International Journal of Sustainable Development and Planning
Vol. 20, No. 11, November, 2025, pp. 4739-4750
Journal homepage: http://iieta.org/journals/ijsdp

Rhythms of Resilience: Residents' Perspectives on Public Space and Seismic Adaptation in Buca, İzmir

Dania Mohammad Abdelaziz*, Saeed Hussein Alhmoud

Department of Interior Design, Faculty of Art and Design, Applied Science Private University, Amman 11937, Jordan

Corresponding Author Email: d_abedelaziz@asu.edu.jo

https://doi.org/10.18280/ijsdp.201117

Received: 17 October 2025
Revised: 18 November 2025
Accepted: 19 November 2025
Available online: 30 November 2025

Keywords:
adaptation, disaster preparedness, public parks, public space, resilience, seismic risk, temporary home, urban governance

ABSTRACT

This study examines how Hasan Aga Park in Buca, İzmir functioned simultaneously as an everyday public space and emergency infrastructure after the 30 October 2020 earthquake, interpreting residents' behaviors and perceptions through the lens of urban "rhythm." A qualitative design combined field observation with a retrospective cross-sectional survey of 40 residents who used the park during and after the event. Descriptive statistics and thematic analysis were integrated to map patterns of movement, gathering, perceived safety, facility adequacy, and emotional meaning. Residents rapidly converged on the park due to proximity, familiarity, and visibility, redefining it from a leisure landscape to "temporary home" and "safe zone." Accessibility and municipal/volunteer coordination underpinned feelings of safety and order, while inflexible furniture and inadequate sanitation constrained adaptability. Design priorities emerging from the data include modular furnishings, shaded/covered areas, accessible paths, reliable lighting and power, clear wayfinding, and provisions for water, toilets, and storage. Embedding preparedness features and multifunctionality across a network of neighborhood parks can strengthen community cohesion, speed emergency response, and transform ordinary public spaces into dependable nodes of urban resilience.

1. INTRODUCTION

A city is an interconnected network system that incorporates buildings, infrastructure, social communities, and open spaces to form dynamic urban environments [1]. İzmir is Turkey's second most populous and third largest city, covering an area of 12,012 km² [2]. In recent decades, the city has been repeatedly affected by earthquake hazards, intensified by overcrowding and inadequate land-use planning [3]. These conditions underscore the urgent need to strengthen urban disaster resilience. Cities today are exposed to multiple and overlapping stressors, including natural hazards such as earthquakes and floods, as well as human-induced pressures such as urbanization and environmental degradation. These stressors may occur suddenly or unfold gradually over time, as in the case of climate change. In parallel, the global frequency and impact of natural disasters have increased in recent years [4], amplifying economic losses, indirect consequences, and human casualties [5].

Urban resilience is now a central concern in planning and architecture. It refers to the capacity of urban systems to anticipate, absorb, adapt to, and recover from disturbance while maintaining essential functions [6]. In the past decade, academic and institutional interest in resilience has grown markedly [7, 8]. This shift reflects a move away from reactive risk management toward a proactive understanding of urban safety [9]. Urban resilience integrates engineering, socio-ecological, and governance perspectives. It describes the ability of complex urban systems to withstand external pressures and reorganize into stable or improved states [7]. Strengthening resilience and supporting the relationship between communities and livelihoods are especially important in disaster contexts [10]. Current approaches increasingly emphasize building resilient communities rather than focusing only on structural vulnerabilities [11]. Policymakers and experts increasingly view resilience as a key framework for addressing urban challenges. This perspective positions resilience as a social and spatial phenomenon rooted in everyday urban life, rather than as a purely technical concept.

Within this framework, public spaces play a key role in shaping urban resilience. Previous research shows that sustainable and healthy urban design must integrate both tangible and intangible dimensions of livability, including well-being, social vitality, and psychological comfort as indicators of resilient urban environments [12]. Scholars also argue that the design and containment of public spaces should be guided by analytical and evidence-based approaches rather than intuition alone, addressing both quantitative and qualitative dimensions of urban performance [13]. While much of the literature has focused on the physical determinants of seismic vulnerability—such as site selection, building typology, and zoning parameters [14]—comparatively less attention has been given to the social and spatial dimensions of resilience as they unfold within public open spaces during and after disasters.

Recent studies show that the redesign and use of

neighborhood public spaces can enhance psychological well-being, social cohesion, and recovery during crises. For example, transforming underutilized residential open spaces into green and social environments has been shown to reduce distress and strengthen social ties during epidemics and periods of enforced isolation [15]. Post-crisis research following the COVID-19 pandemic also indicates that public perceptions of urban open spaces have shifted toward preferences for spatial safety, legibility, openness, and psychological comfort [16]. These findings suggest that public spaces function not only as recreational environments but also as adaptive infrastructures that support communities during severe disruption.

Despite this growing body of work, a key research gap remains in understanding how public spaces operate at once as everyday urban environments and as emergency infrastructures during seismic events, particularly from residents' perspectives. Most existing studies continue to prioritize engineering resilience, while the social and spatial dynamics of collective behavior, emotional attachment, and everyday use during crises remain underexplored.

To address this gap, the present study investigates how Hasan Ağa Park in Buca, İzmir operated as both a routine public space and an emergency refuge after the 30 October 2020 earthquake. It explores residents' behaviors, safety perceptions, gathering patterns, and the evolving emotional meanings attached to the park. Lefebvre's notion of urban rhythm is employed as an analytical lens to interpret shifts in spatial use and social behavior, offering insight into how everyday life reorganizes under sudden disruption and how public spaces can be designed and managed as integral elements of urban resilience.

1.1 Public spaces as resilient multifunctional space

Open spaces include green open spaces, non-vegetated green built-up areas, and undeveloped land [5]. Public spaces should embody safety, healthiness, accessibility, and resilience [17]. They serve three main functions: delivering public services, facilitating social interaction, and fostering culture and creativity. These spaces shape the city's character and rhythm, acting as hubs for community gatherings, relaxation, cultural events, and sports [5]. Their role extends to supporting social interaction, influencing community behavior, and fostering continuous learning, thereby strengthening social capital and adaptability [7].

During disasters, open spaces gain added importance by offering surplus capacity and essential ecosystem services. Vacant land, in particular, provides flexibility and spare capacity, serving as a critical backup during crises [18]. Notably, open spaces also support reconstruction, new development, and urban renewal in post-disaster recovery phases [19].

Urban resilience influences many urban systems, including the landscape, spatial layout, infrastructure, economy, mobility, and emergency management. Well-distributed and high-quality open spaces play a central role in emergency response and city recovery [5].

Public spaces that integrate natural elements, good design, and accessibility contribute directly to post-disaster functionality [20]. The presence of vegetation, water, and open spaces positively impacts health and encourages outdoor activities, exercise, and social interaction [21].

Researchers underline the importance of community parks for enhancing post-disaster food security [22]. Parks should also include portable toilets linked to sewer systems and able to operate independently of water and electricity. Improving both the quality and quantity of public open spaces is essential for enhancing urban life and making these areas more attractive and livable. The changing relationship between residents and public spaces after disasters should guide the development of post-disaster green infrastructure.

2. URBAN LIFE THROUGH THE NOTION OF RHYTHM

Cities are processes and forms conglomerated together [23]. Both coexist and are interdependent. Urban form is a result of connections, especially between built form and open space. It is essential to assess a city's open space/built form relationship in terms of quantity, distribution, and layout (at the city size) and structure and function (at more specific scales). The spatial kinds for their ability to connect, enliven, and support urban life, such as public-private property, temporary unoccupied spaces and car parks, road verges, and the residual space between buildings should be addressed. To examine the public spaces' capacity to adapt to seismic resilience, this research will look at "rhythm" as an analytical tool that Lefebvre introduced [23, 24]. As a field of knowledge, the concept of Rhythm is attached to perceptions of time, repetition, and restoration of relationships, which is found in urban life and movement through space.

Lefebvre's conception of rhythm is embedded within his broader theory of the production of space, where spatial practices unfold through temporal repetitions, variations, and accumulations. Rhythm structures everyday life by linking habitual movements, working patterns, and the routines that bind home, street, and urban environments. These cyclical temporalities sustain continuity yet remain open to disruption and transformation [25]. Within Lefebvre's triad, rhythm is implicit in the interplay between perceived space—shaped by daily practices—conceived space—produced through planning, representation, and abstraction—and lived space—formed through memories, symbols, and embodied experience. Together, these dimensions show that space is never static but continually produced through layers of temporal activity, where rhythms of social life create, modify, and contest the spaces in which they occur [24].

Lefebvre discusses different perceptions of space and time in the understanding of everyday life. As he articulates, *everyday* has a dual meaning: the mundane, the everyday, and the repetitive, what happens every day. Space, time, and everyday life should not be addressed independently. The role of public space plays in residents' lives should be focused on the mono-rhythmic conceptualization of cities, spaces, time, and society and should include radical moments [17]. Lefebvre developed the 'theory of moments'. In which moments are significant times when things can be altered-*moments of crisis* in the original sense of the term, such as earthquakes which the public space should deal with. Has this public space succeeded in dealing with such a moment? In these moments, there is a gap between rhythm beats or a new beat. As much as rhythm analysis concerns the everyday beats, there is always an emerging event, "difference, loss, recollection, contrast, and change", that introduces itself into the "mono-rhythmic, memory, identity, continuity and repetition". Framing urban experience through rhythm thus allows the study to interpret

spatial behavior not as isolated reactions but as patterned responses that reveal how communities negotiate stability and disruption.

2.1 Public space as a "home", "survival space", and "second city"

Immediately after an earthquake, public spaces become the "*second city*" in terms of the multifunctional space they turn to, a "*temporary home*" in terms of the security it serves for residents, and a "*survival space*" in terms of its role in rescuing residents' lives. The "second city" network provides safe places for escape, community gatherings, and temporary shelters when an earthquake strikes. It delivers critical ecological services, products, health services, and commerce. With operational bases for reconstruction, open space is a recovery and adaptation agent. When disaster strikes, open space (together with the social community) contributes the most to resilience during the emergency response (evacuation) and reconstruction [26]. It is critical to plan ahead of time to ensure the capacity of open spaces and social communities to heal after an earthquake. Public space is becoming a temporary home for thousands of people who need to adapt rapidly to their new world for days, months, or even years. They act as group assemblies and temporary shelters, distribution of goods and services, trade re-establishment, commemoration, and storage of polluted or dangerous materials [27]. In the second city, immediate needs are addressed, such as evacuation, medical assistance, communication, social gathering, shelter, and food distribution. It is in the 'people's' subconscious that the park has such significance. They represent themselves without boundaries between different groups of people, different socio-economic statuses, but everyone in this safe space had to stay and be together. It is such a value. This redefinition of public space as both refuge and reconstruction medium situates it within the broader discourse on socio-spatial resilience, emphasizing its dual identity as everyday environment and emergency infrastructure.

3. METHODOLOGY

3.1 Setting the scene

Izmir was hit by a 6.6 magnitude earthquake on 30th October 2020, and it caused a small tsunami which damaged several coastal towns in the Aegean region [28]. People rushed into vacant lands, parks and parking lots. Approximately fifteen thousand people had to sleep in either parks, the homes of relatives, or public recreation areas, amongst other places, because numerous buildings were damaged.

The İzmir Metropolitan Municipality has created designated assembly areas that would be used in the event of an emergency. These assembly areas are chosen due to their proximity to hospitals, schools and other important services, and also because they are far from any potential hazards. The locations were also chosen because they are easy for people with mobility problems to reach. The Buca district has 37 of these areas [29].

The significance of open spaces in the handling of a disaster is highlighted by these conditions. Parks and empty land act as a refuge in times of crisis and also provide a place where people to come together. Despite this importance, the influence of everyday urban open spaces on social resilience remains understudied [5].

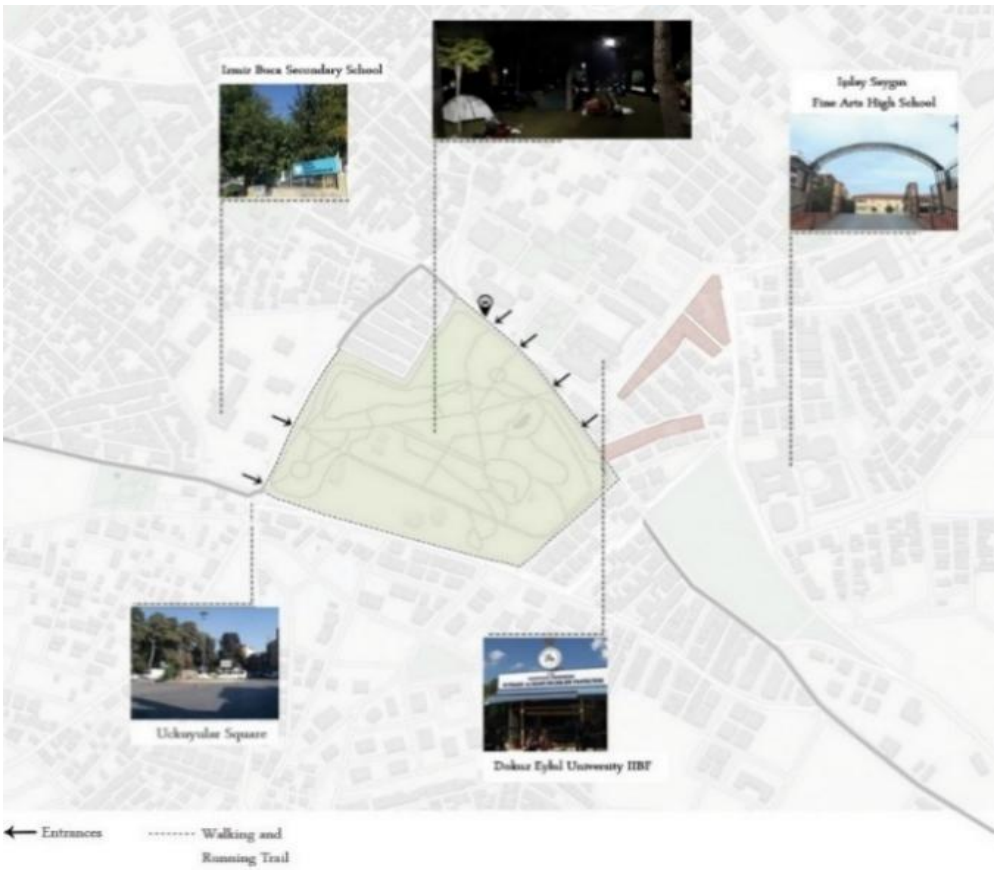

Figure 1. Hasan Aga Park

3.2 Study area

Situated in the Buca, Izmir, Hasan Ağa (Hasanağa) Park served as the garden of a Levantine residence being transformed into a public park in 1926 [30], see Figure 1. It is one of the largest officially designated assembly areas in Buca, with a formal capacity of 46,824 people (Table 1), making it a key site within the district's emergency planning framework [29]. Its position in the centre of Adatepe Neighbourhood and accessibility position it as a typical example of neighborhood-scale assembly areas across İzmir.

The park was put into immediate use on 30th October 2020 as a primary gathering and evacuation point. As it was a highly visible and accessible spot and the residents perceived it to be a safe place, they congregated in the park. The authorities made emergency lighting and essential supplies available and gave medical assistance. Residents chose to stay in the area for several days and used the park for community activities after the disaster, as shown in Figure 2.

The park was selected because of its physical layout, municipal role, and the researchers' proximity to the site, which facilitated detailed observation and engagement with residents.

Table 1. The largest assembly areas in Buca, Izmir [29]

District	Neighbourhood	Zoning Status	Area (m^2)	Capacity (2.50 m^2 per Person)
Buca	Adatepe	Park	117.059	46.824
Buca	Inkilap	Park	74.489	29.796
Buca	Efeler	Park	42.364	19.946
Buca	Şirinkapi	Park	25.600	10.240

Figure 2. Residents sleeping at Hasan Aga Park on the earthquake day

3.3 Data collection

Data were collected in 2024 using a retrospective cross-sectional survey administered face-to-face. The instrument (Appendix 1) was developed based on relevant literature on disaster behaviour, public space use, and urban resilience. The questionnaire contained both closed-ended items (e.g., evacuation behaviour, duration of stay, facility use, perceived safety) and open-ended items designed to capture emotional meaning, perceived limitations, and reflections on the park's role during and after the earthquake.

To reduce recall bias, all questions referring to the disaster period were prefaced with the statement: *"Thinking back to the first week after 30 October 2020…"*, accompanied by a short timeline summarizing the main events. Questions were structured from factual behaviours to more reflective perceptions to support accurate recollection.

Field observations conducted by the researchers during and after the earthquake contextualized the survey findings and provided spatial–temporal insights into movement patterns, congregation areas, and municipal support activities. These observations served as an important secondary data source to triangulate with survey responses.

3.4 Participants and sampling

A purposive sampling strategy was used to include only those with firsthand experience of using the park during or immediately after the disaster. Participants were recruited through in-person intercepts near the park and snowball sampling. The final sample consisted of 40 participants, achieving data saturation [31]. Although the study employed a retrospective cross-sectional survey, the open-ended items produced qualitative data. Accordingly, sample adequacy was assessed using qualitative sampling and saturation guidelines. While researchers have proposed general guidelines, such as 6 or more for phenomenological studies and around 35 for grounded theory or ethnography [32], 12–20 for interviews [33], 20–30 for grounded theory [34], and 5–20 depending on sampling strategy [35], these numerical suggestions often lack detailed justification. Discussions emphasize that qualitative research prioritizes data quality and richness over numerical targets or statistical generalizability [36]. Therefore, sample adequacy is assessed by the depth and relevance of the insights rather than by adhering to fixed numbers.

Many qualitative studies rely instead on the principle of saturation, where additional participants are included until no new themes emerge [37, 38]. Saturation is widely recognized as the point at which further data collection ceases to contribute new analytic insights [39]. While some scholars argue that redundancy can occur with as few as 2-10 participants [40], qualitative samples are generally much smaller than those required for quantitative designs [41]. Other guidance suggests that 25–30 participants are often sufficient to achieve saturation in thematic analyses [42]. Nonetheless, scholars caution against treating saturation as a rigid numerical threshold, noting that it depends on the richness and adequacy of the data, the research design, and the analytical depth required to answer the research questions [38].

Participation was voluntary and anonymous. All participants were informed about the purpose of the study before participation, and verbal informed consent was obtained. No personal identifying information was collected, and all responses were treated confidentially and used solely for academic research purposes. The study followed standard ethical research principles for social surveys involving human participants. These procedures align with established ethical principles of autonomy, informed consent, and confidentiality in research [43-45].

3.5 Data analysis

Combining both qualitative and quantitative analysis was undertaken to investigate the attitudes of the residents and their behaviour. The results from the survey's multiple-choice questions were examined using statistical techniques to calculate means, medians, modes, etc., so as to describe

respondents' age, sex, and other demographic characteristics, the manner in which they were evacuated, and which facility they used. Open-ended responses were examined using thematic analysis. Coding began with examination of the data to identify consistent themes including emotional experience, perceived limitations, duration of stay, movement, and gathering in the park. In this paper Lefebvre's concept of rhythm is examined through three spatial elements - conceived, perceived and lived space. The analysis was structured and the resultant data coded according to particular dimensions. For greater accuracy, findings were triangulated with field observations.

4. RESULTS

A survey was carried out among 40 residents who had visited the Hasan Ağa Park both before and after the earthquake which occurred on the 30th October 2020. A summary of the relevant data include frequencies, and percentages concerning safety perceptions, the length of stay, the usage of facilities, and patterns of behavior. The open-ended responses, relating to spatial experience and emotional reaction, were examined in order to identify the themes which appeared.

Table 2. The socio-demographic characteristics of the participants

Characteristics	Frequency	Percentage
Gender		
Male	17	42.5%
Female	23	57.5%
Age group (years)		
<18	4	10%
19-25	12	30%
25-39	13	32.5%
40-59	5	12.5%
>60	6	15%
Status		
Student	16	40%
Employed	10	25%
Retired	6	15%
Other	8	20%
Material status		
Married	13	32.5%
Divorced	9	22.5%
Single	18	45%
Educational level		
School level	7	17.5%
bachelor level	23	57.5%
higher studies	10	25%
Health status		
No problems	29	72.5%
Severe disability	4	10%
Minor disability	2	5%
Other	5	12.5%

4.1 Participant profile

The sample exhibited a range in age, socio-economic status, education and health, and gender (see Table 2). The participants in the study were comprised of forty percent students, twenty-five percent people with jobs, fifteen percent pensioners and twenty percent other categories. Forty-five percent of participants were single, 32.5% were married, and 22.5% were divorced. Almost all the students have completed their school education with 17.5% students going on to get a bachelor's degree and 25% pursuing higher studies. The scope of the study covered people with a wide age range and various socio-economic backgrounds as well as people with different mobility and health conditions.

4.2 Immediate response and evacuation patterns

About 80 percent of the respondents went to Hasan Aga Park immediately after the earthquake. About 12 percent moved to open spaces such as streets or other public squares, while eight percent took refuge with relatives. The main reasons for choosing the park were its safety, with 78% of respondents citing this, and the fact that it was near their homes with 70% of the respondents. Followed by familiarity with the space and the presence of others (55%). A collective instinct drove the evacuation. One witness reported "I just followed all the others who were running to the park" (P9). "The area is safe, we have been there before", said one of the residents.

4.3 Duration of stay and social companionship

Most people left with family, 25% with friends or neighbors and a small minority of 10% on their own. 47.5% had stayed in the park for one night only. 15% of the group stayed in the park for more than a day, see Figure 3.

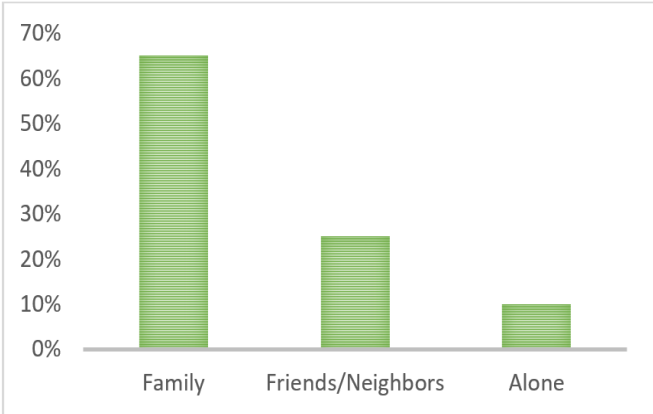

Figure 3. Social companionship during evacuation

4.4 Perceived safety and accessibility

The majority of participants felt safe, with 50 percent saying they agreed that the place was safe and 27.5 percent saying they strongly agreed as depicted in Figure 4. Almost all the respondents said that the park was within a 15-minute walking distance from their houses. A high proportion of respondents associated safety with the park's open layout, its high level of visibility and the provision of lighting.

4.5 Rhythmic themes of spatial experience

A thematic analysis of residents' experiences of Hasan Ağa Park revealed three inter-related rhythmic patterns, which occurred both before and after the earthquake. The concepts of perceived, conceived and lived space as described by Lefebvre arose from resident accounts of movement, duration, adaptation and the emotional significance of space. The quotes used here are based on a summary of repeated themes which came up in interviews rather than the exact words of the people

interviewed.

Perceived space was expressed through residents' descriptions of immediate movement and spatial orientation following the earthquake. Evacuation was commonly described as instinctive and shaped by habitual daily routines rather than conscious decision-making. One resident explained, "At that time, you don't have the pleasure to think deeply, there is no time, you have to do something without even planning… I didn't think about where to go..." Another participant emphasized recognition over choice, stating, "When I reached the park, it felt like I had arrived somewhere familiar to me... in the middle of this chaos". Several accounts highlighted the role of visibility and openness in slowing panic and guiding movement, as one resident noted, "all the buildings, cars, everything was shaking… but at the park there is no fear of something to fall over you. That is the reason was I escaped there..."

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	(N = 40)	
	1	2	3	4	5	M	S
Section B: Earthquake Experience and Immediate Response							
14. I felt safe while staying in the park after the earthquake.	1	2	6	20	11	3.95	77.5%
Section C: Park Facilities and Functional Performance							
18. The support efforts provided during my stay met my needs.	2	3	9	17	9	3.70	65%
Section D: Long-Term Perception							
21. Sharing the park with others helped me manage fear or stress.	3	5	6	18	8	3.58	65%

Key M: Mean S: Satisfaction (Percentage of positive responses of agree and strongly agree)		
	29–40 responses	Very high agreement
	17–28 responses	High agreement
	6–16 responses	Moderate agreement
	Below 5 responses	Low agreement

Figure 4. Residents' perceptions of safety, support provision, and stress relief

Conceived space became evident as residents remained in the park for longer periods. Participants described a growing awareness of how the space was organized and the limits of its design as time passed. One resident noted, "staying at the park in the first couple of hours was good, we didn't feel that there were a shortage of some service or any problems in design, but after we had to stay over till next two days… you could feel its limits." Others reflected on how fixed elements shaped their behavior, explaining, "there were benches located in different parts in the park, high pavements, and other elements which we used it for sitting, we had to adjust ourselves to the space." Several participants described informal attempts to impose order, such as placing belongings to define small areas.

Lived space was articulated through residents' descriptions of waiting, atmosphere, and emotional experience in the park. Participants frequently emphasized the altered perception of time and the presence of prolonged stillness. Others described heightened awareness of surroundings and shared presence. Nighttime was often described as a shift in rhythm, as one participant explained, "I remember when it became night, all the place become quieter, kids were no longer crying or moving around, adults were talking slowly, some felt asleep while others were staring… everything was in a slow pace..."

4.6 Park functions and facility performance

The functions most frequently identified as essential were a place to stay, a shelter (85%), food and water supply (82.5%), power supply (80%), and medical aid (55%). There was considerable satisfaction with emergency lighting and the provision of food with 85 percent of respondents expressing satisfaction. Critical needs during park use as reported by survey respondents were basic necessities. These included sanitation facilities and toilets (70%) and access to food and water (82.5%), and shelter (85%). A large proportion of those interviewed felt that safety and security were of paramount importance, citing clear visibility and good lighting as key factors. Just over half, that is 55%, of those who took part believed that medical support was an essential part of their service. Many respondents emphasised the importance of communication and information. Almost all of the comments highlighted the need for facilities which cater for the social and emotional requirements of users with dementia. 75 percent referred to the flexible spatial design requirements of such facilities which would include for example shaded areas and removable chairs. Community support facilities such as distribution centres and storage were also referred to by the respondents. To clarify the relative importance of the limitations reported, see Figure 5.

Figure 5. Residents' perceived hierarchy of needs in Post-Earthquake Park use

4.7 Facility limitations and gaps

While seventy-five percent of those questioned indicated that the current park facilities were unsuitable for emergency use, thirty respondents agreed. These individuals felt the park's features - fixed benches, lighting and planters - were not flexible enough. A significant number of the participants identified several inadequacies in the facilities. 70 percent noted the provision of toilets was insufficient and of poor quality, 45 percent felt that the area provided for shelter was inadequate and 30 percent noted a lack of information points.

A wide range of participants identified the need for sheltered areas, modular furniture and pathways to facilitate people with various disabilities. Many mentioned the absence of a safe area to sleep, pointing out that “at night, some families struggled to find a tent or place to sleep in… Because of a lack of adequate shelter, people lay down wherever they could find space”. The absence of clear guidance also affected evacuees: “we wanted to know what happened to other parts of the city, but there was no one to ask for a reliable information… we were wondering what will happen next.” These findings are illustrated in Figure 6, which compares facility use, satisfaction, and reported shortcomings.

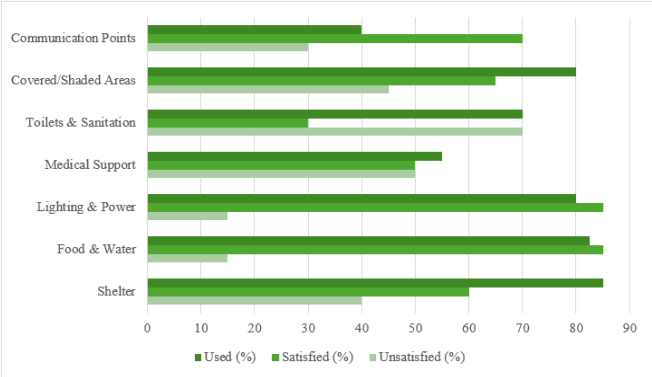

Figure 6. Usage, satisfaction, and reported gaps in park facilities during the emergency

4.8 Institutional and community support

Respondents 87.5% (that is 35 people) noted that aid from the municipality of Buca and the volunteers was crucial, mainly for providing food, water, blankets and medical treatment. Forty-two point five percent of the participants indicated that the support services they had received met their needs, with 22.5% of those expressing the view that the services met their needs very well (Likert 4-5), see Figure 4.

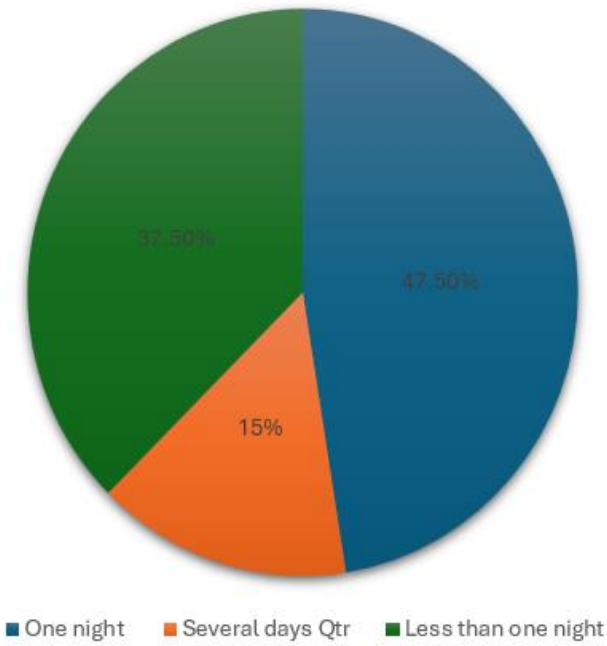

Figure 7. Duration of stay among residents who evacuated to Hasan Ağa Park

4.9 Duration of stay and emotional impact

Almost half of the participants (47.5% of them) spent one night in the park after the earthquake, and 15% stayed for several days, while the rest only stayed for a few days, see Figure 7. Seventy percent felt a sense of relief and safety while in the park. The initial fear felt by one resident diminished when she observed that many other people were in the same situation as she was. Seventy percent of those interviewed stated that they went to public parks more frequently after the earthquake.

4.10 Emotional meaning and post-disaster perceptions

The park was described by the people who stayed there as a "temporary home", a "place of safety" or a "gathering place". Following the earthquake a number of people reported feeling a heightened emotional connection with the park. It was a place where people could feel secure, especially during the night, as some individual pointed out. One resident said that she now uses the park more since the earthquake occurred, suggesting the event improved community cohesion; "I started coming to the park more after the earthquake because it reminds me of how people stood by each other… It's a feeling that has stuck with me". Being in the park with other people helped sixty-five percent of those interviewed to relax or deal with stress and anxiety, see Figure 4.

4.11 Future preparedness priorities

Most participants chose toilets and sanitation as the most important thing to be considered in the design of future disaster relief operations (75%). As one participant noted: “... we had to go to near cafes to use toilets, as the number of toilets in the park was not enough.” The next priority was lighting and power supply (65%). Another participant noted: “… without enough lighting we were nervous as night, ... better lighting is a must.” Followed by water and food storage (60%), alongside broader preparedness features such as emergency signage, communication points, and designated storage areas. Furthermore, other respondents highlighted accessibility challenges, “... it was hard for elderly people to move around, the paths were not designed in a good way... I saw an old woman who struggled to more around alone and i went to help her...”

5. DISCUSSION

The results of the analysis revealed rhythmic patterns in the movements, adaptations and emotional presence of residents within Hasan Aga Park. In the context urban resilience, the observations made above suggest that the ability of urban systems to withstand the impact of a disaster may be influenced by the way social groups are distributed and interconnected within the city. Rather than thinking of the perceived, conceived and lived spaces as rigid categories, this study explores how these three aspects of space evolve over time and how the spaces show resilience through a process that involves disruption, its duration and reorganization.

In the context of Lefebvre's rhythmanalysis, patterns of social, spatial and institutional resilience were observable in the ways park usage shifted and adapted following the earthquake. The daily routine of the local residents was

disrupted and they adapted their movements around Hasan Ağa Park. Here, the park, for many, provided a focal point of everyday life where the daily routine was once more restored through everybody being in the park together. It appears that the response to emergencies was not solely down to the emergency services and contingency plans in place, but rather to ordinary, informal ways of behaving that people employed on a daily basis in their city.

As important as the physical attributes of a public spaces are in earthquake emergencies, accessibility, proximity and clarity are of similar importance. Individuals travelled towards the park through familiar routes or open spaces which were visible to them. The evacuation was guided more by an awareness of the situation than by conscious decision. As Lefebvre has stated, spatial practices which occur every day are very significant when a crisis occurs. In Hasan Ağa Park's experience, it can be seen that any urban space may turn out to be a safe haven when a crisis is at hand.

Limitations in the park's layout began to show as time went by. The prolonged stay was often limited by benches that would not fold, fixed layouts, and poor facilities for sanitation. Here, the rhythmic pattern of the urban space breakdown because areas primarily used for leisure activities cannot support prolonged stays. Public spaces should retain their usability in times of crisis so that the community does not lose access to the same facilities during normal times.

For the residents, feelings and personal relationships played a crucial role in their lives. The group's presence together reduced their fear and promoted a sense of unity. The urban open space was an area in which social interactions occurred and emotional stability and a communal spirit was maintained. Here, the importance of safety lay not only in the preservation of life but also in the psychological well-being it provided through physical closeness, the shared experience of waiting and being together.

These rhythms were further influenced by local authority and community arrangements. The actions taken by the municipal authorities and the volunteers' efforts were seen as visible, persistent and repeated practices. By taking part in these actions, people became aware of their park and brought down feelings of uncertainty which existed. The overall trust in the park was boosted as a public space. This institutional rhythm aligned governance with everyday social practices, showing how resilience develops through repetition rather than isolated interventions.

The earthquake in turn also changed the residents' relationship with the park in the long term. People stated an increase in visits to public spaces following the event. Parks have become connected with social connection, the safety of residents and openness. This reflects a re-rhythming of urban life, where crisis alters everyday routines and attachments. Hasan Ağa Park became a place where locals found comfort, formed a sense of community and collective memory.

This study demonstrates that seismic resilience in urban regions is not merely a matter of urban infrastructure or planning. It emerges through everyday spatial rhythms that allow communities to reorganize life under uncertainty. Using rhythm as an analytical lens positions resilience as a social and spatial process grounded in routine practices and shared presence, rather than a one-dimensional process of recovery.

This does not mean that all public areas are effective in withstanding a disaster. In Hasan Ağa Park the users' behavior was dependent on context. It relied on accessibility, familiarity, institutional presence, and the capacity to support prolonged occupation. Since resilience will only emerge under certain conditions, it is formed by local spatial practices and governance in each region. The process of resilience is dynamic and results from interactions between communities, their physical environment and institutions.

6. CONCLUSION

This study shows that urban resilience is best understood not as a fixed condition but as a dynamic, rhythmic process shaped by the evolving interactions between people, space, and institutions. By applying Lefebvre's theory of rhythm, the research demonstrates how Hasan Ağa Park transitioned from an ordinary recreational environment into an essential refuge immediately after the 30 October 2020 İzmir earthquake.

In everyday conditions, public spaces act as social condensers that support rest, social interaction, and contact with nature, strengthening well-being and cohesion [5, 21]. During crises, however, these same spaces take on new functions and meanings. After the earthquake, Hasan Ağa Park shifted from a leisure setting to a temporary home and survival space where residents gathered for safety and emotional support. This shift reflects Lefebvre's idea that rhythms of space and life are disrupted and then reorganized in response to sudden events [23]. The park became both a physical refuge and an emotional anchor, showing how resilience can emerge from the ordinary urban environment. Everyday routines gave way to collective behaviors shaped by shared needs and uncertainty. This change highlights the dual identity of public spaces: they sustain daily social life in normal times and serve as essential infrastructure for protection and stability in moments of disruption.

Empirically, the findings show that proximity, accessibility, and familiarity shaped the first rhythm of evacuation, as residents moved toward the park along their usual paths. Once assembled, social cooperation and institutional support helped stabilize the situation, confirming that resilience relies on community networks and coordinated local services [26]. At the same time, shortcomings in sanitation, lighting, and shelter revealed how fixed and inflexible infrastructure can restrict a space's ability to adjust to sudden demands. These limitations highlight the importance of a flexible, multifunctional design that can shift smoothly from everyday leisure to emergency use [18, 20]. Such adaptability ensures that public spaces can absorb disruption while still supporting essential social and physical needs.

Theoretically, the study reinforces that resilience must be understood as a rhythmic capacity: the city's ability to absorb disruption and restore balance through cyclical patterns of collective action, rather than through linear recovery models. Rhythm as a lens repositions resilience from a purely technical or infrastructural issue to a socio-spatial phenomenon embedded in everyday life. It reveals how moments of crisis, rather than halting urban rhythms, generate new ones—reshaping how citizens move, gather, and attach meaning to space.

At the institutional level, the study highlights the limitations of conventional, top-down urban planning. As noted by Özgür et al. [46], neoliberal urbanization often imposes rigid spatial ideologies that constrain citizens' participatory engagement with public space. Hasan Aga Park's spontaneous transformation during the earthquake challenges this paradigm, demonstrating that resilience is co-produced through lived

practices rather than predetermined design intentions. Municipalities must therefore integrate participatory, flexible, and inclusive approaches into the planning and management of open spaces, ensuring that these areas can support both social life and emergency functionality.

Practically, this research calls for embedding resilience-oriented design strategies into the urban fabric. Municipal authorities and designers should prioritize essential features, because earthquakes occur without warning [47], public spaces must be pre-equipped to function as immediate, self-sustaining nodes of refuge and coordination. To operationalize these principles, public parks should incorporate design guidelines that support both everyday use and crisis functionality. This includes integrating modular seating and movable elements that can be rearranged for shelter or communal gathering; installing resilient, off-grid sanitation systems and water points; and ensuring adequate shaded or semi-covered structures that serve daily comfort yet provide protection in emergencies. Parks should include solar-powered lighting, backup power outlets, and emergency communication stations to maintain safety and coordination during disruptions. Universal accessibility—step-free paths, tactile surfaces, and accessible toilets—must be embedded to support vulnerable groups.

Incorporating fruit-bearing trees can also enhance preparedness by offering small, naturally available food sources during crises while contributing to shade, biodiversity, and everyday enjoyment. Child-friendly areas should be designed so they remain safe and adaptable during emergencies, providing open, hazard-free zones where families can gather without risk. Enhanced accessibility features—such as wider pathways, resting points, and designated support areas—are essential to ensure that individuals with disabilities can evacuate and navigate the space comfortably during both routine use and crises. Finally, on a border scale, parks should be planned as interconnected networks rather than isolated sites, allowing residents to reach safe spaces quickly and distributing refuge capacity across the urban fabric.

Ultimately, rethinking Hasan Aga Park shows how ordinary spaces can become important frameworks of resilience. The park's ability to shift between recreation and survival—between everyday rhythm and crisis rhythm—demonstrates urban adaptability in a simple, observable way. By linking Lefebvre's ideas with residents' lived experiences, this study highlights resilience as a social and spatial process that changes over time. Building this kind of rhythmic resilience across urban networks can help cities endure disruption, support recovery, and maintain continuity even in uncertain conditions.

7. LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Despite these contributions, this study is subject to several limitations. First, the nature of the survey introduces the possibility of recall bias, as participants were asked to reflect on experiences that occurred several years earlier. Although memory prompts were used to mitigate this limitation, some degree of subjective distortion may remain. Second, the findings are based on a single case study and a relatively small sample size, which limits the generalizability of the results to other urban contexts. Therefore, future research may extend this work through longitudinal investigations that track how residents' attachment to public spaces and preparedness behaviors evolve after seismic events. Comparative multi-city studies could further explore how differences in urban form, governance structures, and socio-cultural contexts mediate the rhythmic transformation of public spaces during disasters. In addition, mixed-method approaches integrating behavioral tracking, spatial analytics, and participatory mapping may offer deeper insights into how everyday urban rhythms reorganize under conditions of extreme disruption.

REFERENCES

[1] Rus, K., Kilar, V., Koren, D. (2018). Resilience assessment of complex urban systems to natural disasters: A new literature review. International Journal of Disaster Risk Reduction, 31: 311-330. https://doi.org/10.1016/j.ijdrr.2018.05.015

[2] TurkStat. Reports of turkish statistical institute. https://turkstatweb.tuik.gov.tr/Start.do.

[3] Kutluca, A.K., Ozdemir, S. (2008). Landslide, earthquake and flood hazard risks of Izmir metropolitan city: A case of Altindag landslide areas. International Journal of Geological and Environmental Engineering, 2(12): 159-164. https://doi.org/10.5281/zenodo.1333087

[4] Ritchie, H., Rosado, P., Roser, M. (2022). Natural disasters. Our World in Data. https://ourworldindata.org/natural-disasters, accessed on Jan. 16, 2025.

[5] Koren, D., Rus, K. (2019). The potential of open space for enhancing urban seismic resilience: A literature review. Sustainability, 11(21): 5942. https://doi.org/10.3390/su11215942

[6] Mendonça, D., Amorim, I., Kagohara, M. (2019). An historical perspective on community resilience: The case of the 1755 Lisbon earthquake. International Journal of Disaster Risk Reduction, 34: 363-374. https://doi.org/10.1016/j.ijdrr.2018.12.006

[7] Koren, D., Kilar, V., Rus, K. (2018). A conceptual framework for the seismic resilience assessment of complex urban systems. In the 16th European Conference on Earthquake Engineering, Thessaloniki, Greece, pp. 18-21. https://www.researchgate.net/publication/326479539_A_CONCEPTUAL_FRAMEWORK_FOR_THE_SEISMIC_RESILIENCE_ASSESSMENT_OF_COMPLEX_URBAN_SYSTEMS.

[8] Zeng, X., Yu, Y., Yang, S., Lv, Y., Sarker, M.N.I. (2022). Urban resilience for urban sustainability: Concepts, dimensions, and perspectives. Sustainability, 14(5): 2481. https://doi.org/10.3390/su14052481

[9] Woods, D.D., Hollnagel, E. (2017). Prologue: Resilience engineering concepts. In Resilience Engineering, pp. 1-6. https://doi.org/10.1201/9781315605685-1

[10] Kapucu, N., Martín, Y., Williamson, Z. (2021). Urban resilience for building a sustainable and safe environment. Urban Governance, 1(1): 10-16. https://doi.org/10.1016/j.ugj.2021.09.001

[11] Farhadi, E., Pourahmad, A., Ziari, K., Faraji Sabokbar, H., Tondelli, S. (2022). Indicators affecting the urban resilience with a scenario approach in Tehran metropolis. Sustainability, 14(19): 12756. https://doi.org/10.3390/su141912756

[12] Sepe, M. (2019). Regenerating places sustainably: The healthy urban design. International Journal of Sustainable Development and Planning, 15(1): 14-27. https://doi.org/10.2495/sdp-v15-n1-14-27
[13] Barelkowski, R. (2018). Understanding the containment of public spaces: Upgrading public domain. International Journal of Sustainable Development and Planning, 13(7): 997-1007. https://doi.org/10.2495/sdp-v13-n7-997-1007
[14] Basar, A.A. (2024). Assessing vulnerability in earthquake-resistant cities: A multiple regression analysis for Sahinali, Nigde. International Journal of Sustainable Development and Planning, 19(3): 973-979. https://doi.org/10.18280/ijsdp.190315
[15] Al Omari, K., Suleiman, G., Isawi, H., Sharaf, F.M. (2023). Urban redesign of public spaces in residential neighborhoods to raise the efficiency of coexistence in the event of dealing with epidemics case study-city of Aqaba (Jordan). International Journal of Sustainable Development & Planning, 18(5): 1385-1390. https://doi.org/10.18280/ijsdp.180508
[16] Ernawati, J., Adhitama, M.S., Alhad, M.A. (2024). The changes in public open space usage and perceptual urban design qualities after the covid-19 pandemic. International Journal of Sustainable Development and Planning, 19(3): 963-972. https://doi.org/10.18280/ijsdp.190314
[17] Lucini, B. (2014). Disaster resilience from a sociological perspective. In Humanitarian Solutions in the 21st Century, pp. 7-30. https://doi.org/10.1007/978-3-319-04738-6
[18] Sharifi, A. (2019). Urban form resilience: A meso-scale analysis. Cities, 93: 238-252. https://doi.org/10.1016/j.cities.2019.05.010
[19] He, L., Aitchison, J.C., Hussey, K., Chen, Y. (2019). Building new houses or long-term recovery? A combination of quantitative and qualitative evidence from earthquake-displaced households in Sichuan, China. Habitat International, 83: 135-145. https://doi.org/10.1016/j.habitatint.2018.12.002
[20] Villagra-Islas, P., Alves, S. (2016). Open space and their attributes, uses and restorative qualities in an earthquake emergency scenario: The case of Concepción, Chile. Urban Forestry & Urban Greening, 19: 56-67. https://doi.org/10.1016/j.ufug.2016.06.017
[21] Hartig, T., Mitchell, R., De Vries, S., Frumkin, H. (2014). Nature and health. Annual Review of Public Health, 35: 207-228. https://doi.org/10.1146/annurev-publhealth-032013-182443
[22] Chan, J., DuBois, B., Tidball, K.G. (2015). Refuges of local resilience: Community gardens in post-Sandy New York City. Urban Forestry & Urban Greening, 14(3): 625-635. https://doi.org/10.1016/j.ufug.2015.06.005
[23] Lefebvre, H. (2017). The urban revolution. In The Globalizing Cities Reader, 2nd ed. https://doi.org/10.4324/9781315684871-68
[24] Lefebvre, H. (1992). The Production of Space. Wiley-Blackwell, Oxford.
[25] Lefebvre, H. (2013). Rhythmanalysis: Space, Time and Everyday Life. Bloomsbury Publishing.
[26] Wang, Z., Jia, G. (2019). Efficient sample-based approach for effective seismic risk mitigation of transportation networks. Sustainable and Resilient Infrastructure, 5(6): 349-364. https://doi.org/10.1080/23789689.2019.1598756
[27] Allan, P., Bryant, M. (2010). The critical role of open space in earthquake recovery: A case study. In Proceedings of the 2010 NZSEE Conference, New Zealand, pp. 1-10. http://db.nzsee.org.nz/2010/Paper34.pdf.
[28] Ergil, L.Y. (2020). Earthquakes in Turkey: What to know and how to prepare. Daily Sabah. https://www.dailysabah.com/turkey/expat-corner/earthquakes-in-turkey-what-to-know-and-how-to-prepare, accessed on Dec. 3, 2024.
[29] Buca Municipality. Assembly Areas. https://www.buca.bel.tr/tr/hizmetler/toplanma-alanlari, accessed on Jul. 20, 2025.
[30] Doğrusoy, İ.T., Zengel, R. (2017). Analysis of perceived safety in urban parks: A field study in Büyükpark and Hasanağa Park. METU Journal of The Faculty of Architecture, 34(1): 63-84. https://doi.org/10.4305/metu.jfa.2017.1.7
[31] Bowen, G.A. (2008). Naturalistic inquiry and the saturation concept: A research note. Qualitative Research, 8(1): 137-152. https://doi.org/10.1177/1468794107085301
[32] Morse, J.M. (1994). Designing funded qualitative research. In Handbook of Qualitative Research, pp. 220-235. https://psycnet.apa.org/record/1994-98625-012.
[33] Lincoln, Y.S., Guba, E.G. (1985). Naturalistic Inquiry. Sage Publications, Beverly Hills, CA.
[34] Creswell, J.W., Poth, C.N. (2017). Qualitative Inquiry and Research Design: Choosing among Five Approaches, 4th ed. SAGE Publications, Thousand Oaks, CA.
[35] Kuzel, A.J. (1999). Sampling in qualitative inquiry. In Doing Qualitative Research, pp. 33-45. https://psycnet.apa.org/record/1992-97742-002.
[36] Tutar, H., Şahin, M., Sarkhanov, T. (2024). Problem areas of determining the sample size in qualitative research: A model proposal. Qualitative Research Journal, 24(3): 315-336. https://doi.org/10.1108/qrj-06-2023-0099
[37] Bryman, A. (2016). Social Research Methods. Oxford University Press.
[38] Sebele-Mpofu, F.Y. (2020). Saturation controversy in qualitative research: Complexities and underlying assumptions. Cogent Social Sciences, 6(1): 1838706. https://doi.org/10.1080/23311886.2020.1838706
[39] Hennink, M., Kaiser, B.N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. Social Science & Medicine, 292: 114523. https://doi.org/10.1016/j.socscimed.2021.114523
[40] Parse, R.R. (1990). Parse's research methodology with an illustration of the lived experience of hope. Nursing Science Quarterly, 3(1): 9-17. https://doi.org/10.1177/089431849000300106
[41] Denny, E., Weckesser, A. (2022). How to do qualitative research? Qualitative Research Methods. Bjog, An International Journal of Obstetrics & Gynaecology, 129(7): 1166-1167. https://doi.org/10.1111/1471-0528.17150
[42] Charmaz, K. (2003). Grounded theory: Objectivist and constructivist methods. 2nd ed. In The Handbook of Qualitative Research, pp. 249-291. https://qualquant.org/wp-content/uploads/text/Charmaz%202000.pdf.
[43] Capron, A.M. (1989). Human experimentation. In Medical Ethics, pp. 125-172.

https://catalog.nlm.nih.gov/discovery/fulldisplay/alma9 99485133406676/01NLM_INST:01NLM_INST.
[44] Orb, A., Eisenhauer, L., Wynaden, D. (2001). Ethics in qualitative research. Journal of Nursing Scholarship, 33(1): 93-96. https://doi.org/10.1111/j.1547-5069.2001.00093.x
[45] Kaiser, K. (2009). Protecting respondent confidentiality in qualitative research. Qualitative Health Research, 19(11): 1632-1641. https://doi.org/10.1177/1049732309350879
[46] Özgür, E.F., Seçer, S., Göğüş, B., Sayın, T. (2017). Use of public spaces in private space-led urbanization: The cases of kadiköy and ataşehir in İstanbul. A|Z ITU Journal of Faculty of Architecture, 14(1): 43-56. https://doi.org/10.5505/itujfa.2017.38258
[47] Gülkan, P. (2000). Building code enforcement prospects: The failure of public policy. Earthquake Spectra, 16(1 Suppl): 351-374. https://doi.org/10.1193/1.1586159

APPENDIX

Appendix 1. Earthquake Emergency Response Survey

Introduction

Thank you for taking part in this study. This anonymous and voluntary survey seeks to understand how residents used Hasan Aga Park during and after the 2020 earthquake and how such spaces support community resilience. Please answer based on your own personal experience. When answering, think back to the first week after 30 October 2020.

Section A: Demographic information

1) Gender:
□ Male □ Female

2) Age:
□ Under 18 □ 19–25 □ 26–39 □ 40–59 □ 60 or older

3) Marital Status:
□ Single □ Married □ Divorced □ Widowed

4) Employment Status:
□ Student □ Employed □ Retired □ Unemployed □ Other: _____

5) Educational Level:
□ Primary / Secondary □ Bachelor's □ Postgraduate □ Other: _____

6) Health Status:
□ No health limitations □ Minor disability □ Severe disability □ Other: _____

7) Household Composition:
□ Live alone □ Live with family □ Live with friends □ Other: _____

Section B: Earthquake experience and immediate response

1) Where were you when the earthquake occurred? (Open-ended)

2) Where did you go immediately after the earthquake?
□ Hasan Aga Park □ Another public park (specify): _____ □ Street/open area □ Relative's house □ Other: _____

3) Why did you choose that location? *(Select up to two)*
□ Proximity to home □ Familiarity □ Safety perception □ Presence of others □ Availability of facilities □ Other: _____

4) Did you go alone or with others?
□ Alone □ With family □ With friends □ With neighbors

5) How long did you stay in the park after the earthquake?
□ Less than one day □ 1–2 days □ 3–5 days □ More than 5 days

6) Approximately how far is Hasan Aga Park from your home?
□ Within 5 minutes' walk □ 6–15 minutes □ 16–30 minutes □ More than 30 minutes

7) I felt safe while staying in the park after the earthquake. (5-point Likert scale)
1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

Section C: Park facilities and functional performance

1) Which of the following functions did the park provide during your stay? (Check all that apply)
□Shelter/tents □Food and water □Medical support □Lighting and power □Toilets/sanitation □Social gathering area □Other: _____

2) What facilities or services were missing or insufficient? (Open-ended)

3) Who provided the most effective assistance during your stay?
□ Municipality □ Volunteers □ NGOs □ Neighbors □ Others: _____

4) The support efforts provided during my stay met my needs. (5-point Likert scale)
1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree

Section D: Long-term perception

(Reflect on how your perception and use of the park changed after the event.)

1) In what ways did the park help you and others recover after the earthquake? (Open-ended)

2) What does Hasan Aga Park mean to you now, after this experience? (Open-ended)

3) Sharing the park with others helped me manage fear or stress. (5-point Likert scale)
1 = Strongly Disagree 2 = Disagree 3 = Neutral 4 = Agree 5 = Strongly Agree
Please explain briefly:
_____

4) How often did you visit the park before 2020?
□ Rarely □ Occasionally □ Frequently

5) How often do you visit the park now (after the earthquake)?
□ Less than before □ Same as before □ More frequently

6) What emotional meaning does the park hold for you now? (Open-ended)

Section E: future preparedness and design recommendations

1) What features would make public parks more resilient in future disasters? (Open-ended)

2) Do you think municipalities should integrate disaster preparedness into park design (e.g., emergency lighting, storage, water)?
□ Yes □ No □ Not sure

3) If yes, which of the following should be prioritized?

(Select up to three)

□ Toilets and sanitation □ Water and food supply □ Open shelter areas □ Lighting and power supply □ Medical or communication points □ Accessibility for disabled and elderly □ Information signage □ Other: _____

Section F: Additional comments

(Open-ended)

Please share any other thoughts about your experience in Hasan Aga Park or suggestions for improving public space resilience.

Closing Statement

Thank you for taking the time to complete this survey. Your answers will help improve the design of public spaces to support community resilience during future emergencies.