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Living through dual crises: Rethinking urban resilience from lived experiences

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Abstract

In recent years, cities have faced increasing pressure from overlapping disasters, exposing critical weaknesses in existing spatial, institutional, and social systems. Numerous decisions made throughout the history of cities are considered in the context of reinforcing the cohesion and adaptability of institutions and communities. Resilient cities adapt to environmental, economic, and social dynamics, demonstrating their ability to withstand pressures and evolve to fulfill various roles over time. Although many crises offer valuable lessons for enhancing urban resilience, this study focuses on how the concurrence of multiple crises alters spatial configurations and usage dynamics within urban environments. The study explores how cities respond and adapt to dual crises, focusing on the intersection of seismic events and pandemic conditions. Using a qualitative, phenomenological research design, the study analyzes official disaster regulations, emergency response plans, media documentation, and in-depth interviews with individuals who experienced both an earthquake and a pandemic simultaneously. The research centers on spatial transformations and shifting urban needs in the aftermath of the October 2020 earthquake, while also reflecting on the broader implications of the February 2023 disaster. Findings highlight the complex, layered nature of urban vulnerability under concurrent crises, emphasizing the need for integrated planning approaches, adaptable public spaces, and cross-sectoral coordination. This paper contributes to the ongoing rethinking of urban resilience strategies by offering grounded insights into the lived realities of navigating dual crises.

Keywords: resilient cities, earthquake, pandemic

1. Introduction

Cities perpetually undergo transformation and adaptation in response to the various shocks and disasters they encounter. Over the course of history, numerous decisions have been taken within urban settings, encompassing aspects such as infrastructure, public spaces, and green areas, all of which factor in the consideration of contemporary crises, shocks, and related eventualities. The concept of urban resilience is widely employed to assess the capacity of cities to withstand and recover from a multitude of diverse impacts and shocks (Meerow et al., 2016; Rezvani et al., 2023). However, there is no single, universally agreed-upon definition of urban resilience. Some studies focus on infrastructural robustness and physical recovery, whereas others argue that urban resilience extends beyond the physical realm to include social, economic, and environmental dimensions (Sanderson et al., 2016). Some other studies argue for a broader perspective that includes social equity (Vale, 2014). This diversity illustrates that urban resilience extends beyond the physical realm to encompass social, economic, environmental, and political dimensions (Meerow et al., 2016; Mouratidis & Yiannakou, 2021; Osman, 2021).

In recent years, the significance of this concept has amplified, driven by the heightened frequency and intensity of natural calamities and the escalating urbanization trends observed across the global population (Osei-Kyei et al., 2024). Urban resilience, as a concept, exhibits a dynamic framework that encompasses a multitude of domains (Osman, 2021). Natural disasters,

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global warming, economic crises, political and social upheavals, and various other scenarios serve as litmus tests for urban resilience (Büyüközkan et al., 2022).

Achieving resilient city status necessitates fulfilling several prerequisites, with the spatial dimensions of resilience being among the most crucial. Identifying and cultivating areas that enhance urban resilience is of paramount importance, particularly during natural disasters. One of the important disasters that test urban resilience is earthquakes. Earthquakes, being a substantial natural calamity, inflict extensive damage on urban infrastructure, and they pose the most significant threat to regions situated in seismically active zones. Over the past two decades, earthquakes and tsunamis have proven to be the deadliest among all types of disasters, accounting for 58% of total fatalities (UN Office for Disaster Risk Reduction, 2019). Approximately 3 billion people in the world currently live in regions with high seismic activity.

Situations that increase the destructive effects of earthquakes and particularly test urban resilience include the overlapping of several disasters. In this sense, the epidemic called COVID-19 represents the most recent example of a city's resilience being tested. With COVID-19, which has emerged since the end of 2019, the way urban spaces are used and designed has changed globally. With the social distance rules brought about by the limited access to the public space during the pandemic process, people's staying at home has reduced physical interaction and slowed down or completely stopped practices such as education, economic activities, religious meetings, sports activities, and cultural activities. At the peak of the pandemic, UNESCO reported that over 1.6 billion learners globally were affected by school closures (UNESCO, 2023). Meanwhile, the global economy contracted by about 3 % in 2020, in what has been described as one of the most severe recessions in modern times (International Monetary Fund, 2020). The pandemic led to a re-evaluation of public space with regard to social distancing and health compliance, while simultaneously restricting activities to the home and forcing a reconsideration of resilient city concepts (Amirzadeh et al., 2023; Banai, 2020; Gök Tokgöz et al., 2023).

Utilizing past disaster insights can enhance cities' resilience to future adversities, but it's crucial to consider the possibility of multiple crises. Despite the richness of urban resilience literature, few studies have examined the compounding effects of multiple disasters occurring simultaneously. The concurrent experience of an earthquake and a pandemic represents a rare and underexplored scenario, one that poses unique challenges for urban resilience. This study specifically aims to explore urban resilience in the context of overlapping crises by analyzing the coexistence of the COVID-19 pandemic and the İzmir earthquake. It investigates how these dual shocks have influenced the use of urban space, the lived experiences of affected communities, and the strategies that can strengthen resilience in earthquake-prone areas. By drawing on interviews with disaster-affected individuals, this study contributes to the literature by providing empirical insights into how communities navigate resilience when confronted with overlapping crises. The focus of the study is what we have learned about urban resilience in the coexistence of pandemic and earthquake. The Bayraklı and Bornova districts in İzmir, Turkey, were selected as the study area due to the occurrence of a seismic event with a magnitude of 6.9 in the vicinity. An integral facet within the chosen field of study pertains to the unique circumstance that the disaster under investigation represents; namely, it stands as the inaugural and most devastating earthquake event to transpire within the timeline of the COVID-19 pandemic (30th January 2020 to 5th May 2023 as declared by WHO). This peculiarity confers distinctiveness within the realm of academic inquiry, as it presents a singular scenario characterized by the absence of pre-existing knowledge to inform relief efforts in the face of a dual crisis encompassing both a pandemic and a catastrophic earthquake. This study focuses on resilience, analyzing field investigations and outcomes. It evaluates strategies for enhancing earthquake-prone areas through interviews and literature analysis, evaluating strategies based on insights.

1.1. An Overview of the October 30 Earthquake in Turkey

Turkey is located in the region of seismic activity. Earthquakes are Turkey's most common natural hazard, accounting for the largest share of deaths and economic losses (UNISDR, 2017). Turkey, which has experienced many major earthquakes in its history, is also at risk of earthquakes in the coming years. Since the occurrence of the October 30 earthquake, there has been a significant surge in academic research pertaining to this subject.

The majority of this research can be categorized as pertaining to geological phenomena, while some align more closely with our specific area of interest. Aslan and Şahinöz (2023) examines the experiences of people with disabilities (PWD) during and after disasters. It highlights the impact of factors like inaccessible living environments, inadequate preparedness, evacuation challenges, and limited access to essential services. The study also highlights the exclusion of PWDs from disaster management processes and their psychological resilience (Aslan & Şahinöz, 2023). A study by Akpolat et al. (2021) on the knowledge and awareness of the İzmir earthquake-affected population found that sustained public education and community solidarity are crucial for mitigating potential earthquakes. Women, often indoors, are identified as a key demographic for targeted earthquake awareness programs. The research also advocated for social structural analyses in regions with rapid urbanization to create accurate risk maps and public policies for earthquake preparedness (Akpolat et al., 2021). Çalışkan and Kaya's study on social solidarity practices in Turkey highlights the importance of AFAD (Disaster and Emergency Management Authority in Turkey) institutions and local administrations in addressing earthquake victims' needs and providing psycho-social support. The findings underscore the significant role played by the AFAD institution and local administrations, as evidenced by 78.2% of participants rating their organizational efforts as either good or very good. Participants expressed satisfaction with assistance but also expressed apprehensions about rising housing costs, and emphasizing the emotional impact of earthquakes (Çalışkan & Kaya, 2021). Ağralı et al. (2023) conducted a qualitative study on the İzmir Earthquake using Twitter data and artificial intelligence. The study found that social media posts were primarily well-wishes within the first five days, with subsequent posts focusing on news updates and aid efforts. The sentiment analysis revealed sadness towards those affected, with neutral content being shared when no significant developments occurred (Ağralı et al., 2023).

As observed, the majority of research studies have primarily focused on the impacts of earthquake disasters, with little attention given to the concurrent circumstances of a pandemic. In this context, a study by Aru (2022) conducted a study that comprehensively examined this issue in the broader pandemic. The study surveyed 522 participants to investigate the link between earthquakes and pandemics. Results showed that most participants were at home during the earthquake, with a high rate of visiting assembly areas, indicating a crowded environment. The study revealed inconsistencies in social distancing rules and mask usage during an earthquake, with a significant increase in post-earthquake COVID-19 cases, indicating a potentially higher increase within the participant sample, particularly in earthquake-affected regions (Aru, 2022).

1.2. The Status of the Pandemic Before and After the Earthquake

The first case of COVID-19 in Turkey was reported on March 11, 2020. Shortly after the first case emerged, numerous measures were implemented to control the course of the pandemic. These measures included international travel restrictions by air and land, controlled intercity transportation, spectator-free sports events, and, most notably, the establishment and implementation of the infrastructure for remote education to ensure social distancing. The widespread adoption of remote working by many businesses opened the way for working from home. As the pandemic situation worsened in the following days, curfews were considered and enforced to gain control. With signs of improvement in the situation as of May 2020, some restrictions were gradually relaxed. National testing and isolation of infected individuals were conducted to control the spread of the disease. Home quarantine was implemented for those in

contact. A mobile application, "Hayat Eve Sığar," was launched to monitor and control infected individuals.

At the time of the earthquake, approximately nine months had passed since the onset of the pandemic. Activities such as wearing masks, using sanitizers, maintaining personal distance, remote education, and remote work had become integral components of the daily routine. Each day, the Ministry of Health disseminated daily statistics on the number of cases and fatalities. Efforts towards normalization were periodically disrupted by the emergence of different viral variants, prompting the reevaluation of eased restrictions. At the moment the earthquake struck at 14:51, it can be noted that many healthy individuals who would typically have been in schools or workplaces were in their homes. In an environment where staying at home had been recommended through all government channels, it is evident that numerous individuals were caught in enclosed spaces during the earthquake. Moreover, those who had been in contact with infected individuals were quarantined in their homes as a precaution, assuming they might be potential carriers of the virus. During the earthquake period, it is documented that the number of COVID-19 cases in Izmir had increased by 3.5 times compared to twenty days earlier (Aru, 2022). This situation underscores the severity of the pandemic's impact. While the pandemic persisted, individuals who experienced the earthquake in their homes had, for approximately eight months, navigated life within the confines of pandemic restrictions. They managed to escape from buildings shaken and shattered by the earthquake's force, leaving behind these constraints that had become an integral part of their lives. Given how closely they had walked to the edge of death, the prospect of contracting an illness no longer appeared as a significant threat. Indeed, the increase in disease cases in the aftermath of the earthquake substantiates this assertion.

2. Material and Method

Within this section details the study's geographical boundaries and qualitative research methodology, which includes semi-structured interviews with key informants, focus groups, and ancillary sources like online news outlets and social media platforms, to provide a comprehensive understanding of the seismic event.

2.1. Field Area

On October 30, 2020, a 6.9 magnitude earthquake occurred on the Aegean coasts of Turkey and Greece, one of the most seismically active regions of the world. The earthquake, with its epicenter off the coast of Samos Island in Greece, caused the most damage in the city of Izmir, located 70 km to the northeast in Turkiye (EEFIT, 2021). Figure 1 shows the earthquake area.

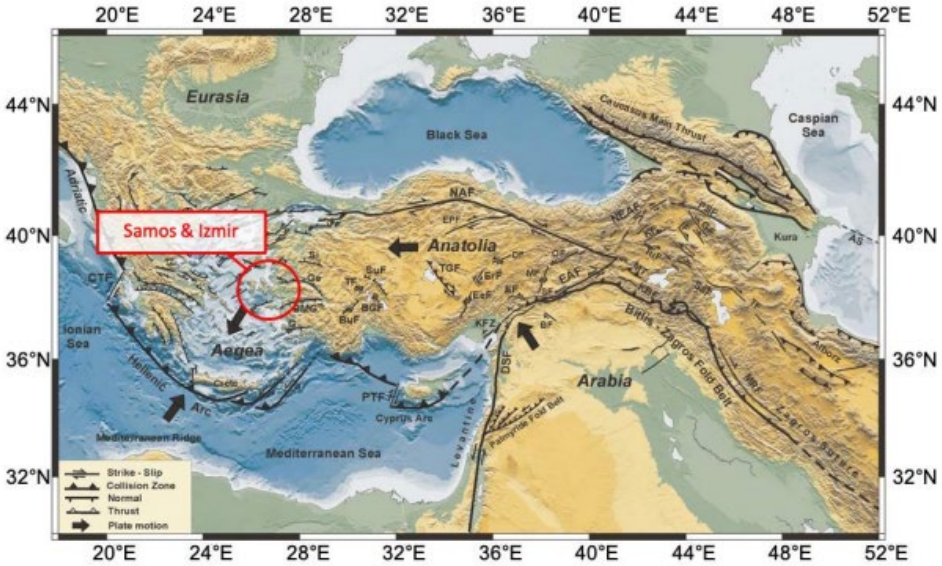

Figure 1 Field area has been circled red (EEFIT, 2021)

İzmir is the third-largest city in Türkiye, boasting a substantial population of approximately 4.4 million residents (TUIK, 2021). It is located in the western part of Türkiye, covers an area of around 12.000 km², and is situated at geographic coordinates 38.42°N, 27.14°E (Republic of Türkiye Ministry of Culture and Tourism, 2025). The earthquake severely affected İzmir's Bayraklı and Bornova districts, leading to the collapse of eight buildings, damage to more than 700 structures, and the tragic loss of 119 lives alongside over 1,000 injuries. Thousands of residents were left unsheltered in the aftermath, corresponding to a significant proportion of the local population. The vulnerability of the affected districts was strongly linked to the characteristics of the building stock, which included a prevalence of mid-rise reinforced concrete structures with inadequate seismic design, as well as some masonry buildings, all of which contributed to the scale of destruction and human loss (EEFIT, 2021). A seismic event caused extensive damage to critical infrastructure and leaving thousands without shelter, causing widespread destruction (Aktas et al., 2022). The study centered its attention on neighborhoods that bore the brunt of this destruction. Although the region usually has a temperate climate, harsh weather during the earthquake—especially at night—made outdoor conditions inhospitable.

2.2. Research Method

This study aims to examine how individuals perceive and interpret their lived experiences during the dual crises of an earthquake and a pandemic in order to gain insights into the social, spatial, and organizational challenges of urban resilience. Accordingly, a qualitative research approach was selected as the foundational methodology for this investigation. The integration of qualitative research methods serves as a valuable instrument for grasping how individuals subjectively experience events "from within" (Flick, 2007). A phenomenological approach was adopted as the guiding framework for this research endeavor. Interviews were conducted with individuals who had encountered the dual challenges of an earthquake and a pandemic concurrently. All data were collected remotely due to pandemic-related restrictions, which shaped both the research process and participants' lived realities.

For analytical purposes, the study's materials were systematically categorized into two distinct groups: interviews and supporting materials. In addition to the interviews, the supporting materials encompassed various sources, including newspaper articles, maps, films, images, and reports. These materials were utilized to corroborate and enrich the insights derived from the interviews, constituting a form of "grey literature." The term "grey literature" refers to content and research produced by entities operating outside the traditional academic or commercial publishing and distribution channels. The inclusion of such sources facilitates a multifaceted examination of the subject matter, allowing for the consideration of diverse perspectives (Haddaway & Bayliss, 2015). As a result, careful consideration was given to the design of the interview protocols and the methods employed in collecting the supporting materials, ensuring their alignment with the overarching objectives of this study.

In this study, both interview transcripts and supporting materials were coded and analyzed using NVivo 12 Pro, which facilitated both the coding process and the subsequent content analysis. The selection of NVivo arises from its capacity to handle extensive amounts of unstructured data, enabling the researcher to code, categorize, and analyze across multiple themes. This ensured a more transparent and replicable analysis process, reducing the risk of researcher bias. In this study, NVivo was particularly useful for identifying recurring themes related to housing, governance, and social interaction during the dual crises, as well as for understanding patterns and connections between earthquake- and pandemic-related experiences.

2.2.1. Interviews

The study's scope was intentionally delimited to exclusively include interviews conducted with residents of Izmir. Priority was given to individuals representing diverse age groups and cultural backgrounds who had experienced both the earthquake and the pandemic concurrently. The interviews were conducted between July and October 2021. Nine participants were engaged in

structured interviews as an integral component of this study. These interviews were conducted remotely, utilizing online platforms, with meticulous records maintained through both audio and video recordings. On average, each interview spanned approximately 40 to 45 minutes, allowing for in-depth exploration of their insights and narratives. The incorporation of supportive materials into the interview process served to enhance and enrich the depth of information obtained from the participants.

Open-ended questions, as employed in this study, refrain from prescribing a predefined set of answer choices, granting participants the freedom to respond in their own words and address the specific aspects they deem most relevant. The interview questions were structured around four distinct themes, each serving a specific research objective. These themes were framed by one or two guiding questions, such as "What are your thoughts on this matter?" "What transpired subsequently?" or "Could you provide further elaboration?" The interview structure made with these objectives was created as shown in Table 1.

Table 1 The Interview's Structural Themes and Information to be Obtained

Themes	Information to be obtain
During and immediately after the earthquake	where did he/she experience the earthquake, where did he/she go after the earthquake, who was on the call, what did he/she witness
Effects of earthquake and pandemic coexistence	Feelings, concerns and effects in the earthquake zone
Post-earthquake needs	Immediately after the earthquake needs like shelter, heating, etc.
How the urban life changed use of the public space	Urban spaces whose use has changed after the earthquake, which areas are safe, which areas are unsafe etc.

The data obtained from these interviews, organized according to these thematic dimensions, underwent a rigorous coding process. Codes, serving as linguistic or symbolic representations, were utilized to attribute semantic meaning to the information. The coding process facilitated the systematic arrangement of the data, preventing the inundation of unprocessed information and representing the initial step in the conceptualization process (Walliman, 2017). In this study, the research team transcribed and systematically coded the interview data.

2.2.2. Supportive Materials

The majority of the supporting materials were sourced from internet news outlets and social media platforms. Over the past few years, there has been a significant surge in social media utilization, with its presence becoming pervasive across various facets of daily life. Due to this circumstance, social media has become a subject of research in many disciplines (Chatziadam et al., 2020). The incidents identified via internet news sources and social media platforms underwent in-depth analysis through the examination of photographs, satellite maps, and videos. This analysis aimed to complement and substantiate the codes derived from the interview data. A content analysis employing qualitative methodology was conducted on the available materials.

News: The process of sourcing information was facilitated by inputting relevant keywords into internet search engines. Initially, preliminary research was conducted on the Internet, utilizing news portals and emphasizing keywords such as "İzmir," "earthquake," "COVID-19," and "pandemic." It was observed that local news sources provided more intricate news coverage compared to mainstream media outlets. Therefore, a comprehensive analysis of local news sources, involving deep data mining, was undertaken to extract relevant information, which was subsequently

collected. In NVivo12 Pro, the news articles were systematically coded with dates and source names, and the news sampling was limited to the period from the date of the earthquake to three months thereafter. Figure 2 presents an overview of news frequency distribution.

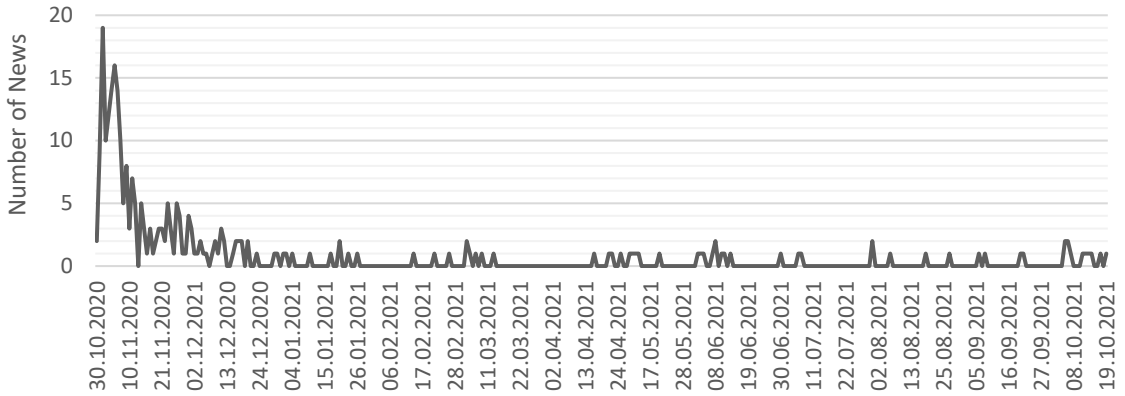

Figure 2 "Earthquake" related news frequencies

The study selected a specific timeframe due to research-related news frequency patterns, with relevant news on the earthquake's first day and until December. Data from interviews and supplementary materials were summarized, with direct quotations coding to mitigate interviewer bias.

Maps: Google Earth possesses an archive of georeferenced satellite photographs incorporated into its mapping interface, serving as a valuable resource for facilitating the orchestration of preparatory measures in response to seismic events. These cartographic representations encompass satellite-derived depictions captured at intervals spanning 7 months preceding the seismic occurrence, the precise day of its incidence, 2 days subsequent to the event, and a comprehensive year post-event. This temporal scope affords the opportunity for discerning alterations transpiring antecedent and subsequent to the seismic event.

Videos: The research uses YouTube videos and interviews with survivors, volunteers, and officials to gather firsthand insights. The analysis of these datasets, including street interviews during walks, aims to establish correlations and uncover new connections. Satellite imagery is used to cross-reference the locations and routes of these interviews.

3. Research Findings

This study investigates the effects of the pandemic and earthquake on the evolving needs of individuals, ascertained through interviews with affected citizens and supportive materials. Salient themes and codes were identified and analyzed. Figure 3 shows the structure of research.

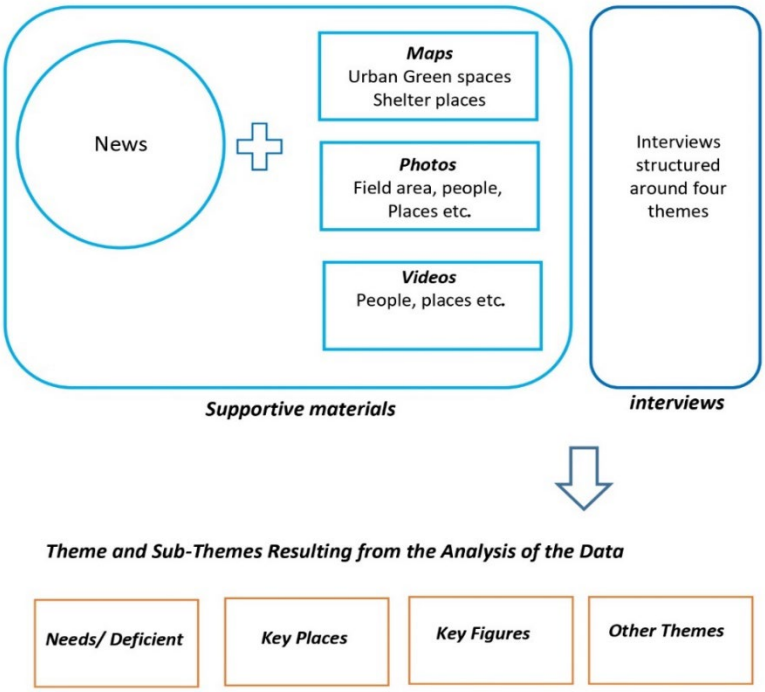

Figure 3 Structure of material research

3.1. Themes and Codes

The data collected from the interviews and supportive materials were organized into themes and sub-thematic categories. The selection of themes and sub-themes was guided by both the literature and the empirical data. Previous studies have consistently recognized housing conditions, government authority, and community support as key elements of urban resilience (Büyüközkan et al., 2022; Cutter et al., 2008; Meerow et al., 2016). Building on these insights, the interview data were coded inductively, which enabled the identification of sub-themes reflecting local experiences during the dual crises. This approach ensured that the analysis remained both theoretically informed and empirically grounded.

The data was categorized **into four primary themes: needs/ deficient, key places, key figures and other codes** having minimal relevance to these. The aforementioned themes and sub-themes were categorized into two branches, namely earthquake-related themes and pandemic-related themes. These themes are discussed in the study first in connection to the earthquake and subsequently in relation to the pandemic. The remarks provided by the interviewees have been coded and are designated as P1 through P9. The Table 2 provides a comprehensive breakdown of the preliminary thematic framework in a more granular manner.

Table 2 Theme and Sub-Themes Resulting from the Analysis of the Data

	Needs/ Deficient	Key Places	Key Figures	Other codes
Earthquake	shelter	emergency assembly areas	earthquake victims	social media
	foods/water	parks /recreation areas	relatives	
	heating	cafes	children	
	internet	courtyards	elderly people	
	electricity	sports halls	pets	
		car parking areas	volunteers	
Pandemic	hygiene social distance	*shelter	people in quarantine	be unorganized
	online education		people who have contact with individual	

To provide readers with a clear overview of the empirical results, the main themes and their associated findings are summarized below. While the detailed analysis is presented in the subsequent sections, Table 3 highlights the most important outcomes across the earthquake and pandemic contexts.

Table 3 Key Findings per Theme

Themes	Key Findings
Needs / Deficient	Post-earthquake, there were significant deficiencies in **shelter, heating, and electricity,** while cleanliness and online education were prominent concerns during the pandemic.
Key Places	**Parks and green areas** became essential locations for post-earthquake shelter and assistance.
Key Figures	**Children and the elderly** were particularly vulnerable, with volunteers providing vital but often disorganized support.
Other Codes	**Social media** was important in coordinating aid and disseminating information, although **disorganization among institutions and volunteers** hindered relief efforts.

While Table 3 provides a concise overview of the key findings across all themes, the following sections offer a more detailed discussion of each theme and its sub-themes. This structure allows the results to be presented in a systematic manner: first outlining the broad patterns that emerged from the data, and then illustrating these patterns with participants' narratives and supporting materials.

3.1.1. Needs/Deficient

The interviews conducted highlighted the prevalent themes of needs and deficiencies. The discussions revolved around the immediate requirements of individuals in the aftermath of the earthquake, as well as those pertaining to the post-disaster period. Additionally, participants addressed pre-existing issues and various administrative shortcomings they perceived. These needs and deficiencies can be categorized into two main groups: daily life necessities and those arising from the pandemic.

The earthquake led to a surge in the need for **shelter**, with many people seeking it due to home damage or awaiting assessments. Participants expressed dissatisfaction with the initial tent setups, which were delayed and inadequately executed, and the scarcity of tents was a major concern.

"During the day, people could spend their time standing or sitting on the grass in parks but at night, this was the biggest problem when talking about children and elderly. The sitting area and sleeping area were the biggest inadequacy. (P1)"

"There weren't enough tents, so many people slept on the ground the first day. (P2)"

"There were many people in the parks around the house, there were tents so for a while, those tents were everywhere, there were too many tents around. (P8)"

The supporting materials particularly emphasize that the need for tents has gradually decreased over time, with an initial shortage on the first night. As victims explored alternatives like hotels, rental accommodations, or moving in with relatives, the need for tents decreased. Many of the 2,578 tents set up in the city remained unoccupied, leading to their relocation towards central areas.

Aid was promptly dispatched from neighboring provinces immediately following the earthquake to provide sustenance in the form of **food and water** to the local population. According to the participants, there were relatively few issues related to food distribution. However, the availability of **electricity** emerged as a critical concern in various areas, given its essential role in both **heating**

and other daily needs. This problem was exacerbated by the earthquake's occurrence in late October, during cold and rainy weather, magnifying the significance of heating. The demand for electric heaters, blankets, and warm clothing garnered widespread attention, particularly on social media, where aid providers were urged to prioritize these essential items. Some participants expressed dissatisfaction with the comfort levels within the provided tents. Insufficient provisions of key necessities, such as heating, electricity, and clean water, were reported. One participant shared their firsthand experience regarding this issue.

"People didn't have a warm place to sleep or shelter outside. It was very cold and the tent was not adequately protected. It tried to warm up by a fire outside. Nearby cafés and restaurants are now whatever, people go there and charge their phones. The electricity demand was too great to provide. The heater was being used, is it better to use the socket for the heater or for the phone in cold weather? That is why people go to any market and it was said that could I charge my phone? (P1)"

The pandemic has heightened concerns about **hygiene, online education, and social distancing,** particularly in areas severely affected by earthquakes. Participants expressed a desire for improved sanitation facilities, including restrooms and washing facilities, and emphasized the importance of maintaining hygiene during food distribution and dining. Volunteers at the Aşık Veysel recreation area (On the 245-acre site in Bornova, there is an Ice Sports Arena, a 5,000-seat amphitheater, basketball and volleyball courts, and relaxation areas, along with a 641-vehicle parking facility) shared observations on restroom and toilet facilities.

"There is the pandemic and the showers opened two days later. Those inside the ice rink were also opened, and while people were taking a shower, their number could be kept up. …There were too many entrances and exits, if 800 tents are mentioned, there are 2500-3000 employees, maybe there with volunteers. There were two toilets in the area we opened, with 3 cabins in each. There were also two on the ice rink. There were 2 entrances each, the cleaning was not enough. We couldn't see enough cleanliness; most of the time we didn't drink enough water because we didn't want to use the toilets. (P9)"

In response to the ongoing pandemic, educational activities that were previously conducted online have been restructured into a mobile learning environment, with a specific emphasis on adhering to stringent social distancing measures. This transition underscores the paramount importance of children's education within this context. Notably, the Turkish Ministry of National Education has established the Education Information Network (EBA), a comprehensive electronic educational content network. EBA, equipped with computers and internet connectivity, has been strategically deployed to facilitate online education for primary school students residing in remote areas. However, many high school and university students are unable to continue their studies due to lack of internet access and computers. Distance education infrastructure was not established until the 8th day after the disaster, with some survivors using mobile phones.

Another topic that came up a lot in the wake of the earthquake was **social distance**. Participants saw that social distancing received insufficient attention in the immediate post-quake period, and the accompanying materials reflected this as well. The participants stated that they could not pay attention to social distances due to the shock of the earthquake.

"We couldn't keep social distance because you came out of the earthquake and you wanted to hug the first person you saw. You see that he/she is alive. Social distancing was very much ignored in this case. (P1)"

Consequently, the spectrum of needs and deficiencies during this period encompasses a wide array of challenges. In the aftermath of the earthquake, various facets of human existence may assume the role of critical necessities. The needs were more complicated as a result of the pandemic and earthquake. In addition to providing for the earthquake's essential needs, the pandemic had to be taken into account.

3.1.2. Key Places

Earthquakes and other natural disasters have a profound impact on urban environments. In the case of the recent earthquake, the already-transformed urban landscape, influenced by the ongoing pandemic, underwent further changes. The participants in the study highlighted various spatial alterations, **including parks, courtyards, sports halls, recreation areas, and parking facilities**.

In the context of the earthquake, significant locations can be analyzed from two perspectives: areas that were immediately identified as safe and protected following the earthquake and locations suitable for shelter and relief efforts. Participants reported evacuating their homes promptly after the earthquake, seeking safety in open areas away from buildings. These safe zones included parks, highway edges, waterfronts, and city squares, where individuals felt secure. Below are some illustrative quotes from the participants to elucidate these findings.

"The only place we can go in an earthquake is the green areas and courtyards near us. There are many houses with courtyards here; people have always gone to the courtyards. (P1)"

"There are no buildings around, just an open space, and there aren't many buildings that could be knocked down and collapsed. For me, the safest areas seem to be those places. The car park next to our house is a really large car park. There may be large parks; there may be such car parking areas. …Aid was always collected in the parks next to our house. Aid was also distributed in the parks. There were many people in the parks. (P8)"

Emergency assembly areas within urban spaces were another notable topic of discussion. Numerous participants expressed their lack of awareness regarding the locations designated for assembly in the city. There is a prevailing opinion that these assembly areas are often chosen from among the urban green spaces. In a study conducted after the earthquake in Elazig, another city in Turkey, it was reported that urban green spaces had been designated as assembly areas (Meral et al., 2021).

"… People gathered in the parks. There was no assembly place. I do not know though. Everyone go to the parks. (P8)"

"First of all, I can talk about the inadequacy of assembly areas. Because, as I said, there were no assembly areas near us, so we had to go out to the courtyards. The assembly areas in the center of the city are generally green areas next to playgrounds. (P1)"

In the aftermath of the earthquake, temporary tents were established on various prominent **green areas** within the city. Analysis of Google Earth imagery of the earthquake-affected region indicates that almost all accessible green spaces were utilized for the placement of these tents, with a notable preference for larger open areas. Among these locations, the Aşık Veysel recreation area stood out prominently as a site where both tents were erected and aid collection took place immediately following the earthquake. During interviews, participants consistently emphasized the significance of this expansive urban green space. For visual reference, Figure 4 provides aerial photographs of this specific region.

Figure 4 Aşık Veysel recreation area (Anadolu Ajansı, 2020)

Post-earthquake relief efforts are coordinated and distributed using indoor facilities, such as **sports halls** and exhibition centers. An ice rink located within the Aşık Veysel recreation area served as one such facility. During interviews, it was reported that relief supplies were gathered and organized at the ice rink before being efficiently distributed to the tents in the adjacent green area.

The social and psychological implications of utilizing urban green areas during a crisis have undergone a significant transformation, particularly in regions where earthquakes are deemed potential threats. These **urban green areas**, typically designated for leisure and relaxation, have demonstrated their potential to serve as gathering points, distribution centers for aid, and temporary shelters during emergencies, thereby enhancing the city's resilience. Consequently, it is imperative to reevaluate design decisions for urban green spaces, considering their utility during times of disaster. The urban green spaces have multifunctional roles in the aftermath of earthquakes, including hosting tent-based relief centers and serving as gathering points. These areas instill a sense of security among people, further underscoring their significance during times of crisis. The situation has been articulated in post-earthquake reports as follows:

"It has been observed that the number of regions and buildings affected by the earthquake is relatively low compared to the urban development; this is due to the significant green spaces in the affected area, enabling the rapid establishment of temporary shelter areas (BUSOS, 2020)."

Cafes situated in close proximity to assembly or shelter areas played a crucial role, particularly in the early days following the earthquake. These establishments served as vital spaces for obtaining warmth, relaxation, restroom facilities, and addressing various needs, including access to electricity and the internet.

The pandemic has also changed the needs for key spaces. In every setting where it is necessary, social distancing must be taken into account. The convergence of a pandemic and an earthquake has juxtaposed two contrasting scenarios. Amidst the pandemic, individuals were encouraged to curtail their social interactions and remain at home. Following the earthquake, pandemic-related considerations were factored into sheltering arrangements, prioritizing warm and enclosed spaces, social distancing measures, and limiting the number of occupants. Early on, the increased demand for tents also serves as an indicator of the pandemic's impact, necessitating a greater quantity of tents than would typically be required.

3.1.3. Key Figures

The key figures of most concern in earthquake-related situations are examined in this section. **Earthquake victims** assume a central role in research and post-disaster recovery endeavors. They can be classified into three groups based on their housing situations and personal relationships with their homes. Survivors of collapsed homes are those who have survived and stay near the debris, focusing on rescuing loved ones and recovering valuable possessions. Uninhabitable homes, standing, are those whose homes are still standing but uninhabitable due to severe damage. They await inspections and evacuation updates, finding outdoor shelter and addressing shelter needs collectively. Residents of habitable homes, despite fearing aftershocks, prefer staying outside due to primary concern, planning to return home once subside, accessing essential needs and temporarily staying in resettlement areas or parks. The above classification provides a comprehensive framework for understanding and anticipating the needs and behaviors of individuals.

Earthquake victims discussed their primary concerns, focusing on individuals like children, the elderly, relatives, and pets. Relatives and friends were crucial first responders, providing support and comfort. Participants reached out to their relatives via social media, phone calls, and internet connectivity.

Following concerns for **relatives**, earthquake victims expressed a heightened sense of worry for children, particularly those residing in tent areas. Given the unique needs of **children**, they require special care and attention during large-scale disasters, which are crucial for their well-being (Ersoy

& Koçak, 2016; Kitayama et al., 2000). To address this concern, an initial volunteer group was organized to tend to the needs of earthquake-affected children. Many volunteers visited tent settlements to engage with children and involve them in recreational activities, aiming to alleviate the psychological impact of the earthquake on these young individuals. The care and well-being of children have been a focus of news reports and videos, with various initiatives involving volunteers, NGOs, and the government. Activities include painting classes, open-air theaters, and sports programs.

"My very closest friend already performs on the street, has organized events there, mostly for children. They played games with the children so that they would not be affected by that situation too much. He went almost every day. A lot of people participated in these events. (P5)"

The elderly constitutes another demographic that is notably vulnerable and requires significant assistance in the face of a severe catastrophe. They are more susceptible to the psychosocial effects stemming from such disasters (Ticehurst et al., 1996; Zhu & Sun, 2017). The earthquake has led to the relocation of elderly individuals to their families, posing challenges in tent settlements and requiring adaptation. Organizations, state-owned social care centers, and specialized professionals worked to address these needs, with special attention given to elderly, disabled, and hospitalized individuals.

Concurrently, individuals are actively deliberating strategies for safeguarding their **pets** in the event of an earthquake. Online news sources reveal that municipal shelters have made extensive provisions to accommodate animals rescued from earthquake debris, with designated sections specifically for these animals. Participant expressed the following concerns.

"I always had such worries after the earthquake. If there is an earthquake at night, which cat will I take first? Should I take the box or carry it on my lap? Can I wear its collar? (P3)"

Volunteers played a crucial role in recovery efforts, including aid transportation, distribution, and care for survivors. However, the abundance of volunteers led to challenges in organization. A large group, known as "disaster tourists," engaged in assistance without a structured approach, distributing food in dispersed tent areas without proper hygiene and pandemic precautions. Within the scope of this study, it is worth noting that social media influencers who conduct documentary-style street interviews and record visual materials comprise an alternative subtype of disaster tourists. The unnecessary congregation of individuals has emerged as a significant contributing factor to the escalation of the pandemic.

The key figures related to the pandemic are those who were under quarantine during the occurrence of the earthquake, as well as those who had direct contact with them. The main focus of pandemic response tactics was to enforce isolation and quarantine measures for those who received a positive diagnosis for the virus. As a result of the earthquake's devastation, these individuals were unable to stay in their homes for the purpose of quarantine. During the chaos of the earthquake, it was impossible to distinguish persons who were under quarantine and who had direct contact with them. Consequently, the action implemented to address one catastrophe was rendered futile by another catastrophe. Hence it is known that following the earthquake, the number of pandemic cases in the area rose.

3.1.4. Other Codes

The other codes encompass issues that were not explicitly queried to the participants, but emerged prominently during the interviews and were subsequently corroborated by supportive materials. **Social media** has played a significant role in this context. In recent years, social media has assumed a pivotal role in crisis management (Houston et al., 2015). It plays a fundamental role in disseminating information to institutions, facilitating interactions, and revealing responses to various issues (Mavi, 2020; Yin et al., 2020). During the interviews, the significance of social media emerged as a recurring theme. All participants unanimously concurred that social media proved to be invaluable for gathering and discerning requirements. Remarkably, despite the absence of

specific social media-related questions in the study's design, participants consistently emphasized the significance of this aspect. Selected participant quotes illustrating this viewpoint are provided below.

"The greatest advantage was social media. Because I think the management was not at all equipped. Thanks to social media, a great deal was arranged. (P3)"

"Help places and needs were constantly shared on social media. I always looked at the lists there, looked at the needs and collected them ...(P6)".

"Social media is something that allows previously blocked traffic to flow... (P7)".

Furthermore, it was noted that individuals or accounts with significant visibility (those boasting a larger number of followers) on social media platforms were often approached for assistance and to disseminate information about the needs in the earthquake-affected area.

"I think, thanks to our people and our social media power, that place has turned into a gathering area and a shelter. Because after most people came there, we used social media very well. To make up for the deficient there. With the power of social media, many companies came to the field before municipal and state aid. There are many brands we have worked with before, brought tea, coffee and even filter coffee. (P9)"

Additional significant issues, beyond those related to social media, included deficiencies in organization and shortcomings in local administrative management. Participants highlighted the being unorganized of the municipal and administrative administration under this subject, which was categorized as **a lack of organization**. The literature covers processes related to post-earthquake recovery, rehabilitation, and reconstruction (Inzulza-Contardo, 2014), often focusing on a brief timeframe, such as the immediate aftermath of the earthquake and the arrival of essential supplies. This crucial period, lasting approximately 72 hours (French et al., 2019), represents the time when people are most in need of assistance and when deficiencies in organizational capacity become most apparent.

Volunteers in tent settlements reported organizational shortcomings, with disorganization being a significant concern. Many found the municipality's assistance insufficient, as evidenced by news reports and street interviews. Content produced after the earthquake supports these comments, with meal distribution processes in densely populated areas like the Aşık Veysel Recreation Area resembling a fairground, characterized by overcrowding, and clothing being haphazardly piled up. City officials were observed visiting tent areas with a large entourage, displaying behavior that appeared disconnected from the realities of the pandemic as they interacted with citizens and even took photographs with those who requested them.

Post-earthquake assessments reveal that volunteers' inadvertent actions compromised pandemic precautions. Individuals affected by the earthquake expressed discomfort as volunteers repeatedly approached them. Organizational inadequacies were primarily due to unregulated volunteer interventions. Established institutions like AFAD, municipal authorities, and the Red Crescent effectively distributed aid and sustenance, while meal service companies and volunteers' unstructured efforts led to unnecessary movement and increased risks of disease transmission. These factors exacerbated pandemic-related risks. This circumstance, in contravention of social distancing measures, heightened the risk of disease transmission within crowded settings, ultimately culminating in a dramatic upswing in COVID-19 cases in Izmir and its surrounding areas.

4. Discussion

Disaster resilience requires the coordinated involvement of multiple actors, including **government institutions, non-governmental organizations (NGOs), community groups, and academic or expert bodies**. Each of these actors has distinct but complementary roles in both the immediate response and the longer-term process of strengthening urban resilience. The findings of this study highlight several critical issues, such as the importance of green areas, social media use,

and the provision of essential services like electricity, clean water, and heating that can be directly linked to these actors' responsibilities. Table 4 summarizes a roadmap that distributes the recommended actions across these different actors, ensuring that the empirical insights derived from the fieldwork are translated into concrete, actionable strategies.

Table 4 Roadmap for Strengthening Urban Resilience

Actors	Recommended Actions
Government	• Make sure that preparations for disaster preparedness include enough space for housing, heating, electricity, and clean water. • Designate and publicize official assembly areas. • Integrate urban green spaces into resilience planning.
NGOs	• Support aid collection and distribution systems. • Provide psychosocial and educational support, especially for children and elderly. • Assist in the organization of volunteers to prevent uncoordinated aid.
Community	• Strengthen self-organization and mutual aid networks. • Use social media effectively for information sharing while avoiding misinformation.
Academia / Experts	• Create policies for incorporating social media and digital tools into crisis management. • Contribute to risk mapping and planning for multifunctional urban green areas.

As summarized in Table 4, the proposed roadmap links the study's key findings to the roles of different actors. The co-occurrence of an earthquake and a pandemic represents a distinctive event warranting in-depth investigation (Gök Tokgöz & Altın, 2023). Upon reevaluating the themes and topics discussed following the tragic event of living through an earthquake and pandemic simultaneously, the following subjects come to light in briefly.

Particular needs and deficiencies; the city collaborated to develop answers when destroyed homes created an immediate demand for shelter. While allocating resources was a significant difficulty, aid providers were encouraged to prioritize vital needs through the use of social media. The city demonstrated flexibility in handling multiple crises simultaneously, utilizing volunteering and community involvement for short-term relief and long-term pandemic evaluations.

The concept of key places should be given particular attention, particularly in significant events that alter spatial dynamics, such as earthquakes. The city faced a complex challenge during the earthquake and pandemic, demonstrating its resilience and adaptability. Residents sought safety in open areas, such as parks, gardens, and waterfronts, and used urban green spaces as assembly areas. These areas served as natural gathering points during disasters, showcasing the community's resourcefulness.

The city's disaster management strategy prioritizes earthquake victims, including vulnerable groups like children, the elderly, pets and disabled individuals. Despite challenges like disaster tourists and lack of coordination, resilience is evident in unforeseen circumstances.

The cited flaws in other codes primarily were around social media and organizational aspects. Social media played a crucial role in disseminating information, coordinating relief efforts, and gathering real-time data on earthquake victims' needs. It has become evident that many issues arising from a lack of organization, compounded by the earthquake and pandemic, find solutions through social media. Interaction and communication are integral aspects of the resilience concept (Crowley et al., 2012). In this context, it can be asserted that the judicious use of social media plays an effective role in enhancing the resilience of cities. However, the city faced challenges in

managing the influx of aid and volunteers, highlighting its capacity for self-improvement and adaptation.

The study emphasizes the importance of earthquake preparedness in regions susceptible to seismic activity, highlighting the impact of a significant earthquake in Turkey in February 2023, which further highlighted the need for ingrained practice in such situations. The magnitude of the February earthquake resulted in heightened demands, as it impacted ten urban centers. In contrast to the Izmir earthquake, assistance was provided to this area not only from nearby cities, but from many locations throughout Turkey. Dedicated facilities for the gathering of necessities and assistance were established in every city, with key places once again assuming a significant role. The role of urban green spaces during the February earthquake was also of paramount importance. Tent facilities for earthquake survivors were once again established in these green areas and sports halls. This reiterated the significance of green spaces as safe havens for the population. The key figures identified in our study once again garnered attention during the February earthquake, as highlighted in news reports. The lack of organization and the role of social media were seen again in this earthquake.

5. Conclusion

Natural disasters like earthquakes and pandemics can severely damage cities, causing resource losses and reduced resilience. Turkey, an earthquake-prone country, is particularly vulnerable to these disasters. In this regard, earthquake-resilient urban designs should be prioritized for implementation in earthquake-prone locations. Buildings and green spaces should be properly planned so that they can serve as shelters in the event of an earthquake and other disasters.

This study emphasizes essential principles, critical urban areas, and deficiencies in urban resilience in the context of the combined impacts of earthquakes and pandemics. Future studies could build upon the findings of this research by examining the coexistence of multiple and overlapping disasters, such as earthquakes, pandemics, and climate-related events. Employing more detailed quantitative methods alongside qualitative approaches would allow for a deeper understanding of urban resilience dynamics. In addition, comprehensive investigations into administrative and organizational structures are needed to reveal existing shortcomings and propose more effective governance models. Such efforts would not only enhance theoretical knowledge but also provide practical guidance for policymakers, local authorities, and community-based organizations.

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CRediT Authorship Contribution Statement

Mehmet Ali Altın: Writing – review & editing, Methodology, Investigation, Analysis, Data curation, Conceptualization. Özlem Gök Tokgöz: Writing – review & editing, Writing – original draft, Methodology, Investigation, Analysis, Data curation, Conceptualization, Data visualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Data will be made available on request.

Ethics Committee Approval

The study was conducted in accordance with the Ethics Committee approval dated 04.10.2021 and numbered 14/1.

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