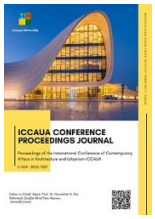

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Conservation Strategy Proposal for Antakya Historic City Centre after 2023 Kahramanmaraş Earthquake

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A b s t r a c t

This article investigates the damage to registered buildings in the Antakya urban site following the Kahramanmaraş earthquakes, offering preservation recommendations based on a holistic approach that considers the buildings' physical features, historical background, social memory, and ties to local life. There is a notable gap in comprehensive, locally focused post-disaster conservation studies for Antakya in the existing literature; this research aims to fill that gap. The methodology includes data collection, field observation, documentation, evaluation, and proposal development. Damage assessments were conducted on 250 buildings using the 1997 Umbria-Marche earthquake damage classification and methods developed by the Turkish Catastrophe Insurance Pool in 2002. Findings show that 131 buildings collapsed, while others suffered varying degrees of damage. The study highlights the importance of resilient conservation strategies grounded in international principles and supported by disaster risk management, holistic preservation, Building Information Modeling, and Integrated Project Delivery. Conducted seven months after the earthquake, this research documents original damage patterns at risk of being lost due to restoration and interventions, providing early and valuable data to the literature. As one of the first comprehensive studies to systematically examine earthquake damage to Antakya's historic fabric, it serves as an important reference for future research.

K e y w o r d s : Antakya (Antioch); Kahramanmaraş Earthquakes; Urban Site; Holistic Approach; Conservation.

1. Introduction

Historic buildings are among the most significant cultural heritage elements that reflect the cultural identity, history, and collective memory of a society. These structures, with their aesthetic, architectural, engineering, cultural, and technological features, document the era in which they were built and convey important information to future generations. Therefore, the preservation of historic buildings is a cultural, social, and national responsibility. Antakya, one of the oldest settlements in Türkiye, stands out with its historical, religious, ethnic, cultural, and architectural richness. Having hosted various civilizations throughout history, the city presents an urban identity that symbolizes tolerance through its multicultural structure. In particular, buildings located within the urban conservation area—such as mosques, churches, synagogues, inns, baths, and residential houses—are tangible reflections of this cultural diversity and constitute the spatial memory of the city.

However, cultural heritage sites today face an increasing risk of destruction due to natural disasters, rapid and unplanned urbanization, technological changes, transformations in lifestyle, and inappropriate conservation policies. Located in an active seismic zone, Antakya has experienced numerous devastating earthquakes throughout its history. Most recently, the city suffered extensive destruction following the earthquakes originating in Kahramanmaraş on February 6, 2023. Two major earthquakes occurred at 04:17 and 13:24 local time, with moment magnitudes (Mw) of 7.7 and 7.6, centered in Pazarcık and Elbistan (Kahramanmaraş), respectively. Additionally, on February 20, 2023, at 20:04 local time, another earthquake with a magnitude of Mw 6.4 struck with its epicenter in Yayladağı, Hatay. These earthquakes affected a vast area of approximately 108,812 km² in Eastern and Southeastern Anatolia, including the provinces of Kahramanmaraş, Hatay, Adıyaman, Gaziantep, Malatya, Kilis, Diyarbakır, Adana, Osmaniye, Şanlıurfa, and Elazığ (Tunç et al., 2024; Dedeoğlu et al., 2025; Özman et al., 2024). Recorded as the most devastating earthquake sequence in Türkiye's history, this disaster not only caused severe damage to physical structures but also profoundly impacted the city's historical fabric and collective memory. Numerous historic structures and civil architectural examples in the Antakya urban conservation area suffered significant damage or were completely destroyed. The magnitude and extensive impact zone of the earthquake significantly increased the scale of destruction, resulting in a major humanitarian crisis. Due to the prioritization of human life, widespread chaos across the country, and difficulties in accessing basic necessities, immediate

intervention and rapid protective measures for these structures could not be undertaken in the aftermath of the earthquake.

In order to protect cultural heritage against the devastating effects of earthquakes and to minimize potential damage, there is a need for disaster preparedness plans that are based on scientific foundations, implemented with appropriate methods, carried out through interdisciplinary collaboration, and designed in a consistent and systematic manner. It is crucial that these preparedness efforts are shaped by a holistic conservation approach, incorporating site-specific strategies that take into account the unique values and needs of cultural heritage. In this way, both the resilience of heritage sites to disasters can be enhanced, and the preservation of cultural assets for future generations can be ensured.

Following the 6 February 2023 Kahramanmaraş Earthquakes, various contemporary studies have been conducted on the historic city center of Antakya across multiple disciplines and topics. Some of these studies are supported by field research, providing fundamental data. Additionally, various official institutions and organizations (e.g., the Republic of Türkiye Presidency of Strategy and Budget, AFAD) have published reports and guidelines, particularly focusing on the preservation of the historic environment, in collaboration with entities such as METU, the Chamber of City Planners (TMMOB), the Chamber of Architects (TMMOB), and ICOMOS. Soyluk and Demircan (2023) analyzed mosque examples damaged in the February 6 Kahramanmaraş earthquakes from an architectural perspective. Soyluk and Köse (2024) discuss disaster risk reduction strategies in historic urban settings, using Kurtuluş Avenue as a case study. Ersoy (2024) examined the earthquake damage to historic buildings in Antakya following the Kahramanmaraş earthquakes and emphasized the importance of strengthening efforts to preserve these structures. Aydın et al. (2025) emphasized the role of cultural identity and education in the reconstruction process of Antakya, highlighting the need for holistic approaches to enhance urban resilience after disasters. Yıldırım (2025) emphasized the importance of heritage documentation for cultural and spiritual sustainability in Antakya after the 2023 earthquake by focusing on structures such as the Habibi Neccar Mosque and St. Paul's Greek Orthodox Church, highlighting the need to consider the social and spiritual aspects of architectural heritage during this process. Kocabaş et al. (2023) examined the damage to the Habibi Neccar Mosque in Antakya following the Kahramanmaraş earthquake and explored intervention methods for the preservation and redesign of cultural heritage. Boyoğlu et al. (2023) examined the impacts of the February 6, 2023, Kahramanmaraş earthquake on cultural heritage sites using TerraSAR-X data. They emphasized that while major destruction could be identified, there were limitations in detecting minor damage, and a single SAR image was insufficient for reliable damage assessment. The study also assessed iconic structures in Antakya, including the Habib-i Neccar Mosque, the Hatay Grand Mosque, and the St. Paul Greek Orthodox Church. Oflazoğlu and Dora (2024) examined the contribution of rituals and cultural heritage to social resilience in Antakya following the Kahramanmaraş earthquake; they demonstrated that the preservation of cultural heritage and the continuation of rituals play a significant role in the reconstruction of shared memory and identity. Aktemur and Ünlükaplan (2024) examined the impacts of the Kahramanmaraş earthquake on the urban identity of Antakya's Zenginler Neighborhood, emphasizing that streets such as Kahraman Street reflect the city's cultural and historical identity and that preserving these areas is crucial for post-disaster recovery. Dora and Dora (2025) examined the role of cultural heritage in the reconstruction of collective memory and identity following the February 6, 2023, Hatay earthquake; they emphasized that both tangible and intangible heritage are vital for social recovery, but comprehensive protection and management strategies are necessary.

In the existing literature, there is a limited number of comprehensive and locally focused studies on how theoretical concepts aimed at protecting cultural heritage in the face of disasters—such as "heritage at risk," "disaster-resilient conservation," and "post-disaster cultural recovery"—can be applied to multilayered cities like Antakya. This study seeks to address that gap by exploring the following core question:

"To what extent have the registered cultural heritage structures in Antakya been damaged following the earthquake, and how can a holistic, sustainable, and disaster-resilient conservation strategy be developed for these structures?"

In this context, the aim of the study is to document the current condition of 250 registered buildings located within the Antakya urban conservation area, assess the damage sustained by these structures, and propose an interdisciplinary conservation model in light of contemporary theoretical approaches. By integrating field data with theories related to *post-disaster heritage conservation*, the study argues that cultural heritage should be addressed not only in its physical form but also within its historical, social, and spatial contexts. This research aims to make a unique contribution to the literature by presenting both a locally specific case study and a set of holistic conservation strategies grounded in current theoretical frameworks.

Moreover, this study is based on a comprehensive field survey conducted only seven months after the 6 February 2023 Kahramanmaraş earthquakes, covering 250 listed buildings in Antakya. Conducting the survey shortly after the disaster enabled the documentation of original damage patterns that risked being lost due to subsequent restoration, demolition, or safety interventions, thereby making a significant contribution to the literature by providing early-period data. In this respect, the study represents one of the first systematic investigations to comprehensively record the earthquake damage to Antakya's historic fabric. The large sample size allows for comparisons across different building typologies and for statistically meaningful evaluations, while the early-stage dataset serves as a valuable reference for future academic research and conservation planning.

This article is derived from the master's thesis titled 'Damage Assessment of Antakya (Antioch) Urban Conservation Area After the Kahramanmaraş Earthquake,' prepared by Esra Koyuncu under the supervision of Assoc. Prof. Dr. Filiz Karakuş. The thesis includes comprehensive photographic documentation and detailed analyses of the earthquake damages to the examined structures. This article primarily presents the findings obtained

from these analyses, along with holistic, sustainable, and disaster-resilient conservation strategy recommendations for the buildings. Readers are advised to consult the thesis for more extensive visual materials and in-depth evaluations related to the structures.

2. Methodology

2.1 Material and Method

This study follows a methodology structured in eight distinct phases. In this context, initially a literature review and archival research were carried out. The most recent zoning plans with a conservation focus for the Antakya Urban Conservation Area were obtained from the archive of A Proje Architecture Office, and data on the architectural features of the buildings were collected to create a building inventory and corresponding maps. The primary source used during the data collection process was the Hatay Cultural Inventory, prepared by the Hatay Governorship in 2011. Subsequently, a field survey was then carried out from September 8 to 11, 2023, to evaluate the state of the registered buildings in the Antakya Urban Protected Area following the February 6 earthquakes. The field study was carried out as a team effort, with contributions from Assoc. Prof. Dr. Filiz Karakuş and Asst. Prof. Dr. Ekrem Bahadır Çalışkan. Out of 462 registered buildings on site, 250 were examined, with each structure photographed and its damage condition recorded according to its inventory number. The necessary notes were made on the zoning plans and maps, and the study was conducted accordingly. During the field study, the damage assessment was conducted on as many buildings as could be accessed within the limited timeframe and prevailing conditions. The extensive destruction caused by the earthquake, along with the loss of street and road patterns, posed significant challenges to identifying structures. Therefore, only those buildings that could be accurately located and assessed during the fieldwork were included in the evaluation. After the field study, the notes taken in the field were recorded digitally (CAD/EXCEL/WORD). During this stage, a range of maps, photographs, and Google Earth Street View images were used to precisely locate the buildings, and the gathered data was used to compile an updated building inventory. Accordingly, new maps were generated to analyze the damage conditions. In this study, the damage assessment of buildings was carried out based on the damage classification system developed after the 1997 Umbria-Marche earthquake and the methodology introduced by the Turkish Catastrophe Insurance Pool (TCIP). The 1997 Umbria-Marche classification is notable for its simplicity, ease of understanding, and continuity with previous damage classification systems. The damage assessment method developed by TCIP in 2002, on the other hand, is consistent, rapid, and easy to implement. This method provides reliable results for the two most common structural systems in Türkiye: reinforced concrete and masonry buildings. During the damage assessment process, buildings were categorized into five levels: 0 (undamaged), 1 (slightly damaged), 2 (moderately damaged), 3 (heavily damaged), and 4 (collapsed). This classification encompasses the degree of physical damage, such as cracks, fractures, and partial or complete collapse, in both structural and non-structural components of the buildings (Goretti & Di Pasquale, 2002; Boduroğlu et al., 2013; Ilki et al., 2013). Since the fieldwork was conducted in September, some buildings that were designated for urgent demolition had already been demolished; therefore, no assessment was made under the category of “buildings requiring urgent demolition. Following these assessments, resilient conservation proposals were presented, grounded in international principles and incorporating tools such as holistic conservation, disaster risk management, digital modeling (BIM), and Integrated Project Delivery (IPD). The workflow diagram (Figure 1) provides an overview of the methodology followed in this study. It outlines each step of the research process in a clear and systematic manner, highlighting the sequence of actions taken to achieve the study's objectives. The diagram visually represents the progression from data collection and analysis to the development of proposals and strategies.

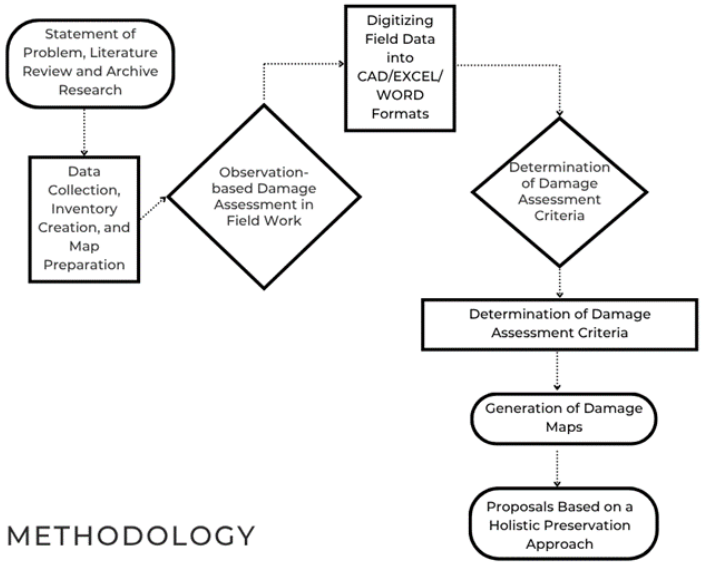

Figure 1. Workflow diagram for the Study (Developed by Authors).

2.2 Antakya Urban Site

Antakya has been a city that has continuously evolved throughout history, shaped by the diverse urban planning approaches of various civilizations, and developed its own spatial patterns. After being founded by Seleucus I Nicator, the city experienced spatial expansion in parallel with the increase in its population. The rapid acceleration of Antakya's spatial development, however, began in the 1950s. During this period, Antakya adapted to the nationwide urbanization movements occurring throughout Türkiye (Dinç, 2015).

The historic city center of Antakya is located between the Asi River, which divides the city in two, and Mount Habib Neccar. The Asi River serves not only as a geographical element that gives the historic texture its identity but also as a boundary separating the historic area from the "New Antakya" region (Rifaioğlu, 2003). The boundaries of Old Antakya are defined by the neighborhoods situated between Mount Habib Neccar and the Asi River, many of which are historically significant. On the other hand, New Antakya is characterized by the areas located on the western bank of the Asi River, which experienced rapid development following Hatay's annexation to Türkiye and particularly after the 1950s.

The historical urban fabric of Antakya encompasses cultural and architectural traces from various periods. The core elements of this fabric are predominantly located in the historic city center, commonly referred to as Old Antakya. In contrast, historical structures are less common in New Antakya, which reflects the urbanization dynamics of the 20th century. Squares, streets, alleys, fountains, houses, and commercial buildings constitute the main components of the city's historic texture (Arıman, 2002). In addition to civic architecture, monumental structures such as mosques, churches, synagogues, khans, baths (hamam), soap factories, and tombs also play a significant role in completing the unique historical fabric of Antakya.

The first urban planning initiative for Antakya was prepared in 1932 during the French Mandate period (Açıkgöz, 2008). The city's first zoning plan was developed in 1948, followed by various planning studies in 1957, 1978, and 1987. The plan prepared in 1987 represents Antakya's first conservation-oriented zoning plan (Arıman, 2002). In 2009, an updated version of the Conservation-Oriented Zoning Plan was ratified and implemented. This revision reestablished and restructured the boundaries of the urban conservation area, archaeological sites, and their buffer zones (Figure 2). These revisions aimed not only to preserve Antakya's historical fabric but also to better manage the challenges arising from the city's growth and development (Rifaioğlu, 2012). Following the earthquakes of February 6, the historic city center of Antakya suffered extensive destruction. In response, the Ministry of Culture and Tourism initiated efforts to prepare a new conservation-oriented zoning plan to support the reconstruction of the city and the preservation of its historical heritage.

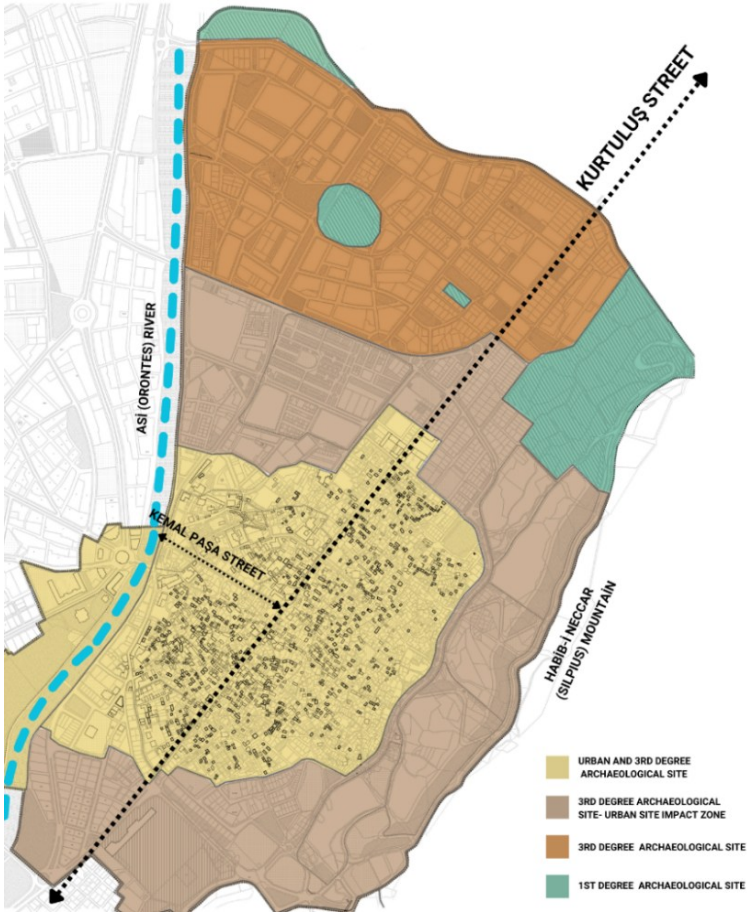

Figure 2. 2009 Conservation Revision Zoning Plan of Antioch (Adapted from the plan drawn by A Project and prepared by the authors).

3.0 Findings and Discussion

3.1 Antakya Urban Site Field Study

Urban fabric is the ultimate product of a long-term interaction between human activities and architectural space; each element exists in harmony with the others. Within every urban fabric lie multiple layers of meaning and transformation that persist implicitly. Therefore, interpreting the urban fabric through a single layer of understanding is highly challenging (Amen & Kuzovic, 2018). The urban conservation area of Antakya, which has hosted various civilizations throughout history, encompasses architectural and cultural elements that reflect the traces of each era. In this context, every component of Antakya's urban fabric forms a meaningful and cohesive whole in harmony with the others. Antakya's urban fabric is not merely a physical layout of settlement; it is a multilayered structure of meaning where social life, belief systems, and historical processes are intricately interwoven.

Antakya, with its urban conservation area and archaeological site areas, has gained the status of a complex site. The city has produced unique historical data through its residential areas *(traditional Antakya houses),* commercial areas *(bazaar, coffeehouse, shops, accommodations),* monumental structures *(complexes, khans, baths, soap factories, fountains, aqueducts, official buildings)*, religious structures *(mosques, masjids, tombs, synagogues, and churches),* and archaeological site areas (Figure 3).

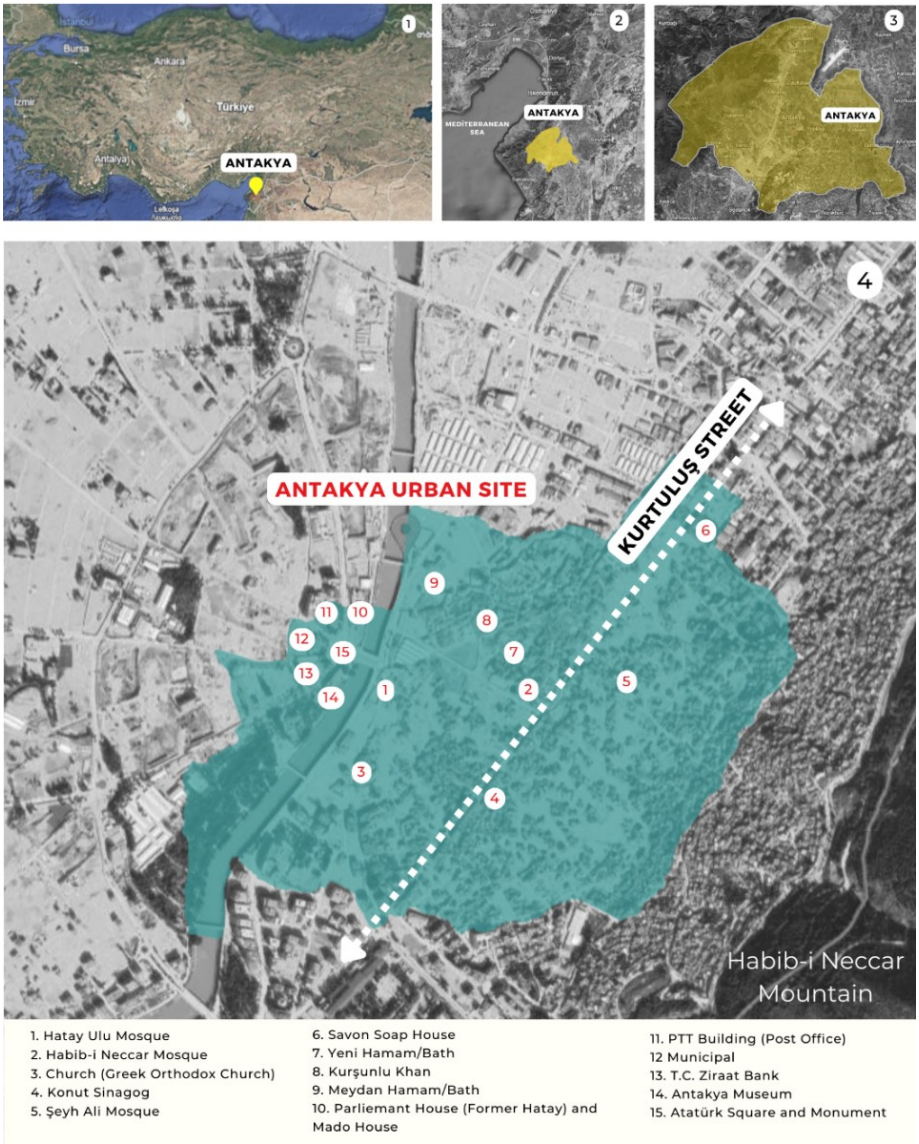

Figure 3. Approach maps to Antakya urban site area (The maps were created by the authors using Google Earth).

An examination of the inventories prepared in line with the zoning plans, along with the most recent Conservation-Based Zoning Plan approved in 2009, reveals that the Antakya Urban Conservation Area contains 462 registered structures (Figure 4). Most of these are traditional Antakya houses. Following residential buildings, mosques are the most numerous structure type. Other structures include churches, synagogues, inns, baths, tombs, and soap factories. In addition to the 462 registered buildings, the urban conservation area also contains historical fountains, aqueducts, and Roman walls.

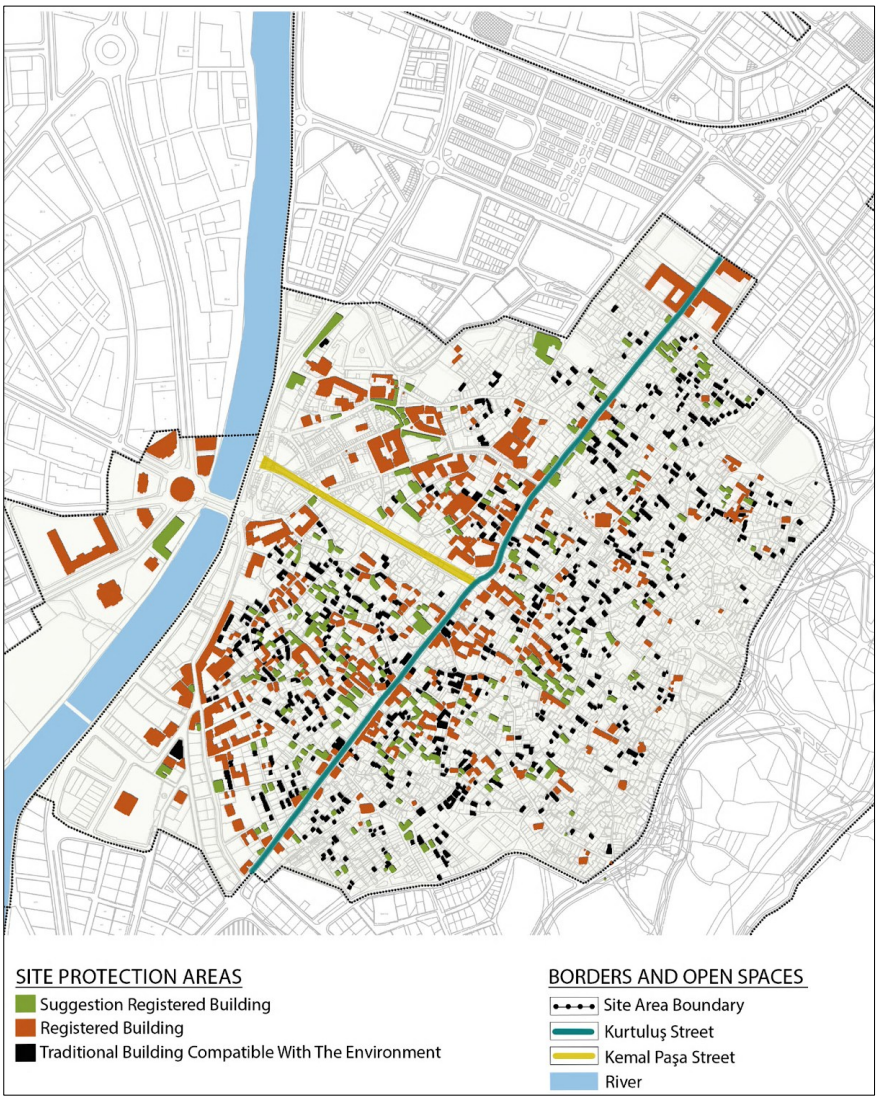

Figure 4. 462 registered buildings located within the urban protected area. In addition to registered buildings, suggestion registered buildings and traditional buildings compatible with the environment are also shown on the map (The map were created by the authors using cultural inventory and conservation zoning plan taken from A Proje Architecture Office Archive).

The findings of this study directly respond to the research question outlined in the introduction and offer a foundational framework for developing a holistic, disaster-resilient conservation strategy for the Antakya Urban Conservation Area. In the field study, damage assessments were conducted on 250 registered buildings with different functions and characteristics located within the urban conservation area. The examinations carried out during this process confirmed the extent and severity of the destruction in the region. It was observed that a significant level of damage occurred in many of Antakya's historic structures, which serve as the city's cultural memory—such as mosques, churches, synagogues, inns, baths, bazaars, soap houses, ancient buildings, traditional houses, commercial centers, and other historical structures. In the study, the 250 buildings examined are divided into two groups and categorized based on their functions. The 1st group consists of 44 monumental structures, while the 2nd group includes 206 civil architecture buildings and various structures with different functions (Figure 5). The 1st group consists of monumental buildings, such as 19 mosques, 5 masjids, 2 churches, 3 tombs, 4 baths, 4 khans, 5 soap factories, 1 covered market (bedesten), and 1 synagogue. The 2nd group, which represents civil architecture, includes 13 commercial buidings, 22 mixed-use residential and commercial buildings, 158 residential buildings, 1 Atatürk Monument and Square, and 12 buildings serving various functions like the Hatay Assembly Building, Post Office, Municipality Building, Dispensary, Primary School, and Police Station (see Figure 6). The locations of 44 monumental buildings in the 1st group and 12 buildings with different functions in the 2nd group within the urban site area can be examined in (Figure 7).

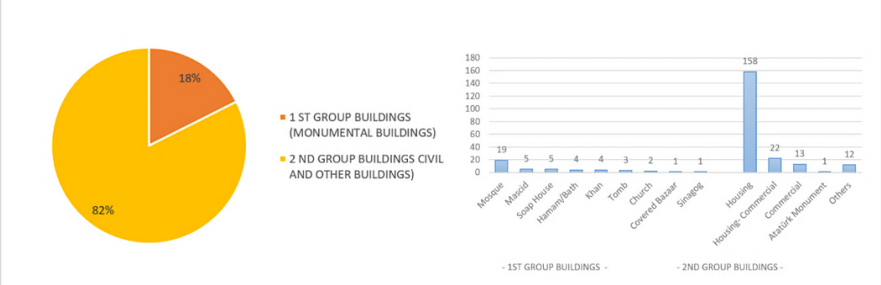

Figure 5. Building groups and types analyzed in the field (Developed by Authors).

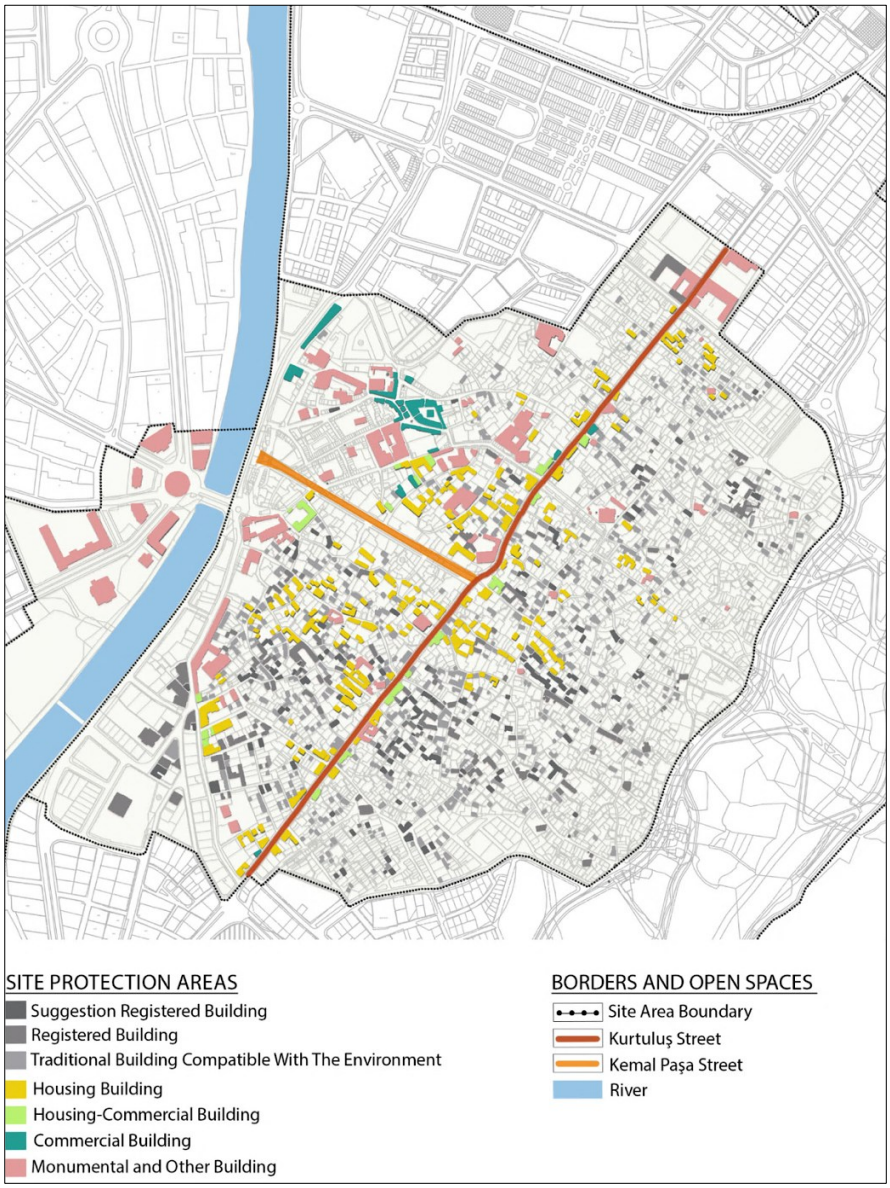

Figure 6. Type of buildings examined in the field (The map were created by the authors using cultural inventory and conservation zoning plan taken from A Proje Architecture Office Archive).

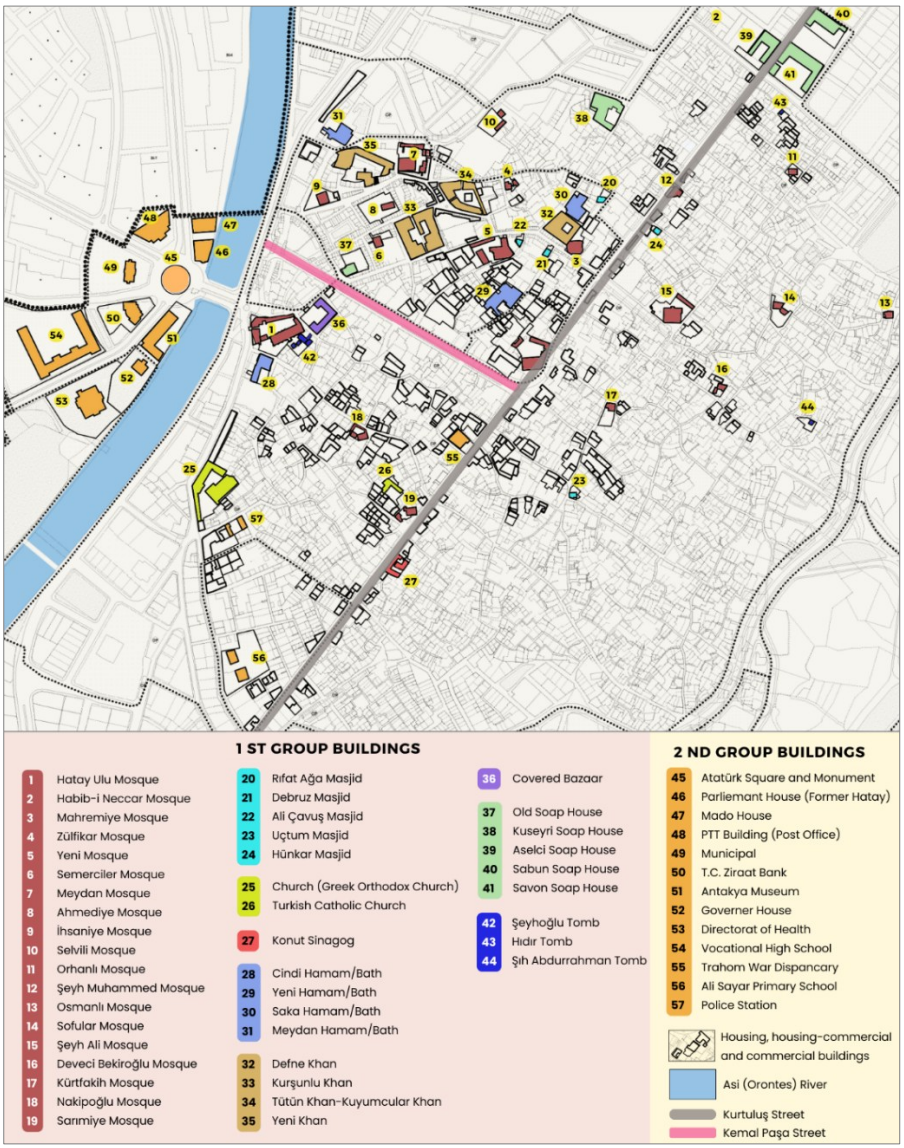

Figure 7. Detailed location map of the buildings examined in the Antakya urban site area (The map were created by the authors using cultural inventory and conservation zoning plan taken from A Proje Architecture Office Archive).

3.2 Limitations of the Study

The primary challenges faced in this study involve deficiencies in the zoning plans, mismatches between zoning data and building locations on Google Maps, the loss of streets transforming into expansive vacant lots due to severe damage, and limited building access caused by debris buildup. These factors have hindered the accurate identification of some of the buildings listed in the inventory. In particular, inconsistencies between the zoning plans and local maps have created difficulties in determining the exact locations of existing buildings. Additionally, due to widespread destruction, some streets have completely disappeared, replaced by vast empty spaces, which has further complicated the identification process. In areas where debris has not yet been cleared, physical access to buildings has been significantly obstructed, preventing the damage assessment of certain structures. Additionally, for certain areas with two or more structures within a courtyard, access to the courtyard could not be provided; as a result, only the street-facing façades could be documented, while the remaining sections remained inaccessible. Despite the constraints and challenges encountered in the field, the accuracy of the identified structures was carefully verified to ensure the reliability of the collected data. This verification involved comparing on-site photographs with location information and images from Google Maps and other sources, effectively preventing the misidentification of buildings. Such methodological rigor enhances the credibility of the study's findings and reinforces their relevance for future research and conservation planning.

3.3 Evaluation of the Field Studies

Damage typically reduces or completely eliminates the functionality, durability, and safety of a structure. Conducting damage assessments and evaluating the current state of a building after natural disasters are critically important for guiding reconstruction and repair processes and minimizing potential risks. Post-earthquake damage evaluation represents a vital initial phase for formulating restoration strategies. Consequently, diverse assessment methodologies have been developed in seismic-prone nations such as Turkey, Japan, and Italy. The damage classification developed following the 1997 Umbria-Marche earthquake is particularly significant for its simplicity,

rapid comprehensibility, and continuity with previous classification systems. In 2002, the Turkish Catastrophe Insurance Pool (TCIP) introduced a consistent, rapid, and easily applicable post-earthquake damage assessment method. In this study, the damage assessments of the examined buildings were conducted based on these methodologies. Both methodologies, by providing simple, rapid, and repeatable assessment criteria, enabled the field team to consistently classify damage across various typologies, ranging from mosques to traditional houses (Goretti & Di Pasquale, 2002; Boduroğlu et al., 2013; Ilki et al., 2013). The study conducted by Karakuş et al. (2024) provides a comprehensive discussion of the evaluation criteria, offering a scientific framework for damage assessment.

After the earthquake, the main streets and avenues of the city, once vital axes, have become unidentifiable and undefined. This transformation signals a profound loss of the city's historical and cultural fabric, leading to the erasure of its urban identity. The street network, previously narrow, complex, and organic, has turned into vast, empty plots of land after the earthquake. This change is not just a physical transformation but also marks a significant rupture in the social and cultural memory of the city. The erasure of old road networks and urban traces has resulted in the loss of the historical and spatial integrity of the urban fabric.

The destruction and damage to both historical and modern buildings have significantly impacted the physical structure of the city. A large portion of the historic urban fabric, including key structures, has been severely damaged, with some buildings completely destroyed. However, the existence of well-preserved buildings despite the extensive damage offers valuable insights into the quality of the city's building stock. In the field research, it was determined that out of the 250 registered buildings, 131 had collapsed. The majority of the remaining buildings have sustained heavy or moderate damage. In 1st group, which consisted of 44 monumental buildings, 3 were undamaged, 7 were slightly damaged, 3 were moderately damaged, 16 were heavily damaged, and 15 were collapsed. In 2nd group, 19 buildings were undamaged, 19 were slightly damaged, 13 were moderately damaged, 39 were heavily damaged, and 116 were collapsed (Figure 8).

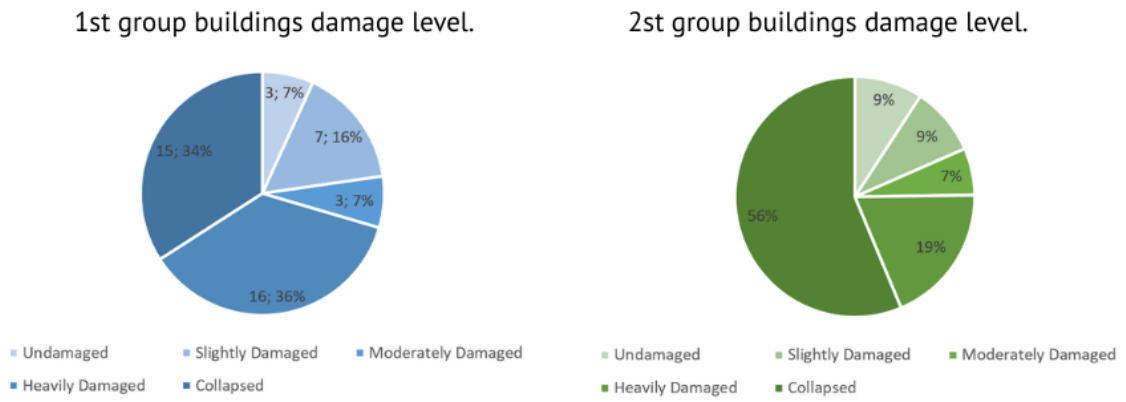

Figure 8. Buildings damage level (Developed by Authors).

Among the mosques surveyed in the field, Hatay Ulu Mosque, Mahremiye Mosque, Zülfikar Mosque, Yeni Mosque, Semerciler Mosque, Meydan Mosque, İhsaniye Mosque, and Nakipoğlu Mosque have been collapsed. The Habib-i Neccar Mosque, Ahmediye Mosque, Orhanlı Mosque, Şeyh Muhammed Mosque, Osmanlı Mosque, Şeyh Ali Mosque, Deveci Bekiroğlu Mosque, Kürtfakih Mosque, and Sarımiye Mosque were heavily damaged. Selvili Mosque was moderately damaged, while Sofular Mosque was slightly damaged.

Among the 19 mosques examined, four have masonry domes, whereas fourteen possess wooden roof structures of various types, including hipped, gable, pitched, and flat roofs. The domes of Habib-i Neccar Mosque, Yeni Mosque, and İhsaniye Mosque were collapsed, while the dome of Şeyh Ali Mosque was heavily damaged. The wooden roofs of Hatay Ulu Mosque, Semerciler Mosque, and Meydan Mosque were collapsed; Mahremiye Mosque, Zülfikar Mosque, and Orhanlı Mosque's wooden roofs were heavily damaged; the wooden roofs of Nakipoğlu Mosque and Sarımiye Mosque were moderately damaged; and the wooden roofs of Ahmediye Mosque, Selvili Mosque, Şeyh Muhammed Mosque, Osmanlı Mosque, Sofular Mosque, Deveci Bekiroğlu Mosque, and Kürtfakih Mosque were slightly damaged (Karakuş et., 2024).

The minarets of Hatay Ulu Mosque, Habib-i Neccar Mosque, Yeni Mosque, İhsaniye Mosque, Osmanlı Mosque, Kürtfakih Mosque, and Nakipoğlu Mosque were collapsed. The minarets of Mahremiye Mosque, Semerciler Mosque, Ahmediye Mosque, Meydan Mosque, Orhanlı Mosque, Şeyh Muhammed Mosque, Sofular Mosque, Şeyh Ali Mosque, and Sarımiye Mosque were heavily damaged, while the minaret of Deveci Bekiroğlu Mosque was slightly damaged. Additionally, the ezanlık of Zülfikar Mosque was slightly damaged, whereas the ezanlık of Selvili Mosque has collapsed (Karakuş et., 2024).

Among the masjids, Debruz Masjid was moderately damaged, while Rıfat Ağa Masjid, Ali Çavuş Masjid, and Hünkâr Masjid were slightly damaged, and Uçtum Masjid was undamaged. Regarding synagogues and churches, the Greek Orthodox Church (Church) was collapsed, while the Turkish Catholic Church and Konut Synagogue were undamaged.

The damage assessment of the hamams(baths) revealed that Cindi Hamam and Saka Hamam were heavily damaged, while Yeni Hamam and Meydan Hamam were collapsed. Among the khans, Defne Khan, Kurşunlu Khan, and Tütün Khan were heavily damaged, while Yeni Khan was collapsed. Additionally, the bedesten in the urban site area was heavily damaged. Regarding the soap houses, Kuseyri Soap House and Sabun Soap House were collapsed, Aselci Soap House was heavily damaged, while Savon Soap House and Old Soap House were slightly damaged. In terms of the tombs, Şeyhoğlu Tomb was collapsed, Şıh Abdurrahman Tomb was moderately damaged, and Hıdır Tomb was slightly damaged. A summary of the damage levels of the structures can be reviewed in (Table 1).

Table 1. Summary of damage status of the 1st group buildings (Prepared by the authors).

Type of Building	Collapsed	Heavily Damaged	Moderately Damaged	Slightly Damaged	Undamaged
Mosque	Hatay Ulu Mosque Mahremiye Mosque Zülfikar Mosque Yeni Mosque Semerciler Mosque Meydan Mosque İhsaniye Mosque Nakipoğlu Mosque	Habib-i Neccar Mosque Ahmediye Mosque Orhanlı Mosque Şeyh Muhammed Mosque Osmanlı Mosque Şeyh Ali Mosque Deveci Bekiroğlu Mosque Kürtfakih Mosque Sarımiye Mosque	Selvili Mosque	Sofular Mosque	-
Masjid	-	-	Debruz Masjid	Rıfat Ağa Masjid Ali Çavuş Masjid Hünkâr Masjid	Uçtum Masjid
Church	Church (Greek Orthodox Church)	-	-	-	Turkish Catholic Church
Synagogue	-	-	-	-	Konut Sinagog
Hamam (Bath)	Yeni Hamam Meydan Hamam	Cindi Hamam Saka Hamam	-	-	-
Khan	Yeni Khan	Defne Khan Kurşunlu Khan Tütün Khan	-	-	-
Covered Bazaar	-	Covered Bazaar	-	-	-
Soap House	Kuseyri Soap House Sabun Soap House	Aselci Soap House	-	Savon Soap House Old Soap House	-
Tomb	Şeyhoğlu Tomb	-	Şıh Abdurrahman Tomb	Hıdır Tomb	-

In the 2nd group, the following buildings were collapsed: Parliament House (Former Hatay), Mado House, T.C. Ziraat Bank, and the Police Station. The following structures were heavily damaged: PTT Building (Post Office), Municipal Building, Directorate of Health, and Vocational High School. The Governor House and Trahom War Dispensary were moderately damaged, while Antakya Museum was slightly damaged. Atatürk Square and Monument and Ali Sayar Primary School were undamaged.

In the 2nd group, a large percentage of traditional Antakya houses suffered significant damage during the earthquake. Out of 158 houses, 97 were collapsed, 28 were heavily damaged, 6 were moderately damaged, and 13 were slightly damaged. The remaining 14 houses were undamaged. In Group 2, a significant portion of the commercial buildings, which are an important part of Antakya's traditional fabric, sustained heavy damage during the earthquake Out of the 13 commercial buildings examined, 7 were collapsed, 2 were heavily damaged, and 3 were slightly damaged. One commercial building was undamaged. In Group 2, a significant portion of the commercial-residential buildings that were integrated into Antakya's traditional fabric over time were severely

affected by the earthquake. Out of 22 commercial-residential buildings examined, 8 were collapsed, 5 were heavily damaged, 5 were moderately damaged, and 2 were slightly damaged. The remaining 2 commercial-residential buildings were undamaged. A summary of the damage levels of the structures can be reviewed in (Table 2).

Table 2. Summary of damage status of the 2 nd group buildings (Prepared by the authors).

Type of Building	Collapsed	Heavily Damaged	Moderately Damaged	Slightly Damaged	Undamaged
Other Buildings	Parliament House (Former Hatay) Mado House T.C. Ziraat Bank Police Station	PTT Building (Post Office) Municipal Directorate of Health Vocational High School	Governer House Trahom War Dispensary	Antakya Museum	Atatürk Square and Monument Ali Sayar Primary School
Housing	97 housing	28 housing	6 housing	13 housing	14 housing
Commercial	7 commercial	2 commercial	-	3 commercial	1 commercial
Housing-Commercial	8 housing-commercial	5 housing-commercial	5 housing-commercial	2 housing-commercial	2 housing-commercial

4.0 Recommendations

4.1 International organizations, guidelines and regulations

The awareness of the importance of preserving world heritage dates back to ancient times; however, scientific methods for restoration began to be applied in the 19th century. International organizations such as UNESCO, ICOMOS, and ICCROM have made significant contributions to the development of conservation practices. These organizations have promoted international cooperation and the exchange of knowledge for the protection of cultural heritage while also leading the establishment of standards in the field. In this context, various reports, declarations, and guidelines have been prepared. The guidelines and declarations published for the protection of cultural heritage serve as important tools that encourage communities and governments to take action on an international scale. These declarations aim to take measures against risks threatening cultural heritage, strengthen national and international collaborations, and adopt sustainable and holistic conservation approaches (Jokilehto, 1999). Some of these charters and guidelines have been examined in the context of this study, and evaluations have been made based on their relevance. Within this framework, several relevant charters and guidelines were reviewed, and various assessments regarding the damage assessment of structures and conservation approaches were conducted (Table 3).

Table 3. International charters evaluation within the framework of Antakya Urban Site Area (Prepared by the authors).

Name of Charter	Content of Charter	Charter evaluation within the framework of Antakya Urban Site Area
The Athens Charter (1931)	This charter outlines the first formalization and documentation of preservation principles, as well as the necessity of working within an international collaborative framework.	Standard principles provide a common framework for projects carried out in areas such as the Antakya urban site, preventing inconsistencies in implementation and ensuring effective preservation
Hague Convention (1954)	It is the first and most comprehensive multilateral treaty dedicated specifically to the protection of cultural heritage during both peacetime and armed conflict.	The historical, cultural, and universal values of the Antakya urban site are preserved, preventing the risk of damage during periods of conflict.
The Venice Charter (1964)	This charter establishes an ethical, scientific, and methodological standard for the preservation of historical buildings and monuments.	The application of scientific standards increases the reliability of preservation projects in Antakya.

Table 3. International charters evaluation within the framework of Antakya Urban Site Area (Prepared by the authors) (continued).

Name of Charter	Content of Charter	Charter evaluation within the framework of Antakya Urban Site Area

The Declaration of Amsterdam (1975)	The preservation principles are integrated into regional planning policies and socio-economic life. This charter adopts a holistic preservation approach, which envisions the support of local and central government, along with public participation.	Adopting a holistic approach in multilayered areas such as the Antakya urban site ensures sustainable preservation and development.
"Recommendation Concerning the Safeguarding and Contemporary Role of Historic Areas" (Nairobi-1976)	This document emphasizes the importance of preserving the authenticity of historic sites and states that they should be effectively preserved along with their surroundings.	Authenticity and proper preservation approaches contribute to the Antakya urban site's gaining international value and ensuring its further protection.
The Burra Charter (1979)	This charter emphasizes the cultural significance, connections, and meanings that a place holds for people by introducing the concept of 'place' instead of 'monument and site.'	The adoption of the concept of 'place' ensures the preservation of the meaning that Antakya holds as an area where different religions, civilizations, and cultures coexist.
The Washington Charter (1987)	This charter emphasizes that the success of preservation requires the integration of cities into modern life and the participation of urban residents in this process.	In the Antakya urban site, a preservation model that integrates historic buildings with modern life while ensuring public participation ensures effective preservation.
Nara Document (1994)	It emphasizes the need to preserve the authenticity of cultural heritage to prevent the loss of cultural identity caused by the pressures of globalization.	The preservation of the authenticity of the Antakya urban site ensures the continuity of not only cultural heritage but also the identity and sense of belonging of the local community.
Charter On The Built Vernacular Heritage (1999)	Traditional architecture (çivil architecture) is one of the key values that reflects the cultural identity of each society and should be preserved as a shared heritage of humanity. This charter presents principles and methods for the preservation of traditional architecture.	A large portion of the historic buildings in the Antakya urban site are examples of civil architecture. In this context, the preservation of traditional architecture means not only protecting the physical structures but also safeguarding the culture they represent.
Budapest Declaration on World Heritage (2002)	This declaration aims to promote social and economic development and improve the quality of life for communities within the framework of preservation, development, and sustainability.	An approach within the framework of preservation, development, and sustainability preserves cultural heritage in the Antakya urban site while enhancing the economic well-being of the community and strengthening social ties.
Principles for the analysis, conservation and Structural Restoration of Architectural Heritage (2003)	This charter presents principles for the rehabilitation of historical buildings that have experienced significant structural damage. According to this regulation, a multidisciplinary approach should be adopted in the preservation, strengthening, and restoration process, and architectural heritage should be considered holistically, taking into account all its components and its surrounding context.	Adopting an approach consistent with these principles in the Antakya urban site ensures the sustainable preservation of both the structures and the city's cultural heritage. This is crucial, as the buildings in this area collectively form the identity of the city.
Valetta Principles (2011)	This charter emphasizes the identification and preservation of the intangible elements that constitute the identity and spirit of a place, as well as the creation of buffer zones outside the urban site. Additionally, it advocates for the development of a context-appropriate and effective management plan for each historic town and urban area.	For the Antakya urban site, the preservation of the intangible elements that constitute the identity of the place ensures the continuity of cultural values and social bonds. Furthermore, the creation of buffer zones and the development of an effective management plan support the protection of the historical fabric and promote sustainable urban development and preservation.

Table 3. International charters evaluation within the framework of Antakya Urban Site Area (Prepared by the authors) (continued).

Name of Charter	**Content of Charter**	**Charter evaluation within the framework of Antakya Urban Site Area**

Türkiye Architectural Heritage Conservation Charter (2013)	This declaration has been prepared because some laws and regulations regulating preservation in Türkiye contain provisions that threaten conservation. This document defines the fundamental principles of preserving architectural heritage for all disciplines involved in the preservation process and various sectors of society.	The effective preservation of Antakya's historical and cultural values is an international responsibility. The involvement of professionals from diverse fields of expertise ensures a strong preservation process.
Principles for the Conservation of Wooden Built Heritage (2017)	This document emphasizes the importance of wooden cultural heritage and defines comprehensive, applicable fundamental principles and practices for its preservation and conservation within an international framework.	The sustainable preservation of the widespread wooden heritage in Antakya is crucial for passing these values on to future generations.

The holistic approach is defined as a multidimensional and comprehensive perspective that considers not only environmental aspects but also social, cultural, and economic factors simultaneously in conservation processes. This approach integrates ecological integrity with community participation, the preservation of local cultures, and the safeguarding of values to ensure the success of conservation projects. Consequently, environmental, social, cultural, and economic dimensions are regarded not as separate entities but as interconnected components of a single system. It also emphasizes that participatory methods must align not only with technical requirements but also with the socio-cultural context. The importance of sustainability and a holistic approach in the conservation of historic cities is significant, as conservation must address not only individual buildings but also the broader social, economic, environmental, and cultural dimensions of the urban fabric. Sustainability, in this context, focuses on protecting environmental, economic, and social principles to ensure that historical and cultural heritage is preserved for future generations. Furthermore, conservation processes must be integrated with contributions from diverse disciplines, including architecture, urban planning, economics, tourism, and the social sciences. In this regard, the conservation of historic cities cannot be limited to physical restoration alone but must instead be understood as a multidimensional, interdisciplinary, and sustainable process (Matarrita-Cascante et al., 2019; Rodwell, 2003).
International guidelines and declarations emphasize the following issues for the sustainable, holistic, and effective protection of cultural heritage:

- Evaluating cultural heritage in all its components
- Utilizing scientific methods
- Considering historical buildings along with their surrounding environments
- Preserving the original value
- Minimum intervention
- Public participation in the conservation process
- Support from both local and central governments
- Interdisciplinary approach
- Preserving the spirit of the place
- Creating buffer zones
- International cooperation
- Raising awareness in society
- Transmitting traditional construction systems to new generations
- Utilizing technology
- Effective and comprehensive management

Conservation projects are complex and sensitive processes that bring together different areas of expertise. The risky and uncertain nature of these projects, combined with traditional, fragmented, and hierarchical delivery methods, can negatively impact project efficiency. In a study conducted by Feriel et al. (2018), the combined use of Integrated Project Delivery (IPD) and Building Information Modeling (BIM) is proposed as a solution to these issues, emphasizing that this integration enhances efficiency in the project management of heritage conservation projects. Through IPD, local authorities, museum officials, experts, and construction companies come together on a shared platform. This increases transparency and strengthens communication and collaboration, thereby significantly reducing delays and additional costs. Building Information Modeling (BIM) is an information-sharing process that digitally models the physical and functional characteristics of buildings in a three-dimensional, data-driven environment. In a comprehensive review conducted by Logothetis et al. (2015), it was emphasized that Building Information Modeling (BIM) and its adaptation for historic buildings, Heritage BIM (HBIM), offer revolutionary innovations in the documentation, management, and restoration processes of cultural heritage. This technology, supported by modern methods such as laser scanning and photogrammetry, enables the creation of realistic and parametric 3D models. After disasters such as earthquakes, analyzing the damage status of structures through 3D models provides significant advantages for developing conservation strategies and pre-disaster risk management. Additionally, during the restoration process, it allows for precise planning of the preservation level of the building's original fabric, preventing unnecessary interventions and promoting interdisciplinary collaboration (Liu et al., 2023; Logothetis et al., 2015).

Although Heritage Building Information Modeling (HBIM) offers significant benefits in conservation projects, technical and organizational challenges arise due to the unique characteristics and complex structures of cultural heritage buildings. Therefore, process improvements and the development of systematic approaches are necessary in HBIM applications (Penjor et al., 2024). A case study examining the use of HBIM in Turkey has demonstrated the contribution of digital documentation and information management to restoration processes. The study shows that HBIM enhances collaboration by integrating data from various disciplines onto a single platform, increases transparency in project management, and accelerates the overall process (Garip, 2023). Acierno et al. (2017) propose ontology-based information modeling methods for the conservation of cultural heritage. Ontology-based modeling facilitates a common language and standardized information sharing among different disciplines, thereby enhancing consistency, transparency, and efficiency in conservation processes. Although ontology-based models primarily focus on information management and conceptual modeling, they can be integrated with BIM workflows to establish a robust information infrastructure supporting BIM.

Consequently, in cities rich in historical and cultural heritage such as Antakya, the combined use of tools like BIM, HBIM, and Integrated Project Delivery (IPD) provides an effective framework for the documentation of historic structures, damage assessment, restoration management, and pre-disaster risk planning. This integrated approach not only strengthens cultural heritage conservation but also ensures that the process remains transparent, interdisciplinary, and sustainable. Thus, it enables the development of more comprehensive and lasting conservation strategies in cities with multilayered cultural fabric.

4.2 Disaster Risk Management

The preservation of cultural heritage is part of an ever-evolving and complex system, and this complexity brings uncertainties that give rise to risks. Since the late 1980s, risk has become a central focus of cultural heritage conservation processes and an integral component of these efforts. As highlighted by Ferreira et al. (2021), understanding the risks faced by cultural heritage buildings and developing resilience strategies are critical for effective preservation. Giuliani et al. (2021) further emphasize that risk management should address not only individual structures but also urban-scale systems holistically; this approach enhances the sustainability of cultural heritage within its social, economic, and environmental contexts. In this regard, a consistent and adaptable risk management methodology reduces uncertainty and enables the creation of systematic and strategic preservation plans. Thus, risk management not only supports the conservation process but also strengthens the sustainability and resilience of cultural heritage.

In the early 1990s, ICOMOS initiated studies on the protection of cultural heritage from disasters. These efforts emphasize the establishment of a risk-sensitive cultural heritage management foundation and the development of methodologies within this framework. The primary aim of the study is to prevent a disaster, mitigate its impact, recover from its losses, or enhance the capacity to respond to disasters. In this context, three main phases have been defined: pre-disaster (preparedness), during disaster (response), and post-disaster (recovery) (ICCROM, 1998).

Risk is an integral part of the conservation process. To reduce risks to cultural heritage and implement a more effective conservation process, a comprehensive and consistent risk management plan is required (ICCROM and ICOMOS, 2023). Risk preparedness should be integrated not only for emergencies but also into the routine management of cultural heritage resources. This requires continuous risk assessment and the implementation of measures in the conservation and management of heritage sites (Johnnides, 2010). The disaster risk management cycle, consisting of three fundamental phases—prevention/mitigation, response, and recovery—forms the basis of disaster risk management plans. This is because the planning process is cyclical, with a continuous feedback loop between the definition of goals, the implementation process, and the evaluation stages (UNESCO, 2010).

1. Pre-disaster phase: Risk assessment, risk prevention and mitigation, preparedness phase (Figure 9)
2. During disaster phase: Emergency response phase (Figure 9)
3. Post-disaster phase: Damage assessment, restoration, repairs, recovery and rehabilitation (Figure 9)

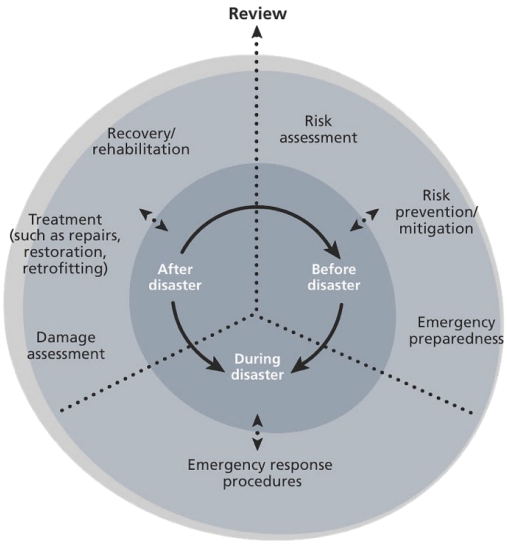

Figure 8. Buildings damage level (Developed by Authors).

4.3 Management Assessment of Conservation Practices in Antakya Pre- and Post-Earthquake

Perhaps Before the Kahramanmaras earthquakes, various restoration projects have been carried out to preserve the historic buildings in the Antakya urban protected area. These projects aimed to protect the city's historical fabric and cultural values, while also addressing the needs of modern life. Specifically, the restoration of historical buildings, streets, and bazaars aimed to provide sustainable protection in terms of strengthening, aesthetics, and functionality. Some of these projects can be listed as follows:

• Restoration of Antakya Historical Uzun Çarşı

A few years before the Kahramanmaraş earthquakes, the restoration of Uzun Çarşı was carried out in cooperation with the Hatay Directorate of Culture and Tourism and the Antakya Municipality. The project, completed in five stages, aimed to achieve a modern and organized appearance. It is the largest street revitalization initiative in Antakya, incorporating elements that enhance functionality (Antakya Municipality, n.d.). However, the appropriateness of the materials and techniques used on the historical fabric is a subject of debate. The severe damage to many historical buildings in the region during the earthquake highlighted deficiencies in building safety. This suggests that the restoration may have strayed from a holistic conservation approach. The post-earthquake period presents an important opportunity to reassess the project and develop a more resilient, authentic, and sustainable conservation approach.

• Restoration of Antakya Kurtuluş Street

A few years before the earthquake, the restoration of Kurtuluş Street was carried out in collaboration with the Antakya Municipality, İller Bankası, and the contractor company. As part of this project, the façades of historical and registered buildings facing Kurtuluş Street were revitalized (Antakya Municipality, n.d.). While this project has made positive contributions in terms of aesthetics and tourism, the damage caused by the earthquake afterward indicates that structural resilience and earthquake safety were not adequately addressed. The fact that the project was limited to buildings with facades on the street points to a lack of a holistic approach and narrows the scope of the project. This is because the buildings within the urban conservation area collectively form the historical fabric.

• Köprübaşı City Square and Surrounding Area Urban Design Competition: "Ma'meydan A City Story"

The "Ma'meydan Bir Kent Hikayesi" project, which won first place in the competition for the Antakya Köprübaşı City Square and its surroundings in 2021, addresses the different periods of Antakya in a holistic narrative, illustrating the city's development around the river. The project aims to integrate cultural heritage into urban life and soften the transition between Old and New Antakya. With its approach sensitive to local dynamics and the needs of the people, it seeks to strengthen both the historical and social fabric (Arkitera, n. d.). While the design is positively assessed for offering contemporary solutions while preserving cultural identity, it still contains uncertainties regarding its feasibility, earthquake safety, and public interaction.

• Antakya Masterplan and Conservation Plan

After the earthquakes on February 6, a comprehensive master plan for the reconstruction of Antakya and Hatay was initiated under the leadership of Foster + Partners, with the participation of national and international experts. Supported by the Turkey Design Foundation, the Ministry of Culture and Tourism, and local authorities, this plan covers an area of 30 km² in Antakya and aims to redesign the city while considering both the historical fabric and community needs. The plan seeks to address issues such as irregular growth before the earthquake, flood risks, and insufficient public spaces. Its core principles include construction in safe areas, strengthening the transportation network, increasing green spaces, enhancing neighborhood structures, creating new districts, integrating public transportation, and adopting a compact city model. This plan offers a model approach for a sustainable and resilient Antakya after the disaster (Foster + Partners, n.d.).

Along with this plan, the Ministry of Culture and Tourism and the Turkey Design Foundation are preparing a new Protection-Oriented Zoning Plan for Antakya. This plan aims to revive cultural heritage, preserve the historical fabric, and create a sustainable, accessible, and resilient city. Elements such as green buffer zones, water management, and human-centered transportation add value to the project. However, shortcomings in the holistic conservation approach are evident. There is no clear strategy for restoration methods, public participation in the cultural heritage process, and how the local community will be involved in decision-making mechanisms. Furthermore, there are uncertainties regarding the plan's feasibility, cost, and the capacity of local authorities. It is also noted that the integration between the master plan and the protection-oriented zoning plan is not clearly outlined (Republic of Turkey Ministry of Culture and Tourism, n.d.).

Following the earthquake disaster, a restoration process was initiated in the Antakya Urban Site Area. In this process, various governmental institutions, notably the Ministry of Culture and Tourism and the General Directorate of Foundations, played significant roles. These two entities undertook critical responsibilities, including damage assessment, project planning, implementation, and supervision, to ensure the preservation of the region's historical and cultural heritage. Additionally, various architectural firms actively participated in the processes of surveying, restitution, and restoration. Moreover, municipalities across Türkiye provided substantial support to the restoration efforts in the Antakya urban site area. These municipalities contributed to the progress of projects by providing financial resources, technical equipment, and manpower.

5.0 Conclusion

This study, based on the master's thesis titled "Damage Assessment of Antakya (Antioch) Urban Conservation Area After the Kahramanmaraş Earthquake" prepared by Esra Koyuncu under the supervision of Assoc. Prof. Dr. Filiz Karakuş, comprehensively and systematically reveals the severe damage inflicted on the historic fabric of Antakya by the February 6, 2023, earthquakes. Conducted immediately after the disaster, the fieldwork documented initial damage patterns that risked being lost due to restoration or demolition interventions, thus providing early and valuable data to the literature. Furthermore, through comparisons among different building typologies and statistical analyses, this research establishes an important reference for understanding the post-earthquake condition of the cultural heritage. The study highlights the indispensable need for a holistic preservation approach in managing the urban conservation area of Antakya, emphasizing the importance of developing an integrated risk management framework tailored to the unique vulnerabilities of the city's cultural heritage. Such a framework should encompass disaster risk assessment, preparedness, response, and recovery phases to ensure both effective conservation and resilience against future hazards. Methodological limitations—including inconsistencies in zoning plans, restricted field access, and difficulties in fully evaluating certain structures—are explicitly acknowledged. These challenges underscore the necessity for enhanced data integration and comprehensive digital documentation, supported by advanced technologies such as Building Information Modeling (BIM) and Integrated Project Delivery (IPD), as well as collaborative stakeholder engagement. Theoretically, the study offers a unique contribution by linking post-disaster damage assessment with conservation practices within an integrated management context. Practically, it goes beyond general calls for preservation by advocating multidisciplinary strategic management plans that incorporate international charters, disaster risk methodologies, and modern technological tools. In conclusion, preserving Antakya's historic heritage requires not only holistic conservation principles but also a concrete risk management approach that aligns with the city's distinct social, cultural, and physical dynamics. This integrated perspective will ensure the secure transmission of Antakya's cultural values to future generations and enable restoration efforts that are both scientifically grounded and socially inclusive.

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This paper is derived from the master's thesis titled "Damage Assessment of Antakya (Antioch) Urban Site After the Kahramanmaraş Earthquake", prepared by Esra Koyuncu under the supervision of Assoc. Prof. Dr. Filiz Karakuş.

Conflict of Interests

The Authors declares that there is no conflict of interest.

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