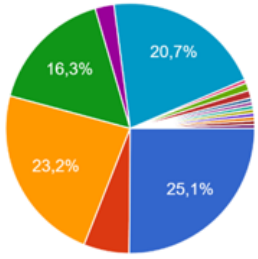
Graph 10



According to Graph 10, regarding where the earthquake survivors spent the first 7 days after the earthquake, 42.9% stated that they stayed outdoors or in vehicles, 17.7% stayed at relatives' or acquaintances' houses, 8.9% stayed in their own homes, 10.3% stayed outside the city, 6.9% stayed in tents, 3% in containers, and 10.3% stated they stayed in other places such as farms, vineyards, workplaces, or greenhouses.

Graph 10 – Shelter Conditions of Earthquake Survivors in the First 7 Days After the Earthquake

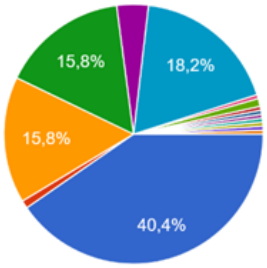
Graph 11



According to Graph 11, regarding where the earthquake survivors spent days 8 to 30 after the earthquake, 25.1% stayed in their own homes, 23.2% stayed at relatives' or acquaintances' homes, 20.7% stayed outside the city, 16.3% in tents, 5.9% in other places such as vineyards, detached houses, and mosques, and 2.5% in containers.

Graph 11 – Shelter Conditions of Earthquake Survivors Between Days 8 and 30 After the Earthquake

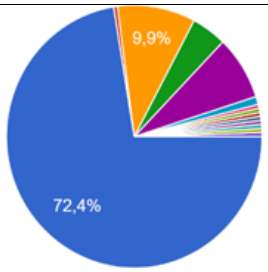
Graph 12



According to Graph 12, regarding where the earthquake survivors stayed one month after the earthquake, 40.4% were in their own homes, 18.2% outside the city, 15.8% in relatives'/acquaintances' homes or tents, 3.9% in containers, and 3.5% in other places such as farmhouses, detached homes, or mosques.

Graph 12 – Shelter Conditions of Earthquake Survivors One Month After the Earthquake

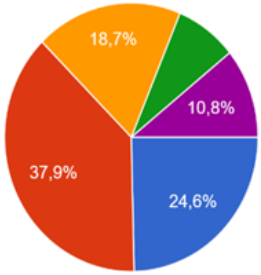
Graph 13



According to Graph 13, regarding the current places of residence of the earthquake survivors, 72.4% are currently living in their own homes, 9.9% in relatives'/acquaintances' homes, 7.9% in containers, 4.4% in tents, and 5.4% in other places.

Graph 13 – Current Shelter Conditions of Earthquake Survivors

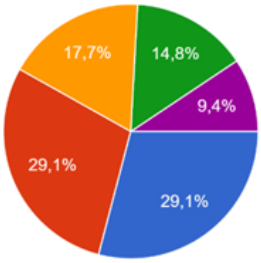
Graph 14



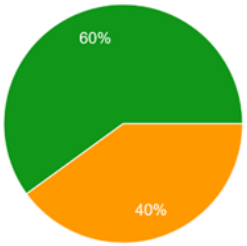
According to Graph 14, 37.9% of the survivors stated that efforts to meet shelter needs began one week after the earthquake, 24.6% said within the first 24 hours, 18.7% said one month later, 10.8% stated the issue is still unresolved, and 7.9% said the efforts started three months after the earthquake.

Graph 14 – Earthquake Survivors' Opinions on the Efforts Made to Address Shelter Needs After the Earthquake

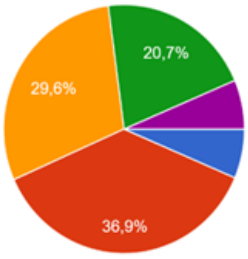
3- Within the scope of the research, questions aimed at revealing earthquake survivors' expectations regarding temporary and permanent housing after the earthquake were calculated separately in percentage graphs and presented. Accordingly;

No	Expectations of earthquake survivors regarding temporary and permanent housing for post-earthquake shelter needs	
Graph 15		According to Graph 15, 29.1% of earthquake survivors stated that they want to live in 1- and 2-story houses, 17.7% in 3-story houses, 14.8% in 4-story houses, and 9.4% in houses with 5 or more stories.

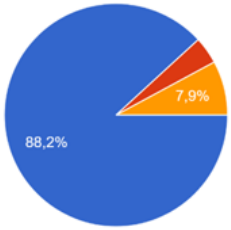
Graph 15 - Number of floors in houses earthquake survivors prefer to live in

Graph 16		According to Graph 16, in response to whether earthquake survivors consider living in buildings with 5 or more floors, 60% said they definitely do not consider it, and 40% said they do not consider it.

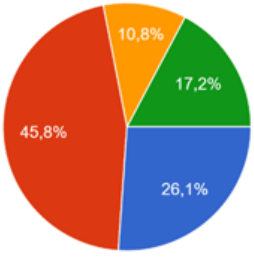
Graph 16 - Earthquake survivors' preferences for living in buildings with 5 or more floors

Graph 17		According to Graph 17, regarding whether earthquake survivors consider living in 2-5 story houses, 6.4% said definitely yes, 36.9% said yes, 29.6% said no, 20.7% said definitely no, and 6.4% said they have no opinion.

Graph 17 - Earthquake survivors' preferences for living in buildings with 2-5 floors

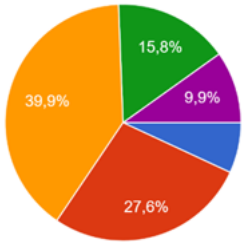
Graph 18		According to Graph 18, 88.2% of earthquake survivors stated that they care about neighborhood relations, 3.9% said they do not care, and 7.9% had no opinion.

Graph 18 - Earthquake survivors' views on neighborhood relations

Graph 19		According to Graph 19, regarding whether earthquake survivors consider building and settling in village or rural areas after the earthquake, 45.8% said yes as an alternative, 26.1% said yes permanently, 17.2% said they do not consider it, and 10.8% were unsure.

Graph 19-Earthquake survivors' preferences for settling in villages/rural areas after the earthquake

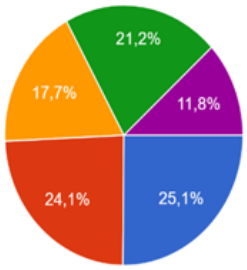
Graph 20



According to Graph 20, regarding whether earthquake survivors consider migrating to other provinces during the transition to permanent housing, 39.9% said no, 15.8% said definitely no, 9.9% had no opinion, 27.6% said yes, and 6.9% said definitely yes.

Graph 20 - Earthquake survivors' preferences for migrating to other provinces during the transition to permanent housing

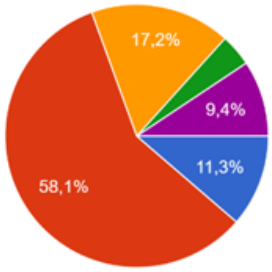
Graph 21



According to Graph 21, regarding the maximum duration earthquake survivors can tolerate living in temporary housing before moving to permanent housing, 25.1% said up to 1 month, 24.1% said 1-3 months, 21.2% said 7-12 months, 17.7% said 4-6 months, and 11.8% said more than 1 year.

Graph 21 - Maximum duration earthquake survivors are willing to stay in temporary housing

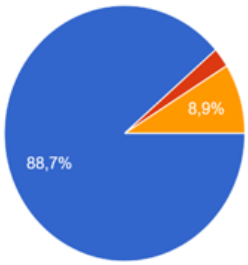
Graph 22



According to Graph 22, regarding earthquake survivors' preference for living in houses with independent units on the same floor, 58.1% said yes, 11.3% said definitely yes, 9.4% had no opinion, 17.2% said no, and 3.9% said definitely no.

Graph 22 - Earthquake survivors' preferences for living in houses composed of independent units on the same floor

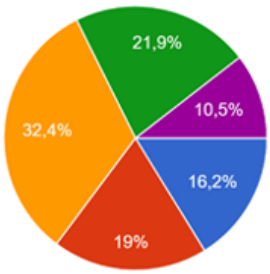
Graph 23



According to Graph 23, 88.7% of earthquake survivors said they definitely prefer detached houses, 8.9% had no opinion, and 2.5% said they definitely do not prefer.

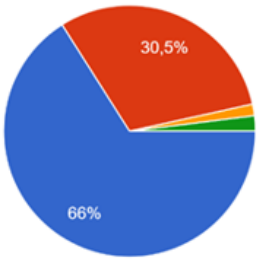
Graph 23 - Earthquake survivors' preferences for detached houses

Graph 24

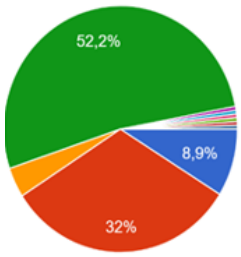


According to Graph 24, regarding the minimum number of independent units in permanent houses, 16.2% said 1 unit, 19% said 2 units, 32.4% said 3 units, 21.9% said 4 units, and 10.5% said 5 units.

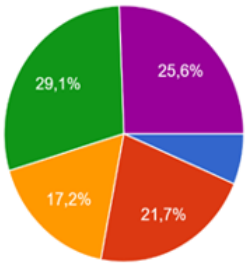
Graph 24 - Earthquake survivors' opinions on the minimum number of independent units that permanent housing should have

Graph 25		According to Graph 25, regarding privacy between buildings in detached permanent housing, 66% said very important, 30.5% important, 1.5% not important, and 2% had no opinion.

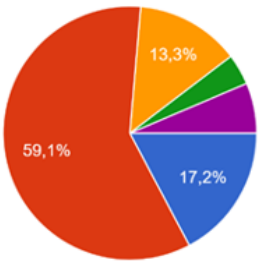
Graph 25 - Earthquake survivors' views on privacy between buildings in detached permanent housing

Graph 26		According to Graph 26, regarding the most important factors other than earthquakes for permanent housing, 52.2% said usability of the house, 32% said proximity to city center, 8.9% said affordability, 3.9% said proximity to relatives/friends, and 3% mentioned safety, solid ground, or all factors.

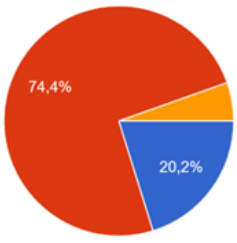
Graph 26 - The most important factors other than the earthquake for earthquake survivors in permanent housing

Graph 27		According to Graph 27, regarding how long earthquake survivors want to live in permanent housing, 6.4% said less than 1 year, 21.7% said 1-3 years, 17.2% said 4-7 years, 29.1% said 8-15 years, and 25.6% said 15 years or more.

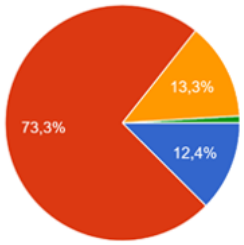
Graph 27 - Duration earthquake survivors want to live in permanent housing

Graph 28		According to Graph 28, regarding earthquake survivors' preference for living far from the city center if permanent housing must be built on solid ground away from the center, 17.2% said definitely yes, 59.1% yes, 13.3% no, 3.9% definitely no, and 6.4% had no opinion.

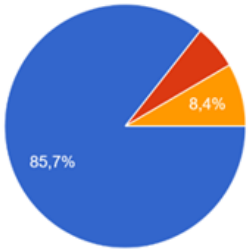
Graph 28 - Earthquake survivors' perspectives on the necessity of building permanent housing away from the city center

Graph 29		According to Graph 29, regarding whether the kitchen and living area in permanent housing should be in the same or separate spaces, 74.4% said separate, 20.2% said same, and 5.4% had no opinion.

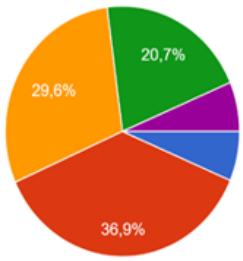
Graph 29 - Earthquake survivors' opinions on whether the kitchen and living area should be adjacent or separate in permanent housing

Graph 30		According to Graph 30, regarding the preferred number of wet areas (toilet, bathroom, shower) in permanent housing, 12.4% said 1, 73.3% said 2, 13.3% said 3, and 1% said 4 or more.

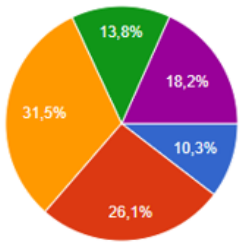
Graph 30 - Earthquake survivors' preferences regarding the number of wet areas in permanent housing

Graph 31		According to Graph 31, regarding whether permanent houses should be detached, 85.7% said yes, 8.4% had no opinion, and 5.9% said they should be multi-story.

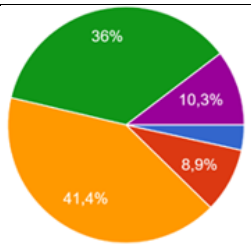
Graph 31 - Earthquake survivors' views on the detached nature of permanent housing

Graph 32		According to Graph 32, regarding thoughts on permanent houses being taller than 2 floors, 6.4% said definitely yes, 36.9% yes, 29.6% no, 20.7% definitely no, and 6.4% had no opinion.

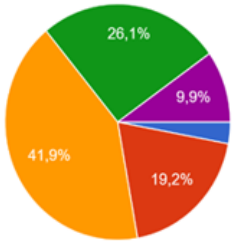
Graph 32 - Earthquake survivors' opinions on permanent housing being built higher than 2 floors

Graph 33		According to Graph 33, regarding opinions on designing temporary houses as permanent housing, 10.3% said definitely yes, 26.1% yes, 31.5% no, 13.8% definitely no, and 18.2% had no opinion.

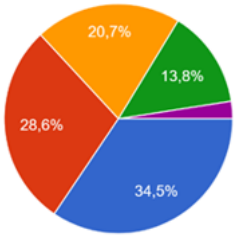
Graph 33 - Earthquake survivors' views on designing temporary housing as permanent housing

Graph 34		According to Graph 34, regarding thoughts on using a single container unit as permanent housing, 3.4% said definitely yes, 8.9% yes, 41.4% no, 36% definitely no, and 10.3% had no opinion.

Graph 34 - Earthquake survivors' opinions on the use of a single container unit as permanent housing

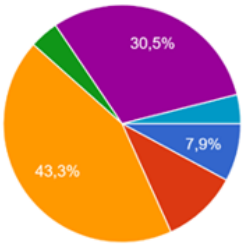
Graph 35		According to Graph 35, regarding whether container units can be stacked or expanded side-by-side to provide permanent housing, 3% said definitely yes, 19.2% yes, 41.9% no, 26.1% definitely no, and 9.9% had no opinion.

Graph 35 - Earthquake survivors' views on whether container units can be enlarged to provide permanent housing

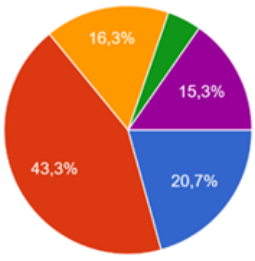
Graph 36		According to Graph 36, regarding the minimum number of floors permanent housing should have, 34.5% said 1 floor, 28.6% said 2 floors, 20.7% said 3 floors, 13.8% said 4 floors, and 2.5% said 5 floors or more.

Graph 36 - Earthquake survivors' opinions on the minimum number of floors permanent housing should have

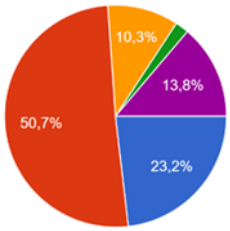
What are the opinions of the earthquake survivors included in the study regarding the minimum required space, new construction technologies for permanent housing, material properties, sustainability, and related issues?

No	Opinions of earthquake survivors regarding certain variables related to temporary and permanent housing	
Graph 37		According to Graph 37, when earthquake survivors were asked about the main building material that should be used in permanent housing, 43.3% responded reinforced concrete + steel, 30.5% new construction systems, 10.3% steel, 7.9% reinforced concrete, 3.9% prefabricated, and 3.9% other options.

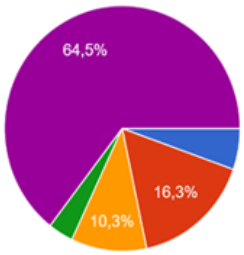
Graph 37 – Earthquake survivors' preferred main building materials to be used in permanent housing

Graph 38		According to Graph 38, regarding the question of whether sustainability can be achieved in temporary settlements/housing, 20.7% said definitely yes, 43.3% said yes, 16.3% said no, 4.4% said definitely no, and 15.3% said they have no opinion.

Graph 38 – Earthquake survivors' opinions on sustainability in temporary housing

Graph 39		According to Graph 39, in response to the question of whether sustainability can be achieved in permanent housing, 23.2% said definitely yes, 50.7% said yes, 10.3% said no, 2% said definitely no, and 13.8% said they have no opinion.

Graph 39 – Earthquake survivors' opinions on sustainability in permanent housing

Graph 40		According to Graph 40, when asked about their thoughts on layered manufacturing (additive manufacturing) in permanent housing, 64.5% said they have no opinion, 5.4% said it should definitely be done, 16.3% said it should be done, 10.3% said it should not be done, and 3.4% said it definitely should not be done.

Graph 40 – Earthquake survivors' opinions on layered manufacturing in permanent housing

4. CONCLUSION AND DISCUSSION

As a result of the housing needs that arise after a disaster, solutions such as emergency response, rehabilitation, and reconstruction are developed to meet these needs. However, housing-related problems emerge that cannot fully address user needs and involve environmental, social, and economic challenges. Addressing these problems requires significant responsibilities from many disciplines, especially architects, to ensure that disaster survivors can adapt to normal life as quickly as possible.

Quantelli (1995) stated that after a disaster, survivors tend to adopt housing solutions by returning to their pre-disaster living conditions, creating temporary shelters, upgrading temporary shelters to permanent housing, or building new homes. Temporary disaster housing should primarily be structures that meet the basic spatial and comfort needs of survivors, be quick and easy to set up, durable, made from recyclable materials, reusable by disassembly or relocation, and low cost (Savaşır, 2008). Considering Turkey's population, the high disaster risk of its housing stock, and prevailing economic factors, post-earthquake reconstruction requires substantial labor, expenditure, and reproduction efforts. Consequently, the organizational structure, preparation process, production variables, and implementation methods gain critical importance. As a result, it becomes imperative to urgently meet the housing needs that arise after an earthquake.

The study found that participants experienced housing-related problems especially during the first month after the earthquake. It was also observed that participants lacked information regarding the earthquake resistance of their pre-earthquake residences. Nearly half of the participants' homes were either damaged or completely destroyed due to the earthquakes. It was noted that emergency interventions did not begin immediately after the earthquake and that traditional methods were used to address housing problems once interventions started. Participants were unable to reside in their own homes even during the first month following the earthquake.

Important findings were reached regarding the earthquake housing needs after the disaster. The results indicated that participants wished to access earthquake housing as soon as possible. Additionally, the majority of participants had households with four or more members, highlighting that the number of rooms based on household size should be a determining factor in post-earthquake spatial planning. The responses to the research question about container and permanent housing formation largely supported this finding.

Most participants were highly educated. It was also found that the majority of participants had lived in their current homes for more than eight years and was homeowners. This suggests that if earthquake housing is constructed with permanence in mind and meets basic needs, residents can live in these homes for many years. Regarding minimum housing requirements, the study concluded that earthquake housing should contain at least three independent units, reflecting the living arrangements of the participants. Furthermore, participants expressed a preference not to live in high-rise buildings after the earthquake; instead, they favored detached or low-rise structures. Thus, it is necessary that permanent housing solutions after the earthquake avoid high-rise constructions. Since neighborhood relations were important to participants, this aspect should also be taken into consideration when providing housing.

The majority of participants indicated that the maximum acceptable transition period to permanent housing was up to six months. This is a significant insight indicating that models developed after disasters should be realizable within a six-month timeframe. Nearly half of the participants reported that they might migrate to other cities during the transition to permanent housing. This could disrupt the sociological balance and lead to challenges related to establishing new communities in other cities. Therefore, the post-disaster housing model must be produced quickly to protect and maintain sociological stability. Although most participants preferred earthquake housing close to city centers, it was also found that if permanent housing must be built on stable ground away from the city center, participants would be willing to relocate to ensure living on solid ground. The findings indicate that it is essential to take into account the living conditions, family structures, neighborhood relations, and housing preferences of the earthquake-affected population in order to ensure socially and culturally responsive post-disaster planning and reconstruction efforts.

While participants generally lacked sufficient knowledge about new construction techniques for permanent earthquake housing, they expressed a positive attitude toward sustainability. The study concluded that earthquake housing constructed with innovative building technologies—quickly built on stable ground, low-rise or detached, capable of accommodating the necessary number of rooms based on household size, maintaining spatial integrity while respecting neighborhood relations, and possessing durability and long service life—would represent the ideal modern earthquake housing model. Therefore, in order to rapidly meet post-earthquake housing needs and to optimize the quality of life for earthquake survivors, the utilization of innovative construction technologies would be highly appropriate. Systems based on innovative construction technologies can be categorized under five main headings: expandable and modular systems, inflatable (air-supported) structural systems, lightweight steel box systems, additive manufacturing technologies, and cross-laminated timber (CLT) structures. Taking into account the specific conditions of the affected region, other local factors, and the needs and expectations of the local population, the selection of the most suitable system among these five—which are advantageous in many respects and possess a high level of adaptability to various contexts—is of critical importance for ensuring post-disaster housing solutions at an optimal level.

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