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Evaluation of the Condition of Antakya (Antioch) Urban Site after the Kahramanmaraş Earthquake

Filiz KARAKUŞ [1*], Ekrem Bahadır ÇALIŞKAN [2*], Esra KOYUNCU [3*]

ORCID 1: 0000-0002-7562-3435
ORCID 2: 0000-0002-5258-2976
ORCID 3: 0009-0007-2159-8776

[1-2-3] *Ankara Yıldırım Beyazıt University, Faculty of Architecture and Fine Arts, Architecture, 06970, Ankara, Türkiye*

**** e-mail**: fkarakus@aybu.edu.tr*

Abstract

Throughout history, many cultural heritage buildings worldwide have been severely damaged by earthquakes and even faced the risk of destruction. On February 6, 2023, two earthquakes with a magnitude of 7.7, centered in Pazarcık and 7.6 in Elbistan, occurred in Kahramanmaraş Province. This study examines the registered buildings in the Antakya urban conservation area after these earthquakes. Within the scope of the study, 250 registered buildings in the area were examined, and their post-earthquake conditions were determined. The city of Antakya is a unique city that has been home to many civilizations due to its location in the historical process it has undergone; it has been kneaded with various religious, ethnic, and cultural richness of these civilizations and reflects the cultural diversity and layeredness created by history. For this reason, it is thought that it is very important to determine the post-earthquake conditions of these buildings, which have an important place in the city's identity.

Keywords: *Antakya (Antioch), Kahramanmaraş earthquakes, urban site, historical building, damage degree.*

Antakya Kentsel Sit Alanının Kahramanmaraş Depremi Sonrasındaki Durumunun Değerlendirilmesi

Öz

Tarih boyunca, dünyanın dört bir yanında bulunan kültürel miras niteliğindeki pek çok yapı, depremlerde ciddi bir şekilde hasar almış, hatta yıkım riskiyle karşı karşıya kalmıştır. 6 Şubat 2023 tarihinde Kahramanmaraş İli, Pazarcık merkezli 7.7 ve Elbistan merkezli 7.6 büyüklüğünde iki deprem meydana gelmiştir. Bu çalışma söz konusu depremler neticesinde, Antakya kentsel sit alanı içerisinde yer alan tescilli yapıların incelenmesini konu edinmektedir. Çalışma kapsamında alanda yer alan iki yüz elli adet tescilli yapı incelenmiş ve deprem sonrası durumları tespit edilmiştir. Antakya kenti, geçirdiği tarihsel süreç içerisinde bulunduğu konum itibariyle birçok medeniyete ev sahipliği yapmış, bu medeniyetlerin çeşitli dini, etnik, kültürel zenginlikleriyle yoğrulmuş, tarihin oluşturduğu kültürel çeşitliliği ve katmanlılığı yansıtan özgün bir kenttir. Bu sebeple kentte bulunan ve kentin kimliğinde önemli bir yeri olan bu yapıların deprem sonrası durumlarının tespitinin oldukça önemli olduğu düşünülmektedir.

Anahtar kelimeler: *Antakya, Kahramanmaraş depremleri, kentsel sit, tarihi yapı, hasar derecesi.*

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1. Introduction

Anatolia has been under the influence of earthquakes since ancient times. When we look at the geological structure of Türkiye, it is completely under the influence of the Alpine orogenic belt. Faulting and epirogenic movements started in our country with the Alpine orogenesis, which intensified at the end of the Oligocene and the beginning of the Miocene. During this period, the areas with hard characteristic structures collapsed under pressure by being torn apart by faults. Afterward, new fault lines were formed, and old faults were rejuvenated simultaneously. In the same period, with tension in the west and compression in the East of Anatolia, North and West Anatolia shifted westwards along the fault lines (Atalay, 1989). Based on current data, our country has three important fault zones. The first is the North Anatolian Fault Zone, the second is the East Anatolian, and the third is the West Anatolian Fault Zone (Figure 1). Fault lines, formed by fractures in the earth, trigger destructive earthquakes in Anatolia every period. Since the early ages until today, many destructive earthquakes have occurred, and these earthquakes have caused thousands of people to lose their lives.

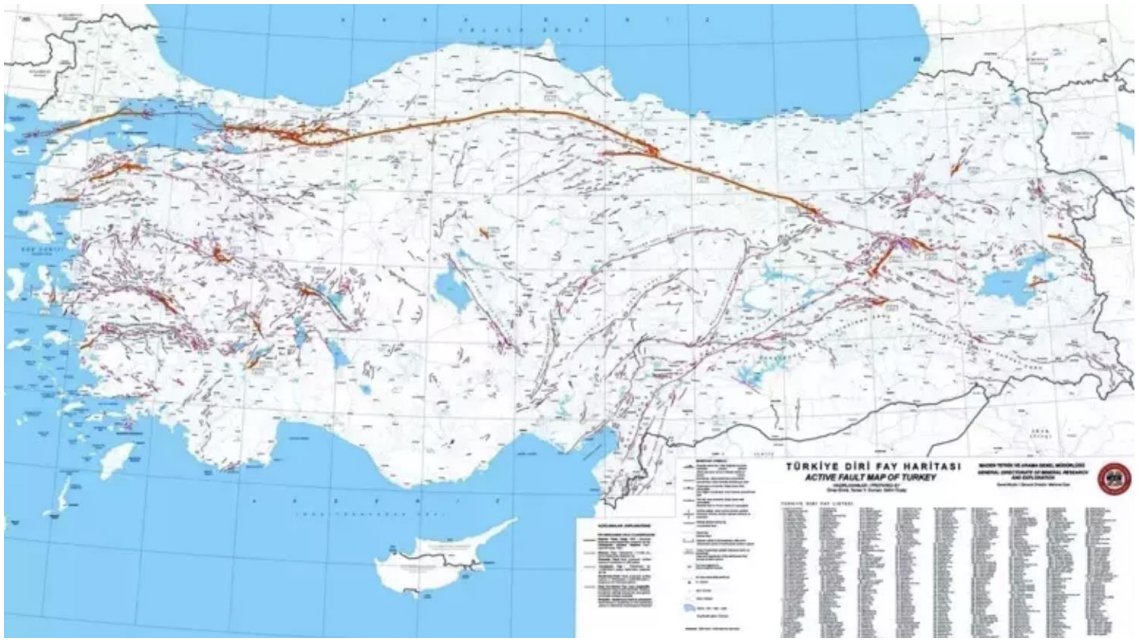


Figure 1. Türkiye Fault Zone Map (TMMOB Chamber of Geological Engineers, 2012)

On February 6, 2023, two earthquakes of magnitude 7.7 and 7.6 occurred at 04.17 and 13.24 Turkish time, with epicenters in Pazarcık and Elbistan districts of Kahramanmaraş. On February 20, 2023, an earthquake with a magnitude of 6.4 occurred at 20.04, with the epicenter in Yayladağı, Hatay. These earthquakes caused major destruction in 11 provinces, particularly Kahramanmaraş, Hatay, and Adıyaman (AFAD, 2023; T.C. Cumhurbaşkanlığı Strateji ve Bütçe Başkanlığı, 2023). In these cities, the earthquake's most important and destructive impact after human losses was on cultural heritage sites. Four World Heritage Sites, 3715 protected sites, and 7987 registered immovable cultural assets are in the provinces affected by the earthquake. In addition, many buildings, urban, rural, archaeological sites, and intangible cultural heritage items in the mentioned areas have also been affected by the earthquake. In the region with a multilayered and rich cultural heritage, some monumental buildings and civil architecture examples that were severely damaged were partially or destroyed (ICOMOS Türkiye Milli Komitesi, 2023).

There are various studies on the effects of earthquakes on historic cities. Guidoboni & Ferrari (2000) examined the effects of earthquakes on historic cities through the example of Italy. Finkel & Ambraseys (1997) examined the effects of the Marmara Sea earthquake of 1894 on historic buildings in and around Istanbul. Abdessemed-Foufa & Benouar (2010) examined the effects and damages of the Algeria earthquake of 1716, and Solares & Arroyo (2004) examined the effects of the 1755 earthquake on Spain. Various studies have also been conducted due to the Kahramanmaraş and Antakya earthquakes. Kocaman (2023) evaluated the effects of the Kahramanmaraş earthquake on historical masonry mosques and minarets through Adıyaman Ulu Mosque. Varnacı Uzun & Somuncu (2023)

evaluated Antakya's urban cultural heritage after the earthquakes and photographed approximately eight buildings damaged in the earthquake. Sezgin & Karagöz (2023), on the other hand, investigated the impact of Kahramanmaraş earthquakes on accommodation establishments in the region. Aktemur & Ünlükaplan (2024), conducted a SWOT analysis of Antakya Zenginler Neighbourhood streets and examined the impact of the 6 February 2023 Kahramamnmaraş earthquake on Antakya urban identity through a sample neighbourhood. Soyluk & Köse (2024) evaluated disaster risk reduction plans in historical areas and the 6 February 2023 Kahramanmaraş earthquakes through the example of Antakya Kurtuluş Street.

This study discusses the city of Antakya, one of the cities most severely affected by these earthquakes. With its 2300 years of history, Antakya, which is the intersection point of many important events in history and carries a great value with every abstract-concrete part it has added to its urban memory in this process, has suffered great losses in terms of cultural and architectural heritage as a result of these earthquakes. Many historical buildings belonging to Antakya's rich cultural heritage were destroyed or severely damaged. This study analyzed 250 monumental or civil architecture works in Antakya Urban Conservation Area (Figure 2).

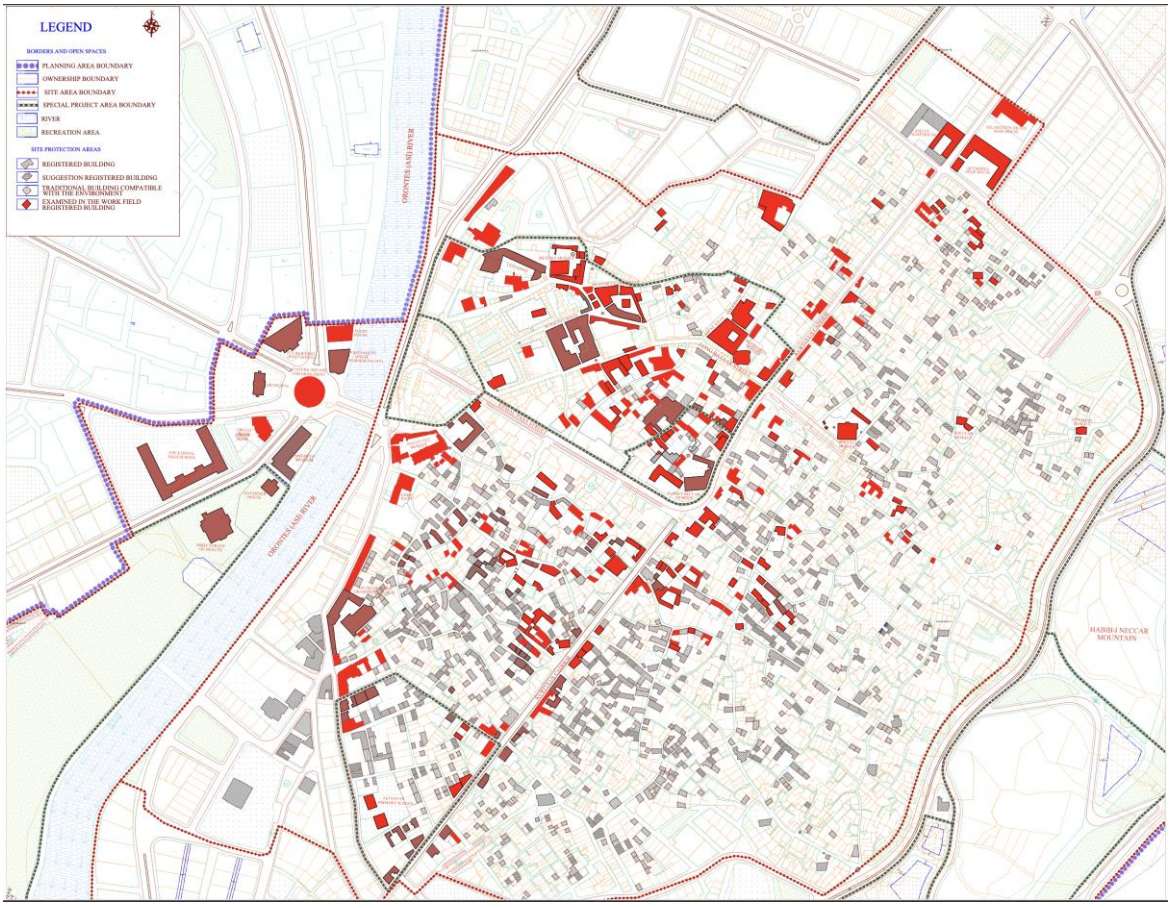


Figure 2. Structures analyzed in the field (drawn by the Authors)

2. Material and Method

2.1. Damage Assesment

Protecting and revitalizing the urban memory left behind after the earthquake was decisive in conducting a study on this city. In this direction, first of all, a literature review and archival research were conducted on the location and boundaries of the area, its importance, historical development process, cultural and natural assets, and the area's natural, physical, social and economic structure. The latest Conservation Zoning Plans for Antakya (Antioch) Urban Conservation Site were accessed (Archieve of A Proje Architectural Office), the building inventory list was prepared, and data/information about the architectural characteristics of the buildings were collected. Then, a field study was conducted between September 8-11, 2023 to determine the condition of the registered

buildings in the Antakya Urban Conservation Area after the February 6 earthquakes. The structures identified in the field were photographed according to the inventory number, and the damage status was noted. Simultaneously, the study was carried out by taking the necessary notes on the map and zoning plan. Some deficiencies in the zoning plans, inconsistencies between the zoning plan and some building addresses on Google Maps, the fact that the streets were lost due to the magnitude of the destruction and turned into a large empty land, and the difficulty of access to the building due to the debris are the main factors limiting the study. Due to these factors, some buildings on the inventory list could not be identified. Since there was no access to the courtyard of some buildings consisting of two or more buildings in the courtyard, the part of the buildings facing the street could be identified, but the other parts could not be reached. After the fieldwork, the notes taken in the field were transferred to digital media (CAD/EXEL/WORD). In this process, maps, photographs, and Google Earth street views were used to clarify the structures, and a new inventory list was created. In this context, new maps related to damage assessment were created.

Post-earthquake damage assessment is one of the most important preliminary stages in determining restoration strategies. Post-earthquake damage assessment and evaluation of structures' usability are important in earthquake-affected countries such as Italy, Japan, and Türkiye. In Italy, the process after the 1570-74 Ferrara earthquakes, 1661 Tuscany earthquake, 1781 Faenza earthquake, 1887 Liguria earthquake, 1968 Belice, 1976 Friuli, 1980 Irpinia and 1984 Abruzzo earthquakes is important in terms of damage assessment methods and evaluation methods (Goretti & Di Pasquale, 2002). In Italy, after the 1997 Umbria-Marche and 1998 Pollino earthquakes, an action plan was initiated to bring order to damage and safety assessment. Various forms were issued for damage assessment. The I Level form, prepared after the 1983 Parma and 1990 S. Lucia earthquakes, analyzed the damage in 6 levels from A2 to F (Table 1).

Table 1. Masonry bearing walls damage classification (I Level GNDT- Ministry of Labour, Civil Protection- form) (Goretti & Dİ Pasquale, 2002)

Level	Severity	Description
A	None	No visible damage
B	Slight	Any crack up to 1 mm
C	Medium	Cracks up to 4 mm when types 1,5,6; up to 2 mm when types 2,3,7; up to 1 mm when types 4, 8 or 9.
D	Heavy	Cracks up to 10 mm when types 1,5,6; up to 5 mm when types 2,3,7; up to 1 mm when types 4, 8 or 9.
E	Very heavy	Cracks and damages higher than D.
F	Destruction	

The 1997 Umbria- Marche earthquake damage classification is characterized by simplicity, immediate comprehensibility, and continuity with previous damage classifications. The damage levels have been reduced to three for easy analysis but with more detailed descriptions. They are grouped into damage to structural elements and damage to non-structural elements. In this forms, the components (vertical structures, horizontal structures, stairs and pre-existing damage) are evaluated with damages levels; very heavy/collopase, medium/heavy and null/slight (Goretti & Di Pasquale, 2002)

After the 1999 earthquakes that hit northwestern Türkiye (Aydan et al., 2000), the Government of the Republic of Türkiye changed its policy on state aid to earthquake victims whose houses were destroyed and damaged during seismic events. The new regulation pointed to compulsory state insurance of structures. As a result, the Turkish Catastrophe Insurance Pool (TCIP) was established in 2000 to administer compulsory earthquake insurance. In 2002, TCIP commissioned researchers to develop a consistent, fast, easy-to-implement damage assessment method that could be utilized after an earthquake. Accordingly, a methodology (Table 2) that fulfills the basic characteristics expected from a reliable damage assessment algorithm was developed for reinforced concrete and masonry structures, Türkiye's two most common building systems (Boduroğlu et al., 2013; Ilki et al., 2013). During the development of the methodology, various guidelines for post-earthquake damage

assessment in different countries were used (Baggio et al. 2007; Grünthal, 1998; FEMA 306 1998; Japan and Building Disaster Prevention Association (JBDPA) 2015).

Table 2. The revised version of TCIP Damage Assessment System (Revised by the Authors)

Level	Name	Definition
0	Undamaged Building	Where there is no earthquake damage in vertical and horizontal load-bearing structural members
1	Slightly damaged Building	The vertical and horizontal members that form the structural system of the building suffered limited damages in such a way that the damaged members either do not entail any repair or require relatively simple repair relatively simple repair applicators
2	Moderately damaged Building	Due to damages in the vertical and horizontal structural membes, the performanca and capacity of the structure can be decrased to a certain degree in comparison to that of pre-earthquake condition
3	Heavily damaged Building	The damages in the structural members can reach to severe levels. In addition, many of the non-structural members of the building are substantially damaged. The building may have lost a signicant amount of its pre-eartquake performance and capacity.
4	Building to be urgently demolished	The building where a partial collapse has occured in at least one storey, or the building exhibiting easily observable residual displacements are classified in this category. The existing condition of this buildings poses danger to the safety of life and property.
5	Collaped Building	The structural system lost its integrity and the building lost its integrity and the building is collaped partially or comltely. The vertical and horizontal load bearing capacity of the building is entirely eliminated.

The damage assessment of the buildings examined in this study was made based on these studies, however; since the study was conducted in September, some of the buildings that needed to be urgently demolished were demolished, and therefore, no examination was made under the title of "building to be urgently demolished". The investigations were evaluated according to the criteria 0 (undamaged building), 1 (slightly damaged building), 2 (moderately damaged building), 3 (heavily damaged building) and 4 (collapsed building).

2.2. The City of Antakya and the Urban Conservation Area

Antakya is a cosmopolitan city where many civilizations, empires, and states established sovereignty and bequeathed their cultures. Since it has a rich cultural heritage from the Hellenistic period to the present day, it is a city known and important worldwide (Arıman, 2002). Antakya, which was one of the three major metropolises of the world in the past and received the title of "Queen of the East", sets an example to the world today with its cultural structure, lifestyle, and tolerance (Ömeroğlu, 2006).

Playing an important role in the spread of the Christian religion, being an important center for the exchange of information between Constantinople and the East, and being a base of preparation and operations in the military expeditions of the emperors to the East are among the factors that increased the importance of Antakya throughout its history. Due to its strategic location, the city constantly fought foreign invasions (Bakır, 2022). A while after the establishment of Christianity in the city, Islamic conquests took place, and Islam began to spread in the region. Two different beliefs prevailed in the city before Christianity. One of these beliefs was Paganism, and the other was Judaism (Bahadır, 2013). The cultural blend of the city has deepened even more with the experience of the three Abrahamic religions and other religions.

The city was built between the Asi (Orontes) River and the western slope of the Habibi Naccar (Silpius) Mountains. A city wall surrounded it until two centuries ago, but now there are only some ruins on the Silpius Mountains (Figure 3) (Çelebi & Günaltay, 1982).

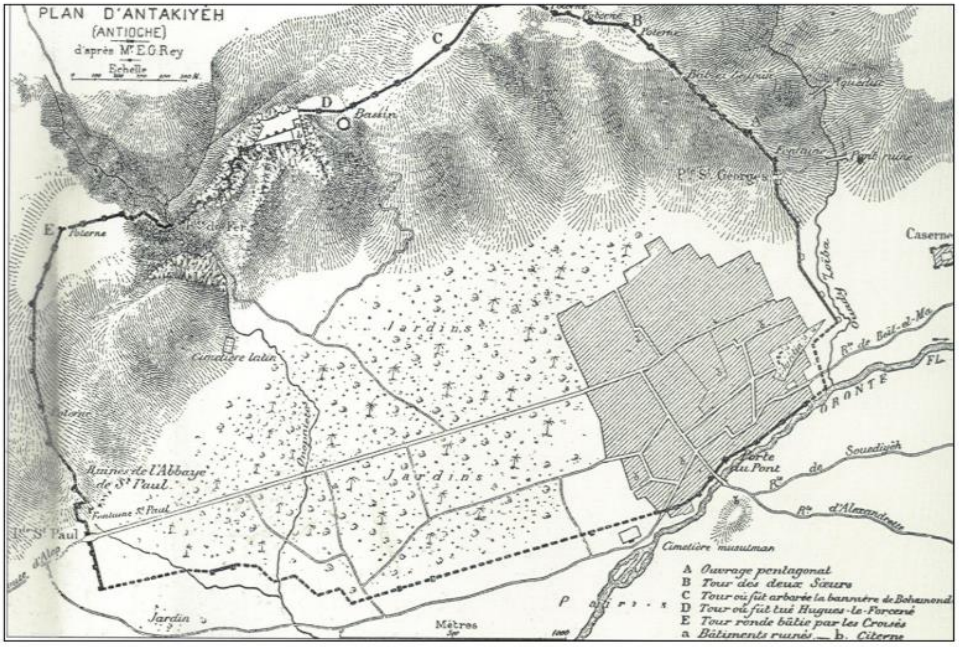


Figure 3. The expansion area of Antakya, bounded by the city walls surrounding the city and the Asi River (Güzer, 2007; Demir, 1996)

The grid plan scheme, a characteristic feature of Hellenistic period cities, was also applied in Antakya, and the Agora in the city was located around the Great Mosque (Demir, 1996; Güzer, 2007). The most important reconstruction activity of the Roman Period was the construction of the 2956 m long "Colonnaded Street" (Herod Street) (Downey, 1961). The city was severely damaged during the Persian invasion in 256 AD. Although rebuilt afterward, the city form was largely destroyed by successive earthquakes and subsequent fires in the early 6th century (Maas, 2000).

Antakya was remodeled according to the characteristics of an Islamic city during the Ottoman Period. The courtyard typology and introverted architecture dominated the grid plan (Güzer, 2007). Antakya's road texture did not emerge due to certain planning or depending on an order. The road texture, which developed spontaneously depending on the needs, existing texture, and topographical structure, shows an intricate, winding, and organic structure. The walls of buildings or courtyards limit the streets. The streets are narrow, and dead-end streets are frequently encountered (Ömeroğlu, 2006; Temiz, 2002).

Due to the successive earthquakes and wars in 1615, 1822, and 1872, Antakya turned into ruins, and the city became a town due to the decrease in population. The earthquake of 1872 caused the heaviest damage to the city, and the city walls surrounding the city were almost destroyed. The bridge over the Asi River cracked, and 2/3 of the city was destroyed. After this date, the walls surrounding the city were considered as proof of the original size of the city (Güzer, 2007). Until the end of the 19th century, while the city was within the city walls, a new settlement area was formed on the opposite bank of the Asi River. This area, known as "Muhacirin Osmaniye", later became known as "Yeni Mahalle". This area was rapidly built up due to the favorable topography. Completely new buildings were constructed here (Güzer, 2007).

When the city was under French rule, the historical Colonnaded Street was replaced by Kurtuluş Street and Kemal Paşa Street, which cut this street vertically. These streets form a linear axis. The grid plan scheme seen in the city at the beginning has lost its dominance in the central area and turned into an organic texture. The old city center, which continued its development around Ulucami Square at the end of Hürriyet Street until the 1940s, bears the architectural traces of the Ottoman Period (Figure 4) (Güzer, 2007).

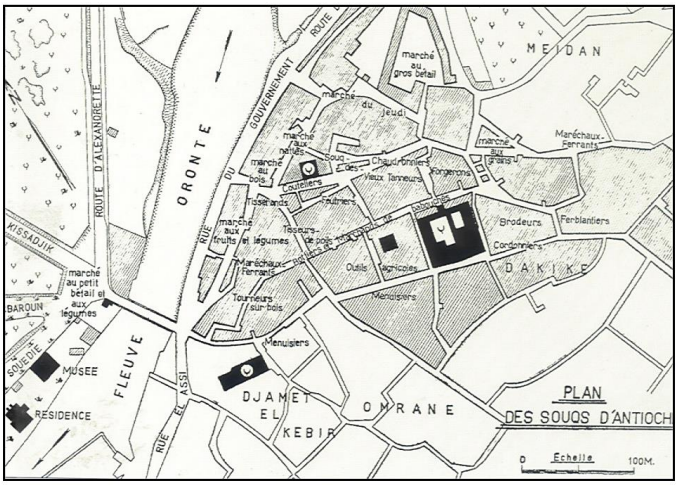


Figure 4. Plan of the city dated 1936. It is seen that Kurtuluş Street, the main axis of the city, has not yet been opened (Güzer, 2007; Demir, 1996)

The first zoning plan for Antakya, including Gazipaşa Street, was prepared in 1948, but this plan was not put into practice, and a new zoning plan was prepared in 1957 (Rifaioğlu, 2014). However, since the 1957 zoning plan brought an order that changed the urban texture and damaged the street-courtyard-house relationship, the traditional urban texture was negatively changed (Özalp, 2008). In 1975, 70 buildings to be protected were registered as " Monuments" and 132 houses were registered as "Civil Architecture Examples" by a board appointed by the General Directorate of Antiquities and Museums of the Ministry of Culture. In addition, archaeological, urban, and natural site boundaries were determined. A new zoning plan was prepared in 1978 based on the decision that necessary measures should be taken for the artifacts identified and deemed necessary to be protected and that plan decisions should serve this purpose (Demir, 1996; Ömeroğlu, 2006; Güzelmansur et al., 2007). However, this plan was not successful in protecting the city's historical texture, and a new zoning plan was put into effect in 1987. This plan defined 1st and 3rd Degree Archaeological Sites, Natural Sites, and Urban Sites (Rifaioğlu, 2014). The city, which many civilizations have shaped, the area to the East of the Asi River passing through it, where historical events and cultures were formed, was defined according to the Hatay-Antakya Site Conservation Zoning Plan Implementation Regulation. Kurtuluş Street and most of Old Antakya are located within the boundaries of the urban conservation area. The Antakya Historic Site, the development activities within the site boundaries, and the "Antakya Site Boundaries" were finalized with the board decision numbered 638 in 1990 (Ömeroğlu, 2006; Kocaoğlu, 2016).

The neighborhoods in Antakya urban site are as follows: Akbaba, Barbaros, Biniciler, Dutdibi, Fevzipaşa (part of it), Gazipaşa, Güllübahçe, İplikpazarı, Kuyulu, Kantara, Kocaabdi, Kardeşler (part of it), Meydan (part of it), Orhanlı (part of it), Sofular, Şehitler, Şirince (part of it), Şeyhali, Ulucami, Yenicami and Zenginler (Figure 5). The location of the urban conservation area in the center provides easy access. Kurtuluş Street, which has existed since the city's foundation, is still a very important axis for the city and is one of the most important transport axes of Antakya throughout history. The area has many building types such as temples, inns, baths, traditional houses, and traditional bazaars. This historical texture formed by monumental and civil buildings has formed the silhouette of Antakya city (Ömeroğlu, 2006).

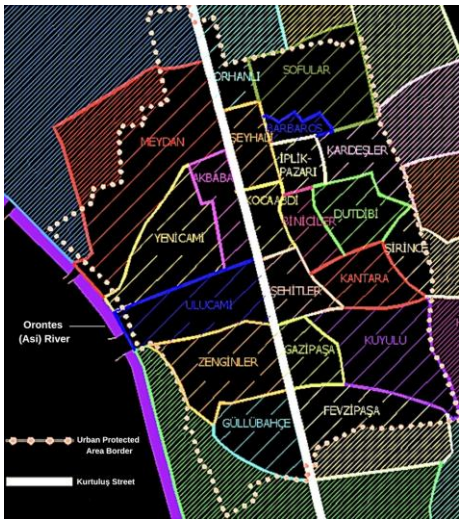


Figure 5. Antakya Urban Conservation Site (Ömeroğlu, 2006)

When the distribution of Antakya cultural heritage buildings in the city center is examined, it is seen that most of these buildings are located east of the Asi River, between Kurtuluş Street and Hürriyet Street (Figure 6) (Dal & Kaymaz, 2021). Old Antakya, located between the Asi River and Habib-i Neccar Mountain, is also the city's oldest settlement. For this reason, most buildings with historical and cultural value are in this area. Old neighborhoods (Zenginler Quarter, Yeni Cami Quarter) are in Old Antakya. In these neighborhoods, traditionally narrow streets and Antakya houses are concentrated. Habibi Neccar Mosque and Ulu Mosque (Figure 7), Sarımiye Mosque, Amntakya Orthodox Church (Figure 8), Antakya Catholic Church, and Antakya Jewish Synagogue are the religious buildings in this area (Sargın & Dinç, 2017). Apart from the Ottoman period buildings such as Kurşunlu Han (Figure 9), Defne Han, Cindi Bath, there are also Republican period buildings such as the Hatay Parliament Building (Figure 9), Hatay Governorship, PTT building.

Figure 6. Kurtuluş Street, Hürriyet Street and Gazipaşa Street (Kocaoğlu, 2016)

Figure 7. Habibi Neccar Mosque (left) (Fikriyat, 2023), Antakya Ulu (Grand) Mosque (right) (Antakya Metropolitan Municipality, 2015)

Figure 8. Greek Orthodox Church of Antioch (Church of St Piyer and St Paul) (Kültür Portali, 2014)

Figure 9. Hatay Historical Parliament Building (left) (Fırat Üniversitesi İletişim Fakültesi Uygulama Gazetesi, 2022) and Uzun Bazaar and the entrance to Kurşunlu Han (right) (ASE İnşaat Mutfak Turizm, 2022)

3. Findings and Discussion

Antakya is geographically located in the Amik Plain on the southwestern flank of the point where the Asi River meets Habib Neccar Mountain. In addition to being located on the northern end of the Jordan Rift Valley, an active fault line, it is also located in a region where different tectonic movements are felt. Some of the earthquakes in the city in the historical process were mild, and some were quite destructive (Bakır, 2022). The last of these catastrophic earthquakes occurred on February 6, 2023. Hatay was one of the cities most affected by the February 6 earthquakes, in which many buildings collapsed, and more than 50 thousand lives were lost.

As a result of the examination of the inventories prepared after the zoning plans and the last Conservation Plan approved in 2009 (Archieve of A Proje Architectural Office), it was determined that there are 462 registered buildings in total within the Antakya Urban Site (Hatay Valiliği, 2011). The majority of these buildings are traditional Antakya houses. After the houses, the dominant building type is mosques. Among these building types, in addition to traditional houses, mosques, churches, synagogues, inns, baths, and tombs, there are also soap-making structures (sabunhane) unique to Antakya. These buildings are among the important groups that enrich the urban conservation area.

Based on the inventory list and the Conservation Zoning Plan, 250 registered buildings were inspected for damage. Of the buildings examined, 44 are examples of Group 1 (monumental buildings), and 206 are examples of Group 2 (civil architecture). Of the 44 monumental buildings, 19 are mosques, 5 are masjids, 2 are churches, 3 are tombs, 4 are baths, 4 are inns, 5 are soap houses, 1 is a Bedesten, 1 is a synagogue. Of the 206 civil architecture buildings, 13 are commercial, 22 are residential+commercial, 158 are residential, 1 is an Atatürk Monument and square, and 12 are buildings with different functions (Hatay Parliament Building, Post Office Building, Municipality Building, dispensary, Primary School, Police Station etc.) (Figure 10).

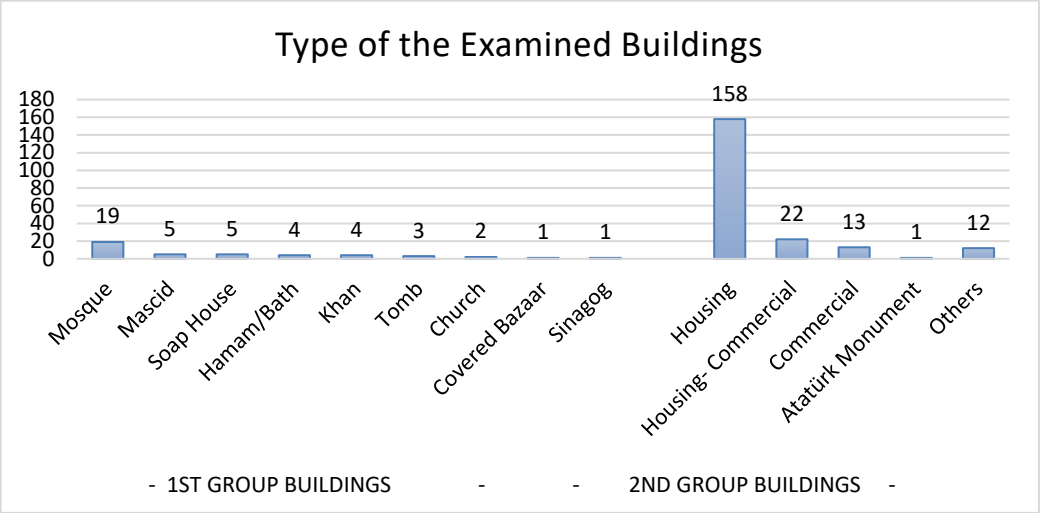


Figure 10. Building groups analysed in the field

Figure 11 and Figure 12 shown the damage level distrubution due building types. From the 44 monumental buildings examined, 3 were undamaged, 7 were slightly damaged, 3 were moderately damaged, 16 were heavily damaged, and 15 were demolished (Table 3). Regarding the civil architecture works, 19 buildings were undamaged, 19 were slightly damaged, 13 were moderately damaged, 39 were heavily damaged, and 116 were demolished (Table 4). Out of 250 buildings, 131 buildings were completely demolished (Figure 13). Most of the remaining structures are heavily and moderately damaged.

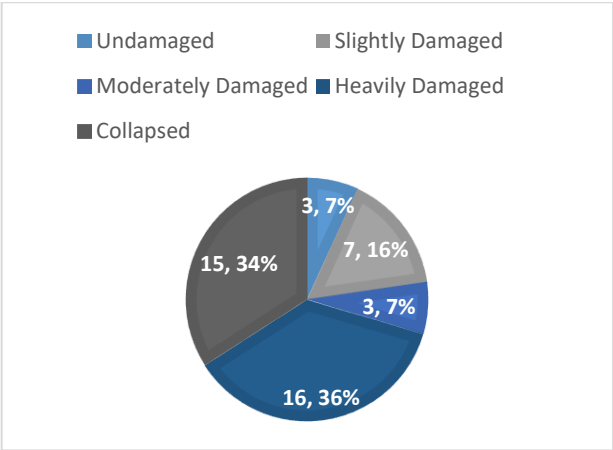


Figure 11. 1st Group damage level

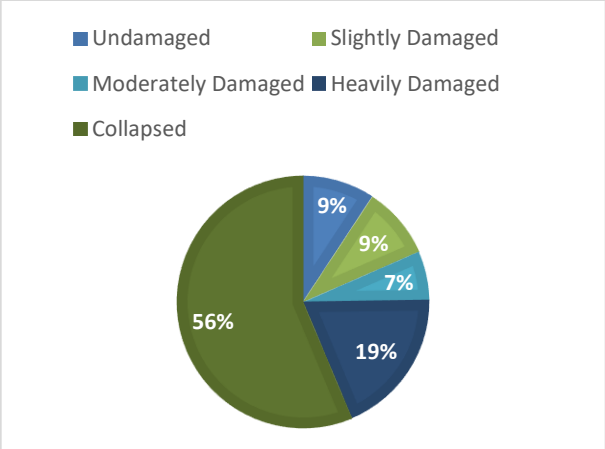


Figure 12. 2nd Group damage level

Table 3. The damage degree of the 1st group buildings (monuments) (Prepared by the authors)

NO:	TYPE OF BUILDING	INVENTORY NUMBER	EXPLANATION	DAMAGE LEVEL
1	MOSQUE	B11	Hatay Ulu Mosque	4
2	TOMB	B12	Şeyhoğlu Tomb	4
3	HAMAM/BATH	B13	Cindi Hamam/Bath	3
4	CHURCH	B15	Church	4
5	COVERED BAZAAR	B16	Covered Bazaar	3
6	MOSQUE	B21	Habib-İ Neccar Mosque	3
7	HAMAM/BATH	B31	Yeni Hamam/Bath	4
8	MOSQUE	B45	Mahremiye Mosque	4
9	KHAN	B47	Defne Khan	3
10	HAMAM/BATH	B48	Saka Hamam/Bath	3
11	MASJID	B49	Rıfat Ağa Masjid	1
12	MOSQUE	B52	Zülfikar Mosque	4
13	MASJID	B53	Debruz Masjid	2
14	MASJID	B54	Ali Çavuş Masjid	1
15	MOSQUE	B59	Yeni Mosque	4
16	SOAP HOUSE	B71	Old Soap House	1
17	MOSQUE	B72	Semerciler Mosque	4
18	KHAN	B73	Kurşunlu Khan	3
19	KHAN	B75	Tütün Khan-Kuyumcular Khan	3
20	MOSQUE	B79	Meydan Mosque	4
21	KHAN	B81	Yeni Khan	4
22	MOSQUE	B82	Ahmediye Mosque	3
23	MOSQUE	B83	İhsaniye Mosque	4
24	HAMAM/BATH	B84	Meydan Hamam/Bath	4
25	MOSQUE	B87	Selvili Mosque	2
26	SOAP HOUSE	B88	Kuseyri Soap House	4
27	SOAP HOUSE	B96	Aselci Soap House	3
28	SOAP HOUSE	B97	Sabun Soap House	4
29	SOAP HOUSE	B98	Savon Soap House	1
30	TOMB	B99	Hıdır Tomb	1
31	MOSQUE	B101	Orhanlı Mosque	3
32	MOSQUE	B105	Şeyh Muhammed Mosque	3
33	MOSQUE	B111	Osmanlı Mosque	3
34	MOSQUE	B112	Sofular Mosque	1
35	MOSQUE	B113	Şeyhali Mosque	3
36	TOMB	B118	Şıh Abdurrahman Tomb	2
37	MOSQUE	B120	Deveci Bekiroğlu Mosque	3
38	MOSQUE	B122	Kürtfakih Mosque	3
39	MASCID	B124	Uçtum Masjid	0
40	MOSQUE	B148	Nakipoğlu Mosque	4
41	MOSQUE	B156	Sarımiye Mosque	3
42	SINAGOG	B171	Konut Sınagog	0
43	MASJID	B183	Hünkar Masjid	1
44	CHURCH	B203	Türk Katolik Church	0

Table 4. Damage degree of the 2nd group buildings (houses and commercial buildings)

NO:	TYPE OF BUILDING	INVENTORY NUMBER	EXPLANATION	DAMAGE LEVEL
1	MONUMENT	B1	Atatürk Square and Monument	0
2	PARLIAMENT HOUSE	B2	Parliemant House (Former Hatay)	4
3	PUBLIC	B3	Mado House	4
4	PUBLIC	B4	PTT Building (Post Office)	3
5	PUBLIC	B5	Municipal	3
6	BANK	B6	T.C. Ziraat Bank	4
7	MUSEUM	B7	Antakya Museum	1
8	PUBLIC	B8	Governer House	2
9	HEALTH SERVICE	B9	Directorat of Health	3
10	SCHOOL	B10	Vocational High School	3
11	COMMERCIAL	B14	Commercial next to Orthodox Church	4
12	HOUSING	B17	Housing	4
13	HOUSING	B18	Housing	4
14	HOUSING	B19	Ramize Karabay House	1
15	HOUSING	B20	House	1
16	HOUSING	B22	Ülkü Ocakları Building	1
17	HOUSING	B23	Housing	1
18	HOUSING	B24	Housing	1
19	HOUSING	B25	Housing	3
20	HOUSING	B26	Housing	2
21	HOUSING	B27	Housing	0
22	HOUSING	B28	Housing	3
23	HOUSING	B29	Housing	4
24	HOUSING	B30	Housing	4
25	HOUSING	B32	Housing	3
26	HOUSING	B33	Housing	4
27	HOUSING-COMMERCIAL	B34	Housing-Commercial	1
28	HOUSING-COMMERCIAL	B35	Housing-Commercial	4
29	COMMERCIAL	B36	Commercial	4
30	HOUSING	B37	Housing	4
31	HOUSING	B38	Housing	2
32	HOUSING	B39	Housing	4
33	HOUSING-COMMERCIAL	B40	Housing-Commercial	4
34	HOUSING	B41	Housing	3
35	HOUSING	B42	Housing	4
36	HOUSING	B43	Housing	3
37	HOUSING	B44	Housing	1
38	HOUSING	B46	Uludağ House	4
39	HOUSING	B50	House-Fountain	1
40	HOUSING	B51	Chemistry House	3
41	HOUSING	B55	Housing	4
42	HOUSING	B56	Sedat Adali House	4
43	HOUSING	B57	Housing	4
44	HOUSING	B58	Housing	4
45	HOUSING	B60	Housing	4
46	HOUSING	B61	Housing	4
47	HOUSING	B62	Housing	4
48	HOUSING-COMMERCIAL	B63	Housing-Commercial	4
49	COMMERCIAL	B64	Commercial	4
50	HOUSING-COMMERCIAL	B65	Housing-Commercial	1
51	HOUSING	B66	Housing	4

Table 4. Damage degree of the 2nd group buildings (houses and commercial buildings) (continued)

52	HOUSING-COMMERCIAL	B67	Housing-Commercial	**4**
53	HOUSING	B68	Kuseyri House	**0**
54	HOUSING-COMMERCIAL	B69	Housing-Commercial	**3**
55	COMMERCIAL	B70	Commercial	**1**
56	COMMERCIAL	B74	Commercial	**1**
57	COMMERCIAL	B76	Commercial	**3**
58	COMMERCIAL	B77	Commercial	**3**
59	COMMERCIAL	B78	Commercial next to Meydan Mosque	**1**
60	COMMERCIAL	B80	Commercial	**4**
61	COMMERCIAL	B85	Sultan Sofrası	**4**
62	COMMERCIAL	B86	Hotel-Commercial	**4**
63	HOUSING	B89	Housing	**4**
64	HOUSING	B90	Housing	**4**
65	HOUSING	B91	Housing	**4**
66	HOUSING	B92	Housing	**4**
67	HOUSING	B93	Housing	**4**
68	HOUSING	B94	Housing	**3**
69	HOUSING	B95	Bekir Çelik House	**4**
70	HOUSING	B100	Housing	**4**
71	HOUSING	B102	Housing	**4**
72	HOUSING	B103	Housing	**3**
73	HOUSING	B104	House-Fountain	**4**
74	HOUSING	B106	Housing	**4**
75	HOUSING	B107	Housing	**4**
76	HOUSING-COMMERCIAL	B108	Housing-Commercial	**4**
77	HOUSING	B109	Housing	**4**
78	HOUSING	B110	Housing	**4**
79	COMMERCIAL	B114	Commercial	**4**
80	HOUSING-COMMERCIAL	B115	Housing-Commercial	**4**
81	HOUSING	B116	Housing	**4**
82	HOUSING	B117	Housing	**4**
83	HOUSING	B119	Housing	**4**
84	HOUSING	B121	Housing	**4**
85	HOUSING	B123	Housing	**4**
86	HOUSING	B125	Housing	**4**
87	HOUSING	B126	Housing	**4**
88	HOUSING	B127	Housing	**4**
89	HOUSING	B128	Housing	**0**
90	HOUSING	B129	Housing	**0**
91	HOUSING	B130	Housing	**3**
92	HOUSING	B131	Housing	**3**
93	HOUSING	B132	Yigitbaş House	**0**
94	HOUSING	B133	Housing	**4**
95	HOUSING	B134	Housing	**3**
96	HOUSING	B135	Housing	**4**
97	HOUSING	B136	Housing	**1**
98	HOUSING	B137	Housing	**3**
99	HOUSING-COMMERCIAL	B138	Housing-Commercial	**3**
100	HOUSING-COMMERCIAL	B139	Housing-Commercial	**4**
101	HOUSING	B140	Housing	**4**
102	HOUSING-COMMERCIAL	B141	Housing-Commercial	**2**
103	HOUSING	B142	Housing	**4**
104	HOUSING	B143	Housing	**2**
105	HEALTH SERVICE	B144	Trahom War Dispancary	**2**

Table 4. Damage degree of the 2nd group buildings (houses and commercial buildings) (continued)

106	HOUSING	B145	Housing	1
107	HOUSING	B146	Housing	4
108	HOUSING	B147	Housing	1
109	HOUSING	B149	Housing	4
110	HOUSING	B150	Housing	4
111	HOUSING	B151	Housing	4
112	HOUSING	B152	Housing	3
113	HOUSING	B153	Housing	4
114	HOUSING	B154	Housing	3
115	HOUSING	B155	Housing	2
116	HOUSING	B157	Housing	3
117	HOUSING	B158	Housing	0
118	HOUSING	B159	Housing	0
119	HOUSING	B160	Housing	0
120	HOUSING	B161	Housing	3
121	HOUSING	B162	Housing	3
122	HOUSING	B163	Alexi K. House	3
123	HOUSING	B164	Fethiye G. House	3
124	HOUSING	B165	Housing	3
125	HOUSING	B166	Housing	3
126	HOUSING-COMMERCIAL	B167	Housing-Commercial	0
127	HOUSING-COMMERCIAL	B168	Housing-Commercial	0
128	HOUSING-COMMERCIAL	B169	Housing-Commercial	2
129	HOUSING	B170	Housing	0
130	HOUSING	B172	Housing	0
131	HOUSING-COMMERCIAL	B173	Housing-Commercial	2
132	HOUSING-COMMERCIAL	B174	Housing-Commercial	2
133	HOUSING	B175	Housing	4
134	HOUSING	B176	Housing	1
135	HOUSING-COMMERCIAL	B177	Caffehouse-Housing	3
136	HOUSING	B178	Housing	2
137	HOUSING	B179	Housing	4
138	HOUSING-COMMERCIAL	B180	Housing-Commercial	2
139	HOUSING	B181	Housing	4
140	HOUSING	B182	Housing	4
141	HOUSING	B184	Housing	4
142	HOUSING	B185	Bedriye Küçük House	0
143	HOUSING	B186	Housing	4
144	HOUSING	B187	Housing	4
145	HOUSING	B188	Housing	4
146	HOUSING	B189	Housing	4
147	HOUSING	B190	Housing	4
148	HOUSING	B191	Housing	4
149	HOUSING	B192	Nuriye Kumru House	4
150	HOUSING	B193	Kemal Bilgin House	4
151	HOUSING	B194	Housing	4
152	HOUSING-COMMERCIAL	B195	Housing-Commercial	3
153	HOUSING	B196	Housing	4
154	HOUSING	B197	Housing	4
155	HOUSING	B198	Housing	4
156	HOUSING	B199	Housing	4
157	HOUSING	B200	Housing	4
158	HOUSING	B201	Housing	4
159	HOUSING	B202	Housing	0

Table 4. Damage degree of the 2nd group buildings (houses and commercial buildings) (continued)

160	HOUSING	B204	Housing	4
161	HOUSING	B205	Housing	3
162	HOUSING	B206	Housing	4
163	HOUSING	B207	Housing	4
164	HOUSING	B208	Housing	4
165	HOUSING	B209	Housing	4
166	HOUSING	B210	Housing	4
167	HOUSING	B211	Housing	4
168	HOUSING	B212	Housing	4
169	HOUSING	B213	Housing	4
170	HOUSING	B214	Housing	4
171	HOUSING	B215	Housing	4
172	HOUSING	B216	Housing	3
173	HOUSING	B217	Housing	3
174	HOUSING	B218	Abdul Keberiti House	4
175	HOUSING	B219	Housing	4
176	HOUSING	B220	Housing	4
177	HOUSING	B221	Housing	4
178	HOUSING	B222	Housing	4
179	HOUSING	B223	Housing	4
180	HOUSING	B224	Housing	4
181	HOUSING	B225	Housing	4
182	HOUSING	B226	Housing	4
183	HOUSING	B227	Housing	4
184	HOUSING	B228	Housing	4
185	HOUSING	B229	Housing	1
186	HOUSING	B230	Housing	4
187	HOUSING	B231	Housing	0
188	HOUSING	B232	Housing	2
189	HOUSING	B233	Housing	0
190	COMMERCIAL	B234	Commericial	0
191	HOUSING	B235	Housing	3
192	HOUSING	B236	Housing	3
193	SCHOOL	B237	Ali Sayar Primary School	0
194	HOUSING	B238	Housing	3
195	HOUSING-COMMERCIAL	B239	Housing-Commercial	3
196	HOUSING	B240	Housing	4
197	HOUSING	B241	Housing	4
198	PUBLIC	B242	Police Station	4
199	HOUSING-COMMERCIAL	B243	Housing-Commercial	4
200	HOUSING	B244	Housing	4
201	HOUSING	B245	Housing	1
202	HOUSING	B246	Housing	3
203	HOUSING	B247	Housing	4
204	HOUSING	B248	Housing	4
205	HOUSING	B249	Housing	4
206	HOUSING	B250	Housing	4

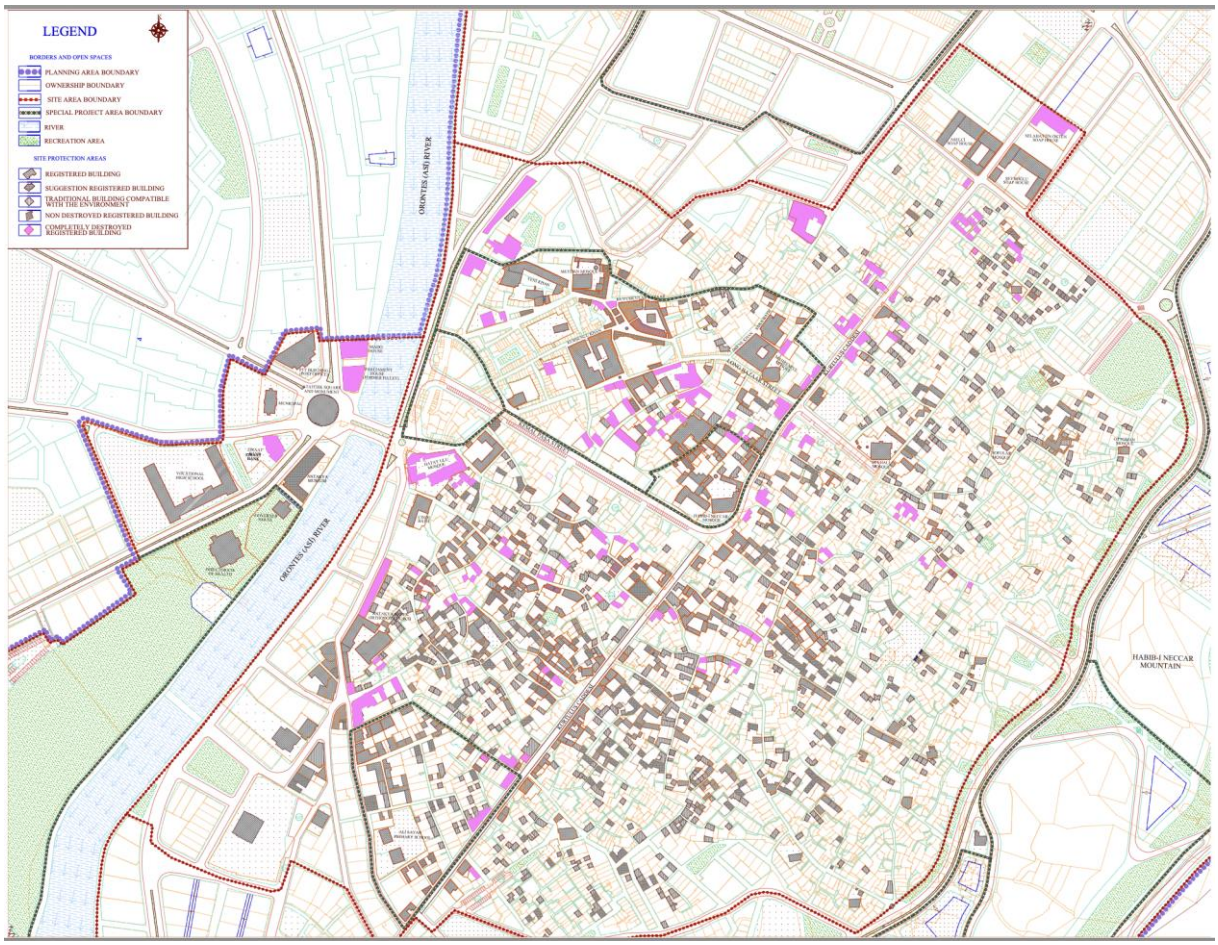


Figure 13. Collapsed Buildings (drawn by the Authors)

The destruction of many monumental buildings (Figure 14) is thought to have serious implications for urban identity and people's perception of the city. Although the magnitude of the destruction may be attributed to the intensity of the earthquake, it is obvious that other factors should also be emphasized. The multilayered structure of the city, especially within the urban conservation area, the alluvial soil structure in the East of the Asi River, and even the fact that the river bed was wider in the past and that the water decreased in time and the construction of buildings near the river bed can be counted among the factors that increased the severity of the destruction. The Great Mosque of Hatay, one of the important gathering places of the city, was destroyed, while the Habibi Neccar Mosque was heavily damaged (Figure 15). Habibi Neccar Mosque is one of the symbolic structures of the city, with a group of buildings around it. The mosque has a very important place in the city's history as it is considered the first mosque built within the borders of today's Türkiye.

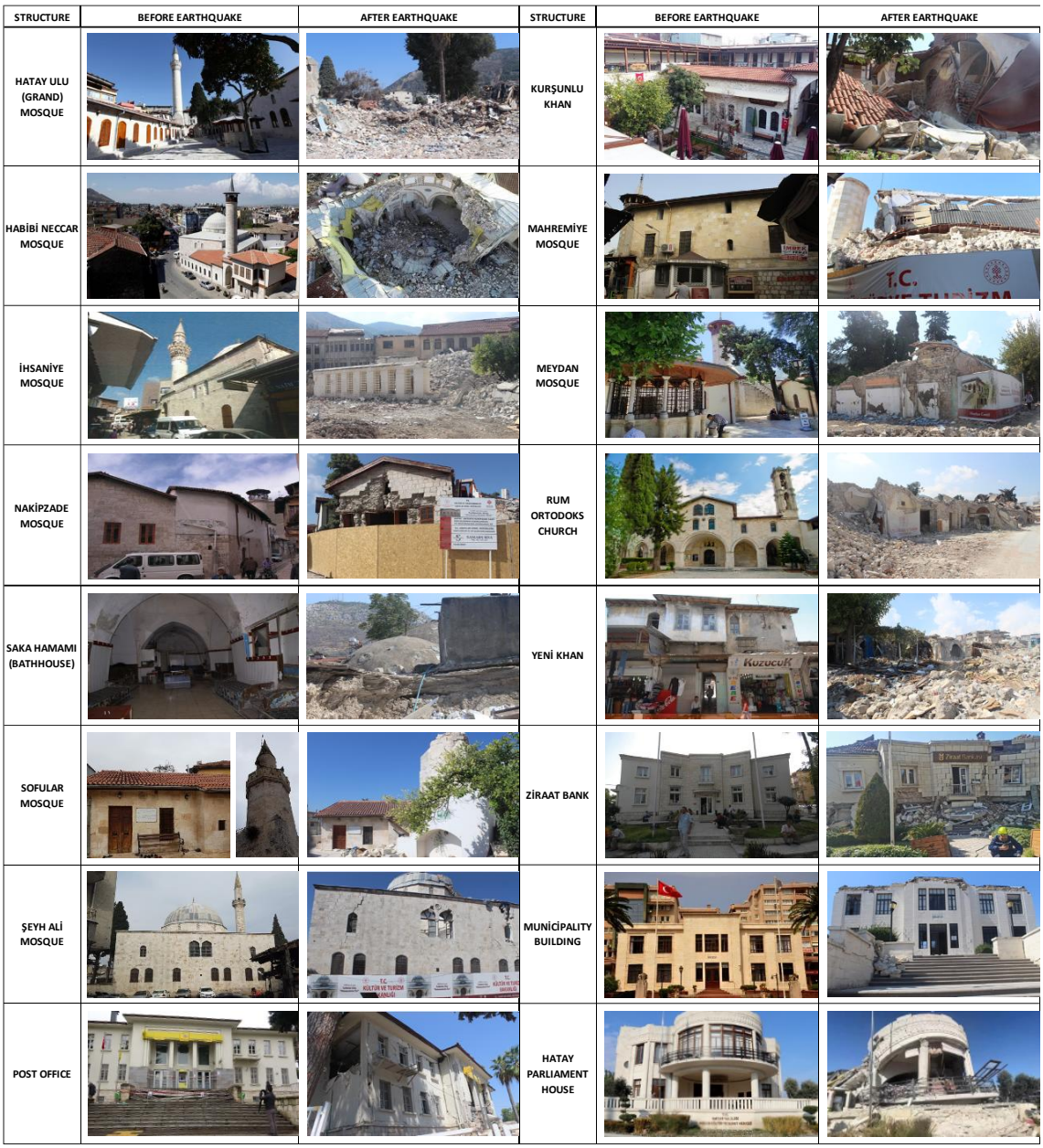


Figure 14. Post-earthquake condition of monumental buildings in the area (Taken by Authors, 2019 & 2023)

Figure 15. Habibi Neccar Mosque and its surrounding (Arkeofili, 2023)

Similarly, the Greek Orthodox Church (Church of St. Piyer and St. Paul) is a very important place for Christians and was heavily damaged after the earthquake. Buildings with residential-commercial functions located on Kurtuluş Street, one of the city's most important streets, were also significantly damaged (Figure 16). Antakya traditional houses with courtyard typology bounded by streets were also severely affected by the earthquake (Figure 17).

Figure 16. Kurtuluş Street before and after the earthquake (taken by the Authors, 2023)

Figure 17. Traditional house examples within the urban conservation area (taken by the Authors, 2023)

According to the research of Aktemur & Ünlükaplan (2024), most of the urban image elements such as the UNESCO Gastronomy House, Expo House, Sermaye Mosque, and the Catholic Church in Zenginler Neighbourhood, one of the oldest settlements of Antakya, were destroyed or heavily damaged. Cindi Hamam, Nakip Mosque, and Kurtuluş Hamam on Türk Yurdu Street are also among the buildings that were severely damaged. In addition, it is seen that the historical texture has also been lost with the destruction of the elements that form the boundaries of the neighborhood, the roads lost with the demolished buildings, and the images that serve as edges (Aktemur & Ünlükaplan, 2024).

Within the scope of the study conducted by Göçer (2024), the structural behavior of Antakya High School, which is an educational structure, due to the effects of Kahramanmaras earthquakes was evaluated by the data obtained by on-site observation. Three different branches of the building were

evaluated in terms of damages following the rating as 0 (no damage), 1 (rarely), 2 (moderate), and 3 (high). While one of the units with the same architectural characteristics collapsed due to the earthquake, the other unit survived with secere damage. The reasons for this can be defined as the inhomogenius mixture of the mortar used as binding material, the use of wall components in the form of rubble stones of different sizes, and irregularities in the wall knitting system (Göçer, 2024). These findings briefly summarise the reasons for the problems in the 250 structures examined.

One of the important architectural components damaged in the area is domes. Masonry domes, which are curved and spherical building components, have been widely used as upper covering elements in large interior spaces of historical buildings such as mosques, churches, mausoleums, baths, and palaces (Grillanda et. al., 2019; Pavlovic et al., 2016). These structures are weak elements against earthquakes due to their very low tensile strength. As stated by Bayraktar et al. (2022), heavy damage and collapse of masonry domes have occurred in the past due to disasters such as earthquakes. Of the 19 mosques analyzed, four are masonry domed and fourteen have wooden roofs (hipped, gable, pitched, flat, etc.). The Great Mosque of Hatay has a vaulted and wooden roof. Among the domed ones, the domes of 3 of them have collapsed and one of them is heavily damaged. Hatay Great Mosque was also completely demolished. Two of the ones with wooden roofs were demolished, three of them were heavily damaged, two of them were moderately damaged, and seven of them were slightly damaged (Figure 18a-b).

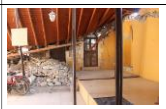
	Name of Building	Dome/Wooden roof (hipped, pitched, gable, flat)	Post-earthquake Situation	Pre-earthquake Situation	Damage Level of the Dome	Minaret	Photo of Minaret	Damage Level of the Minaret
1	Hatay Ulu Mosque	Wooden, Vault			Collapsed	✓		Collapsed
2	Habib-i Neccar Mosque	Dome			Collapsed	✓		Collapsed
3	Mahremiye Mosque	Wooden			heavily damaged	✓		heavily damaged (only base part standing)
4	Zülfikar Mosque	Wooden			heavily damaged	a ezanlık (small minaret)		Slightly damaged
5	Yeni Mosque	Dome			Collapsed	✓		Collapsed
6	Semerciler Mosque	Wooden			Collapsed	✓		heavily damaged
7	Ahmediye Mosque	Wooden			Slightly damaged	✓		heavily damaged (only base part standing, the base part was also dismantled for new construction)
8	Meydan Mosque	Wooden			Collapsed	✓		heavily damaged (only base part standing)
9	İhsaniye Mosque	Dome			Collapsed	✓		Collapsed

Figure 18a. Dome and minaret damage assessment in the mosques inspected (by Authors)

	Name of Building	Dome/Wooden roof (hipped, pitched, gable, flat)	Post-earthquake Situation	Pre-earthquake Situation	Damage Level of the Dome	Minaret	Photo of Minaret	Damage Level of the Minaret
10	Selvili Mosque	Wooden			Slightly damaged	a ezanlık (small minaret)		Collapsed
11	Orhanlı Mosque	Wooden			heavily damaged	✓		heavily damaged (only base part standing)
12	Şeyh Muhammed Mosque	Wooden			Slightly damaged	✓		heavily damaged (only base part standing)
13	Osmanlı Mosque	Wooden (it is wooden in original, later a reinforced concrete slab constructed)			Slightly damaged	✓		Collapsed
14	Sofular Mosque	Wooden			Slightly damaged	✓		heavily damaged (only base part standing)
15	Şeyhali Mosque	Dome			heavily damaged	✓		heavily damaged (only base part standing)
16	Deveci Bekiroğlu Mosque	Wooden			Slightly damaged	✓		Slightly damaged
17	Kürtfakih Mosque	Wooden			Slightly damaged	✓		Collapsed
18	Nakipoğlu Mosque	Wooden			Moderately damaged	✓		Collapsed
19	Sarımiye Mosque	Wooden			Moderately damaged	✓		heavily damaged (only base part standing)

Figure 18b. Dome and minaret damage assessment in the mosques inspected (by authors)

It has been determined that one of the building components affected by earthquakes is minarets, which generally have a long and thin architectural design. Minarets, due to their slender structure, are more susceptible to natural disasters such as wind and earthquakes compared to other architectural elements (Ercan et. al., 2017). The behavior of minarets during earthquakes has attracted the attention of many researchers and many studies have been conducted to understand the occurrence of these damages and to predict their behavior in earthquake scenarios. Doğangün et al. (2007) stated that minarets are mostly damaged in the cone/spire *(külah),* upper part of the minaret body, cylindirical or polygonal bady, and transition segment under the earthquake effect. Experimental and numerical studies have shown that there is no stress accumulation in the cone section of the minarets (Doğangün et al., 2008; Çakır et al., 2016). However, the maximum displacement occurs in this region, and the absence of a staircase in the upper body of the chancel causes the stiffness to decrease and the displacement to increase suddenly. Therefore, it can be said that the cone and body connection parts of some minarets do not have sufficient displacement stiffness and strength (Atmaca et al., 2020). Seventeen of the 19 mosques examined have minarets and two have ezanlık (small minaret).. Eight of the minarets have been demolished, nine of them are heavily damaged (only the pedestal part is standing), and two of them (one of which is a ezanlık) are slightly damaged (Figure 17a-b).

4. Conclusion and Suggestions

The issue of how and where new construction will occur in cities affected by the Kahramanmaraş earthquakes is very important. However, this issue must be considered more carefully, especially in historical city centers. It is a common practice to build post-earthquake disaster housing on the city's

outskirts and in areas with solid ground. This issue should inevitably be handled sensitively in the historical city centers affected by the earthquake, especially in the urban protected area of Antakya, and how the identity of Antakya city can be preserved, how these buildings can be revived, and in which building reconstruction is inevitable, should be addressed by experts in the field.

In order to preserve the multicultural and multilayered structure of Antakya, it is necessary to ensure that the region's people can live here and continue their economic activities. Since the area around the Asi River is a gathering area for Antakya's cultural heritage, such as the Habibi Neccar Mosque, churches, the Long Bazaar, cultural venues, and neighborhoods where traditional residences are gathered, it is important to preserve their relations with the old city in the plans to be made.

It is extremely important that post-earthquake restorations are carried out in a way to keep the social memory alive, to keep the places, focal points and old experiences alive in the memories. It is only possible to create and keep alive the urban identity of the region known as Old Antakya (Antioch) by revealing the production of a symbolic space and regaining the social memory of these places.

Within the scope of this study, archive and inventory studies, zoning plans, and conservation plan research were conducted, and the buildings in Antakya Urban Protected Area were listed. Subsequently, the post-earthquake conditions of the registered monumental and civil architecture examples were comprehensively revealed through field studies. This study, which records the city as a whole without focusing on the individual buildings and their reasons for being affected by the earthquake and the documentation necessary for processes such as restoration and reconstruction, presents the damage conditions of monumental buildings and civil architecture examples. The study's limitations include not being able to reach the buildings encountered in the fieldwork, not being able to approach them due to security risks, and the destruction of the elements (streets/avenues) necessary for the direction and location of the buildings. Nevertheless, the results obtained by examining 250 buildings in total and the experience of a large part of the conservation area both show the level of destruction of the earthquake effects in the historic city and constitute a reference for future studies such as conservation and site management.

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Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

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