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Stone deterioratins in Mardin Madrasas: The case of Şehidiye and Kasımiye Madrasas

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Abstract

Stone is a widely used building material in cultural heritage buildings due to its petrographic properties. However, changes occur on the stone surfaces of the buildings due to exposure to environmental and climatic factors. Therefore, it is of great importance to detect these changes and take measures for the long-term preservation of these structures. The aim of this study is to identify and classify the stone changes observed in Şehidiye and Kasımiye madrasahs in Mardin. In addition, the similarities and differences of the changes and the causes of the changes will be determined. The study includes the identification and classification of stone alterations based on a general literature review, visual inspection of the alterations and mapping methodology. Observed changes were identified through visual inspection, categorized as physical, chemical, biological or anthropogenic, and photographed for documentation. A mapping method was used to determine the extent of change, which involved calculating the ratio of observed changes to total façade area. The changes on each façade were then analyzed to determine their causes. The impact of the same changes on the various structures and their proportions in relation to the façade were compared.

1. Introduction

Due to its geographical location and its location on the Silk Road, one of the most important trade routes, Mardin has welcomed many civilizations. Communities belonging to different civilizations, cultures and religions have lived together [1, 2]. These communities, who lived in Mardin at different times, played an important role in the development of the city by leaving artifacts from their own periods [3]. The high number of cultural heritage buildings in the city is important in terms of reflecting the experiences of different cultures in the past and present. One of the building types built in different periods and times is madrasah buildings. Madrasa buildings are the structures where the cultural and educational activities of the period were carried out [4]. While some of these structures have survived to the present day, some of them have not survived to the present day. Some of the madrasah buildings that have survived to the present day have changed their functions and some of them are used for the same functions [5, 6]. The easy accessibility of stone material specific to the region has played an important role in the use of stone as the main construction material of cultural heritage buildings [7]. Under natural factors and atmospheric conditions, degradation is observed on the surfaces of stone materials [8]. Surface degradation is observed physically, chemically and biologically. In addition to these degradations, anthropogenic degradations caused by human impacts are also observed and cause the destruction of structures over time [9-11]. These damages on stone surfaces cause weakening in the strength and durability of the stone and also pave the way for the formation of other degradations [12, 13]. Taking precautions against the degradation seen in the structures is important in terms of transferring the structures to future generations [14].

As a result of the on-site observations, physical, chemical, biological and anthropogenic degradation and their causes were examined in two different madrasas, Şehidiye and Kasımiye madrasas in Mardin. It is important to identify and classify the stone deterioration in historical buildings that are cultural heritage, and to take the right precautions to transfer the buildings to future generations [15, 16]. For this reason, the measures to be taken against the deterioration of historical buildings that have the characteristics of cultural heritage are important in terms of people's awareness of

history and appropriate protection procedures by authorized persons or institutions.

2. Method

Stone material has been preferred more than other main construction materials. This process covers the period from the settlement of people to the present day. In addition, stone material has been frequently used in historical buildings since it can be used without the need for additional binding materials and its high workability [17]. The stone used in historical buildings deteriorates on the surface of the stone as a result of factors such as humidity, air pollution and salt accumulation under climatic conditions [18-20]. In this study, stone deterioration in Şehidiye and Kasımiye madrasahs in Mardin was identified, classified and analyzed. In the study, the deterioration was visually analyzed by photography and the proportions of the deterioration to the façade were determined by mapping method. The types, rates, types and causes of deterioration in the two madrasahs were analyzed by comparing two different structures and it was aimed to determine the similarities and differences of the deterioration.

The degradation of Şehidiye and Kasımiye madrasas were classified as physical, chemical, biological and anthropogenic degradation by visual analysis method. Autocad 2018 and Adobe Photoshop CS6 were used in the mapping method. After determining the deterioration seen on the facades and inner courtyards of the buildings, the deterioration was applied to the facades with the mapping method. The area covered by the deterioration type on the entire facade was determined and written as a percentage ratio. While calculating the areas covered by the deterioration on the facades, it was determined by the ratio of the total area of the surface where the deterioration occurred to the entire facade surface area. The study aims to support the studies to be carried out in the following years as a basis.

2.1. Study Area

The city of Mardin was founded in the region called "Fertile Crescent" on Mesopotamia. As it was home to different cultures, different names such as "Maride", "Mâridin" and "Mârdê" were used [21, 22].

In terms of historical development, historical artifacts dating back to 3000 BC are found in the first settlements of Mardin [23]. When the later years are examined, artifacts belonging to different civilizations are found [24]. Although the Artuqid state has a great influence on the formation of the city's identity, the works belonging to the Karakoyunlu, Akkoyunlu, Safavid and Ottoman states are also located in the city [25]. Only some of these artifacts have survived to the present day.

Madrasa buildings, which were used as educational and cultural buildings in the society, were also used as basic educational institutions within the complexes during the Ottoman Empire [26]. The city of Mardin was also located on the historical road, which influenced the construction of a large number of madrasah buildings in the city. There are eleven madrasas in the city: Kasımiye, Şehidiye, Zinciriye, Altunboğa, Şah Sultan, Muzafferiye, Savur Kapı, Melik Mansur, Hatuniye, Marufiye and Hüsamiye.

Şehidiye Madrasah, the subject of this study, was built between 1239-1260 [27, 28]. However, it is not known exactly when the Kasımiye Madrasa was built. Since it is similar to Zinciriye Madrasah in terms of architectural style, it is thought to have been built during the same period (the last years of the Artuqid State) [22, 24]. Both buildings are among the madrasas that have survived to the present day and are still frequented by visitors. The locations of Şehidiye and Kasımiye madrasas are shown in Figure 1 by processing Google Earth map.

Figure 1. Geographical locations of Şehidiye and Kasımiye madrasas (processed on Google Earth)

Mardin is located in the Southeast Region of Türkiye in terms of geographical characteristics. It has 36° 54' and 37° 47' north latitudes and 39° 55' and 42° 41' east longitudes. It has an altitude of 1100 meters and a surface area of 8891 km^2. Due to its sloping terrain, access to the buildings is provided by steep ramps and stairs [29, 30]. Şanlıurfa borders Syria in addition to the provinces of Diyarbakır, Batman, Şırnak and Siirt (Figure 2).

The city has a continental climate in the center and a Mediterranean climate in the districts. Due to the characteristics of the climate, the winter months are cold and the summer months are dry and hot. July is the month with the highest average temperature (29.8 °C) and January is the month with the lowest average temperature (3.0 °C). Table 1 shows the average temperature values between 1942 and 2022. In light of

the data obtained, it was observed that the maximum sunshine duration was in July (12.4 hours) and the minimum in December (4.4 hours). Due to the climatic characteristics of Mardin, stone deterioration is common [31, 32].

Figure 2. Location map of Mardin in Türkiye [7].

Table 1. According to meteorological data, average temperature and precipitation values of Mardin province.

Mardin	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annually
Average Temperature (°C)	3,0	4,2	7,9	13,5	19,5	25,6	29,8	29,6	25,3	18,6	11,1	5,4	16,1
Average Highest Temperature (°C)	5,8	7,4	11,6	17,4	24,0	30,6	35,0	34,7	30,1	22,9	14,5	8,2	20,2
Average Lowest Temperature (°C)	0,6	1,4	4,6	9,8	15,1	20,3	24,6	24,7	20,8	14,7	8,1	2,9	12,3
Average Sunshine Time (Hours)	4,5	5,1	5,9	7,3	9,7	12,1	12,4	11,4	10,3	7,7	5,9	4,4	8,1
Average Number Of Rainy Days	12,11	10,61	11,70	10,28	7,35	1,54	0,48	0,24	0,70	5,12	7,66	10,80	78,60
Total Monthly Rainfall	115,9	103,2	97,7	81,1	47,3	6,5	3,2	2,3	4,0	33,8	71,9	108,7	675,6

2.2. Architectural features of Şehidiye and Kasımiye Madrasas

Şehidiye Madrasah is located in Şehidiye Neighborhood. It is not known exactly by whom the madrasah structure was built. It has survived to the present day but has lost its originality due to restoration works carried out at different times. After the construction of the building was started, the building was named Şehidiye Madrasa as a result of the martyrs' graves around the building [24]. The entrance to the building is through the main portal and the passage to the courtyard is through the corridor covered with a barrel vault. The cells located opposite each other in the building were used as education centers (Figure 3). The building has a total of 5 facades, including four facades facing the courtyard and the facade on which the main portal is located. The madrasah structure changed its function after the restoration and is now used as a mosque [33]. Limestone was used as the main construction material of the building. In addition to limestone, cut stone and kabayonu stone were also observed in some parts of the building.

Kasımiye Madrasah is a two-story madrasah with a single courtyard in Mardin. The building consists of a square space with a dome over the mosque and rooms covered with barrel vaults. There are also madrasah rooms at the back of the courtyard. The ground floor of the building has a mausoleum, Hanafi masjid, Shafii masjid and 11 cells, while the first floor has 12 cells (Figure 4).

To the left of the main entrance is the onion-sliced masjid and to the right is the tomb with a sliced dome. When you enter the courtyard, there is an iwan with selsebil and cells with sliced domes located around the courtyard. The iwan in the courtyard is covered with a

pointed vault. With the 2007 repair, the portico vaults on the ground floor were made of cut stone, but after the repair, they were plastered and turned into barrel vaults [25, 34, 35]. Kasımiye Madrasah has a total of seven facades, including four facades facing the inner courtyard, the south facade, which is the front facade, and the east and west facades, which are the side facades. Limestone was used as the main material of the building. In addition to limestone, there are kabayonu stone and cut stone.

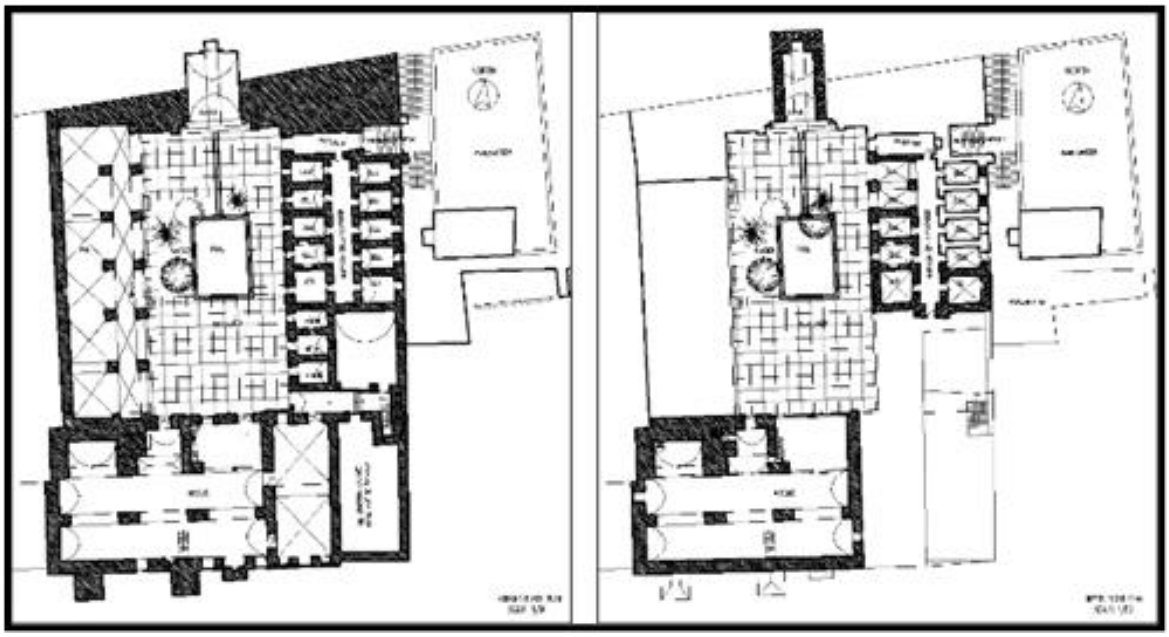


Figure 3. Plan of Mardin Şehidiye Madrasa.

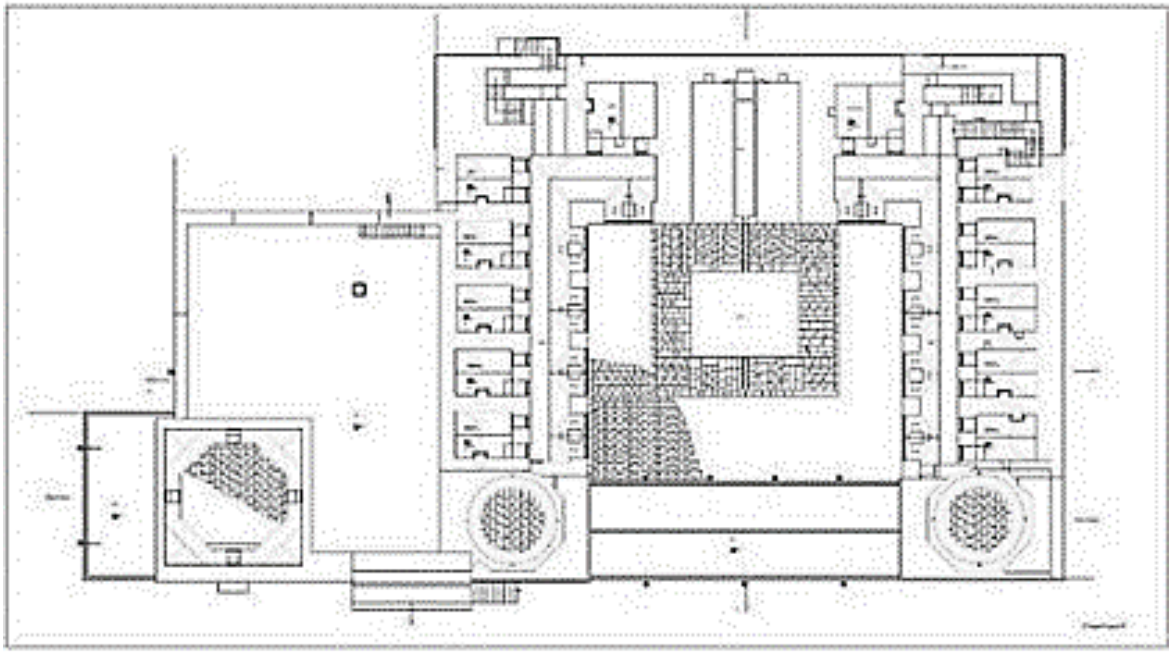


Figure 4. Plans of Mardin Kasımiye Madrasa.

3. Results

Stone, which is the main construction material of stone structures that have the characteristics of cultural heritage, degrades over time due to climatic reasons such as pressure, temperature, wind and precipitation [36-39]. These degradations on stone surfaces cause the durability of the stone to decrease over time and cause the formation of other degradations. In addition, in some cases, it causes the acceleration of the degradation process that has already occurred. Taking precautions against the deterioration of the structures and correct interventions prevent serious damage to the structures [40-43].

In this study, the deterioration observed on the stone surfaces of the Şehidiye and Kasımiye madrasas in Mardin was identified, classified and documented by photography. The deterioration of the buildings was classified as physical, chemical, biological and anthropogenic deterioration [44, 45]. With the data obtained, deterioration was analyzed by visual analysis method and mapping method. In the mapping method, the types of deterioration occurring on the facades were

recorded on the facade and the entire rate of deterioration was determined.

Physical degradation occurs due to mechanical effects and atmospheric conditions. These are the formations such as fracture, joint discharge, crack formation and abrasion that occur on stone surfaces due to the breakage of bonds as a result of the weakening of the minerals in the stone [46-48].

Chemical degradation is the changes that occur on stone surfaces as a result of atmospheric events. Effects such as color changes, salinization, and crusting on stone surfaces are examples of chemical degradation [49, 50].

Biological degradation is the type of degradation caused by organic substances on surfaces. Moss, plant and lichen formations are examples of biological degradation [51, 52].

Anthropogenic degradation is the changes that occur as a result of conscious or unconscious destruction of stone surfaces by humans [53]. Misuse, periodic wear and tear, and lack of maintenance occur as a result of anthropogenic degradation.

In this study, the stone deterioration seen in Şehidiye and Kasımiye madrasas were examined under two headings visual analysis and mapping method.

3.1. Investigation of stone deterioration in Şehidiye and Kasımiye Madrasas by visual analysis method

With the visual analysis method, stone deterioration in Şehidiye and Kasımiye madrasas were identified and analyzed by classification. As a result of the classification, the deteriorations were classified as physical, chemical, biological and anthropogenic and documented by photography.

In both Şehidiye and Kasımiye madrasahs, joint discharges, hairline crack formation, fragment loss and surface abrasion are observed as physical deterioration types. Due to the climatic conditions prevailing in the city and the effect of time, the mortars binding the stone structures together have lost their effectiveness and the joints between the stones have become empty. Due to the climatic conditions of the city of Mardin, capillary cracks are frequently observed in historical stone structures, which are cultural heritage, as a result of exposure to thermal shock, and crack formation due to weather events such as precipitation and the properties of the stone. Surface abrasions on stone structures are observed as a result of the wind-carrying dust particles. It can be said that the natural conditions and the orientation parameters of the buildings are also effective in the similar types of physical deterioration seen in Şehidiye and Hatuniye madrasas. The physical deterioration observed in the structures is shown in Figure 5. Capillary cracks (Figure 5a), joint discharges (Figure 5b and 5c), fragment losses (Figure 5d) and surface abrasions (Figure 5e and 5f) are observed.

The limestone used as the main construction material in the Şehidiye and Kasımiye madrasas has been subjected to chemical deterioration as a result of internal and external factors over time. Changes such as discoloration, salinization and bacterial growth observed on the stone surfaces are examples of chemical degradation. The chemical deterioration of the Şehidiye and Kasımiye madrasas is shown in Figure 6. Color changes (Figure 6a), salinization (Figure 6b) and bacterial growth (Figure 6c).

The biodegradation observed in Şehidiye and Kasımiye madrasas are shown in Figure 7. Plant, algae and bacterial growths were observed as biodegradation in Şehidiye and Kasımiye madrasas. The growth of roots due to plant growth in the structures causes the formation of joint gaps, widening of cracks and fragmentation on the stone surfaces. Plant growth, which is a type of biological degradation, accelerates the processes of physical degradation such as joint voiding, crack formation and surface detachment [54]. In addition to plant growth, moss and bacterial growths are found in Şehidiye and Kasımiye madrasas. Moss formations are more common in areas where stone surfaces come into contact with water [55]. Plant growth (Figure 7a), moss growth (Figure 7b) and bacterial growth (Figure 7c) observed in the madrasas are shown.

Anthropogenic degradation, which occurs as a result of the damage and harm caused by people consciously or unconsciously to cultural heritage buildings, was observed in Şehidiye and Kasımiye madrasas. In both buildings, anthropogenic deterioration is observed on the stone surfaces as a result of the use of sharp tools. Figure 8 shows the deterioration caused by the use of sharp tools.

3.2. Investigation of stone deterioration in Şehidiye and Kasımiye Madrasas by mapping method

The stone deterioration observed in Şehidiye and Kasımiye madrasas were analyzed by mapping method in addition to visual analysis. The deteriorations observed in the buildings were classified and the ratio of the deterioration type to the entire façade was determined. In the study, the eastern façade, south-facing façade, north-facing façade and east-facing courtyard façade of Şehidiye Madrasah and the southern façade, eastern façade, western façade, south-facing courtyard façade and west-facing courtyard façades of Kasımiye Madrasah were analyzed.

As a result of the examinations, capillary cracks, joint discharges, surface abrasion and fragmentation were observed as physical alterations. Surface abrasion was the most common physical alteration while fragmentation was the least common. The analysis of the physical alterations observed in Şehidiye Madrasah by mapping method is shown in Table 2, and the analysis of the physical alterations in Kasımiye Madrasah by mapping method is shown in Table 3.

According to the analysis by mapping method, discoloration, salinization and bacterial formation were observed as chemical alterations. While discoloration and salinization were the most common types of alteration, bacterial formation was less common than the other two types. The analysis of the chemical alterations observed in Şehidiye Madrasah by mapping method is shown in Table 4 and the analysis of the chemical alterations in Kasımiye Madrasah by mapping method is shown in Table 5.

As a result of the analysis of the biological alterations observed in Şehidiye and Kasımiye Madrasas by mapping method, plant formation and moss formation were observed in Şehidiye Madrasah; plant formation, moss formation and bacterial formation were observed in Kasımiye Madrasah. The plant and moss formations observed in Şehidiye Madrasah are shown in Table 6, while the plant, moss and bacterial formations in Kasımiye Madrasah are shown in Table 7.

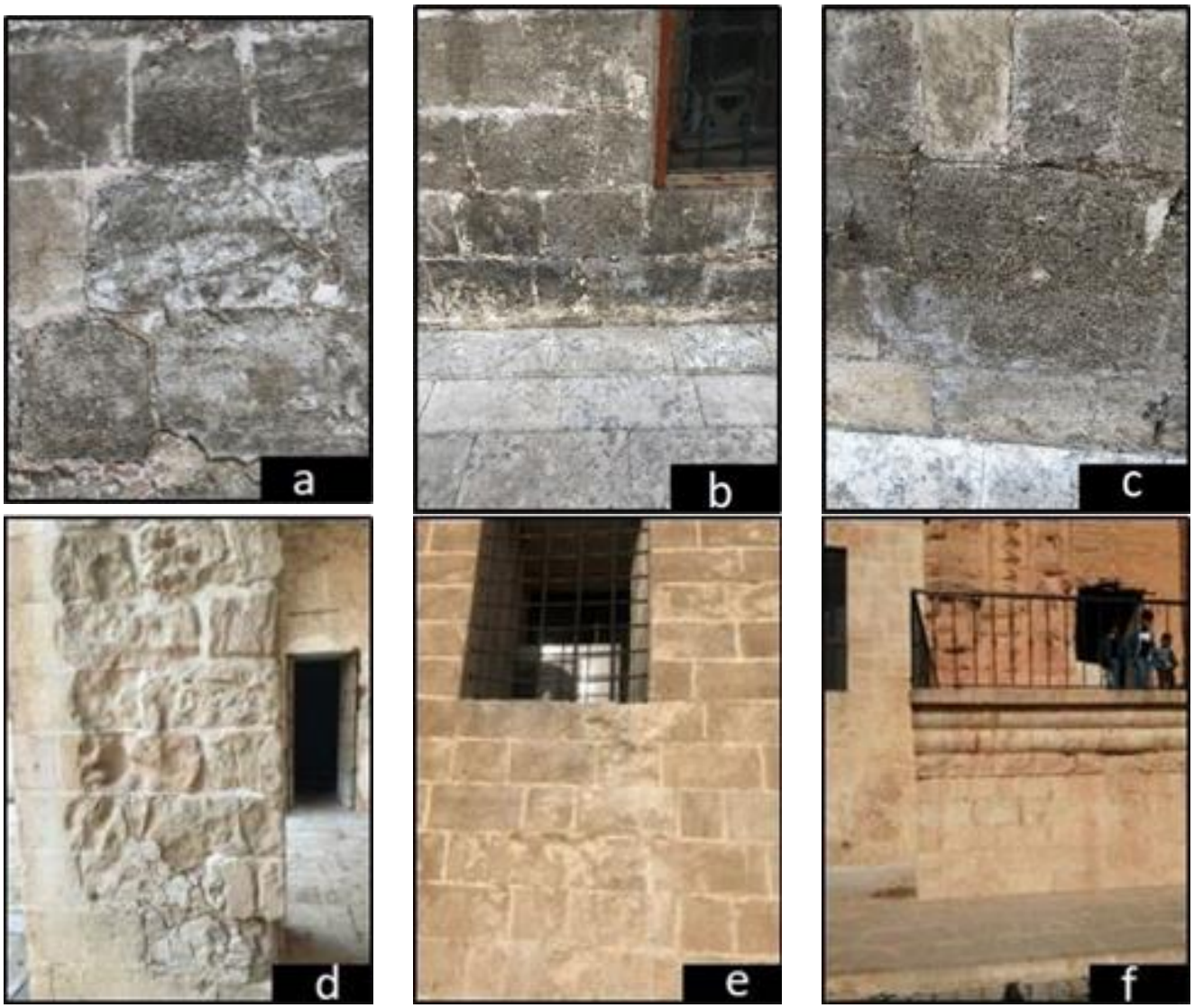


Figure 5. Physical deterioration observed in Şehidiye and Kasımiye madrasas.

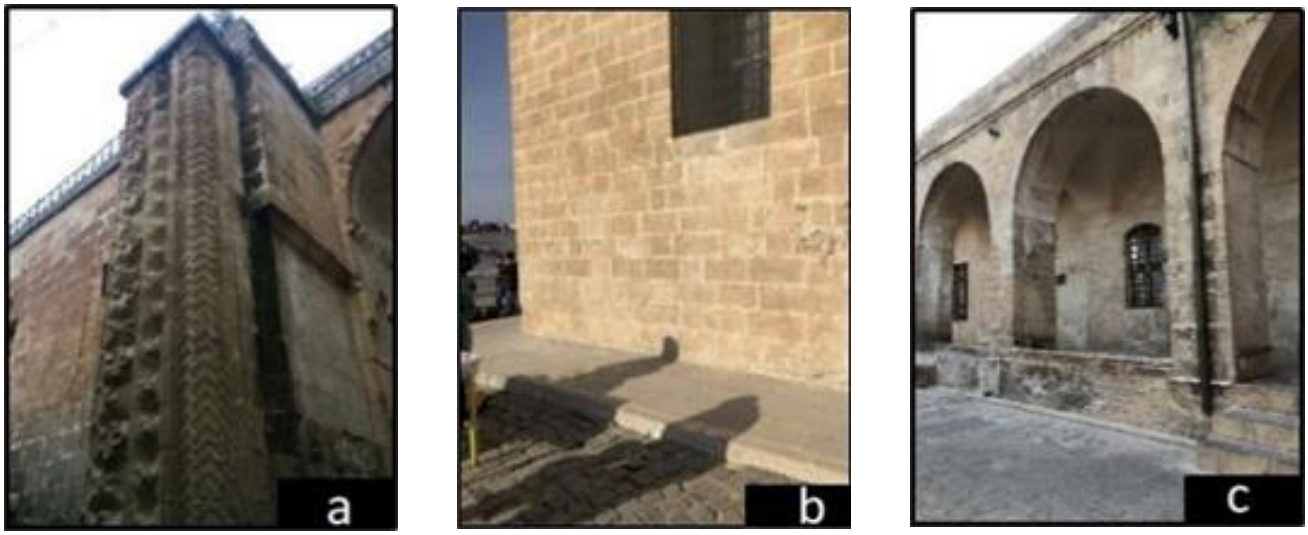


Figure 6. Chemical deterioration observed in Şehidiye and Kasımiye madrasas.

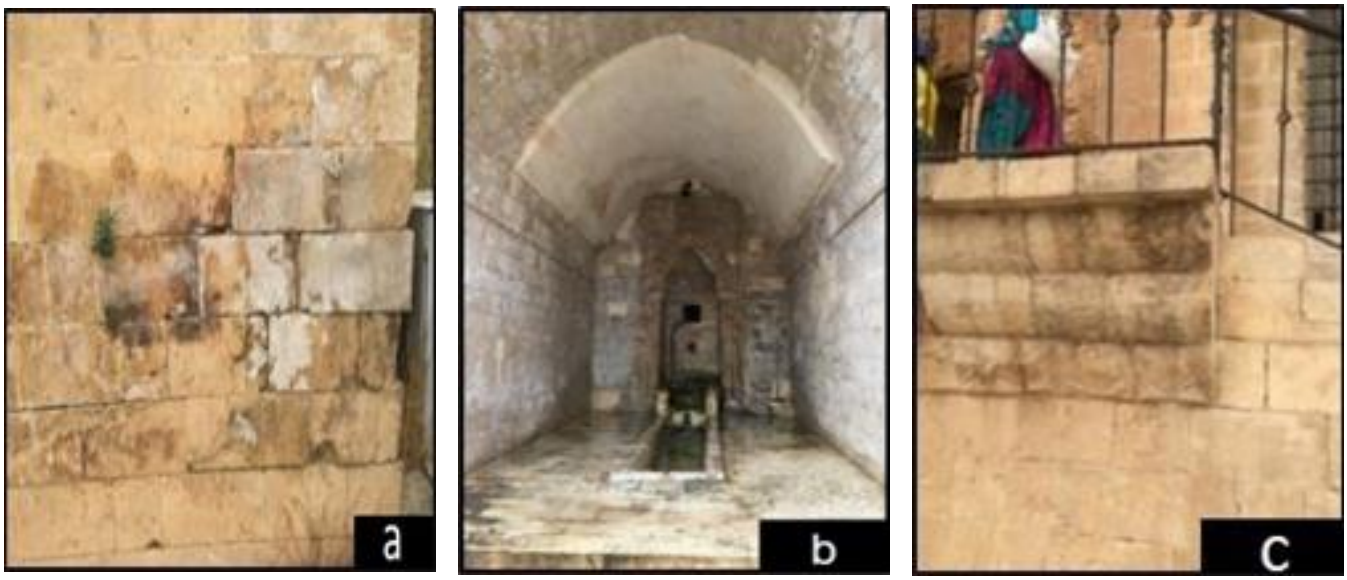


Figure 7. Biological deterioration observed in Şehidiye and Kasımiye madrasas.

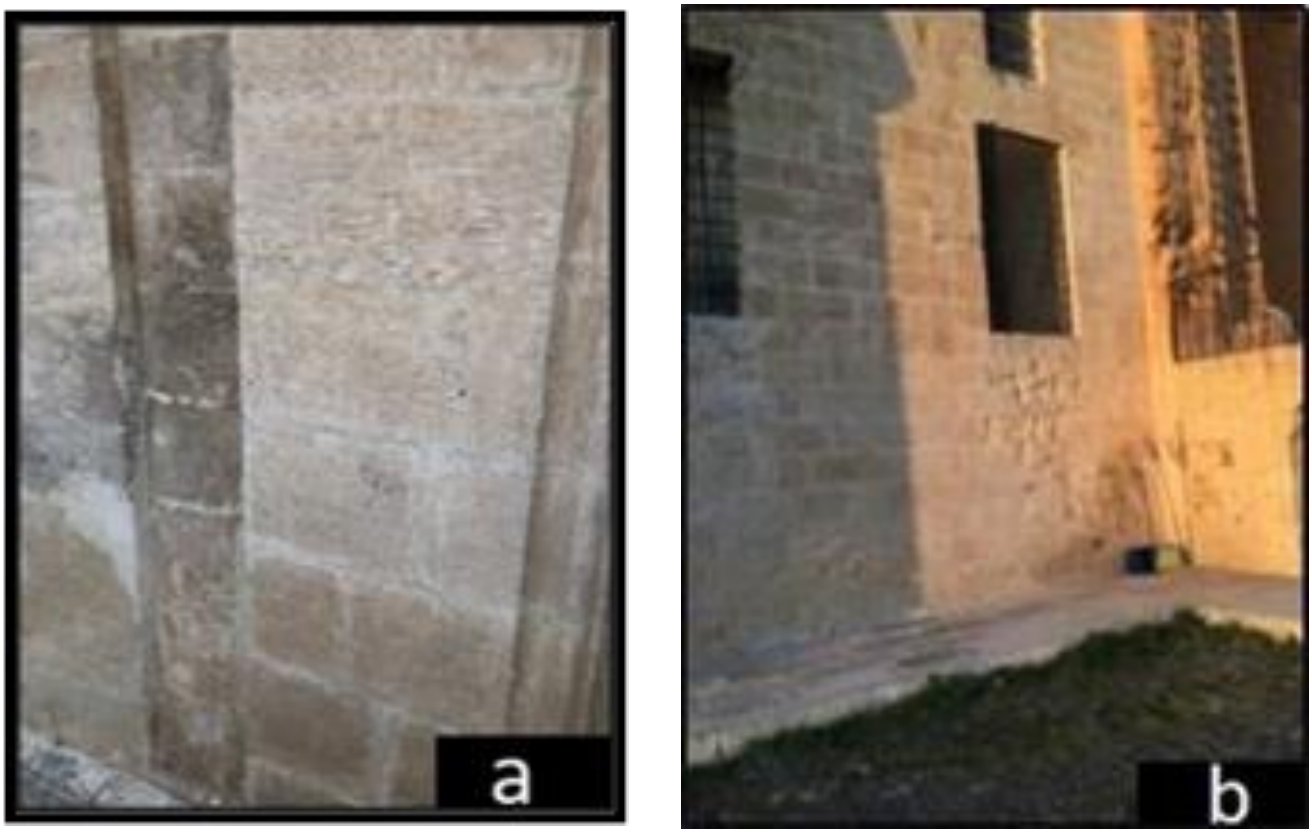


Figure 8. Anthropogenic deterioration observed in Şehidiye and Kasımiye madrasas.

As a result of the analysis of the anthropogenic alterations observed in Şehidiye and Kasımiye madrasas by mapping method, alterations were observed due to the use of sharp tools. The use of sharp tools in Şehidiye Madrasah is shown in Table 8, while the use of sharp tools in Kasımiye Madrasah is shown in Table 9.

4. Conclusion

Stone, one of the main construction materials of cultural heritage historical buildings, has been used for different purposes in different areas of human life. The limestone, which is the main construction material of Şehidiye and Kasımiye madrasas, which are located in Mardin and are cultural heritage, has been subjected to changes on the stone surfaces due to exposure to climate and external factors and the petrographic properties of the stone. In this study, the stone deterioration observed in the Şehidiye and Kasımiye madrasas was analyzed. In the study, the stone deterioration seen on the exterior facades and courtyard facades of the buildings were analyzed by classification. After the classification, the deterioration was analyzed by visual analysis method and mapping method by photographing the deterioration.

Table 2. Analysis of physical deterioration in Şehidiye Madrasah by mapping method.

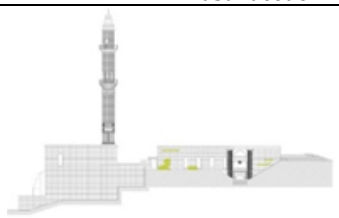
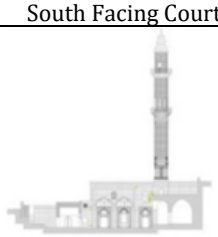
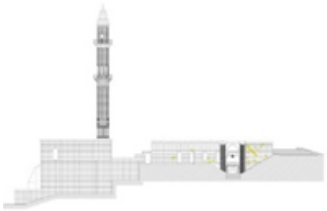
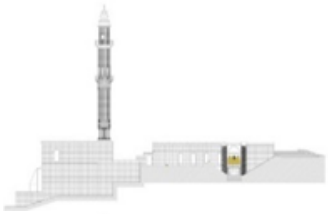
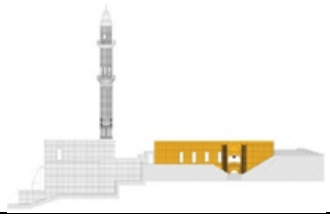
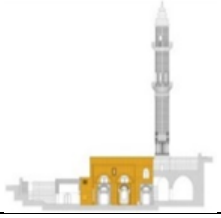
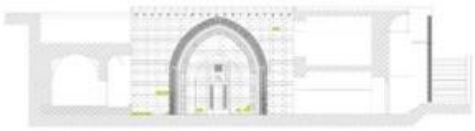
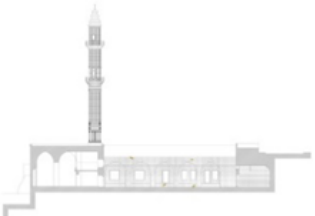
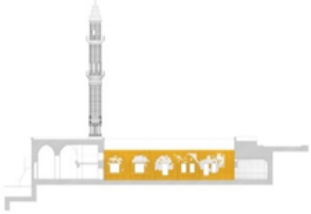
Physical Degradation Type	Facade Deterioration Ratio	Ratio (%)	Facade Deterioration Ratio	Ratio (%)
	East Facede		South Facing Courtyard Facade	
Joint Discharge		8		1.2
Capillary Crack		6		1.4
Fragment Breakage		5		0.3
Surface Abrasion		93		90
	North Facing Courtyard Facade		East Facing Courtyard Facade	
Joint Discharge		1.5		10
Capillary Crack		2.3		12
Fragment Breakage		0.8		1
Surface Abrasion		21		87

Table 3. Analysis of physical deterioration in Kasımiye Madrasah by mapping method.

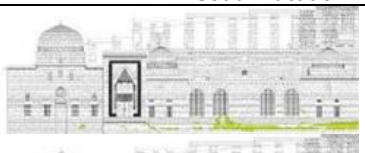
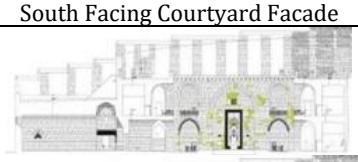
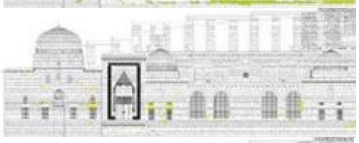
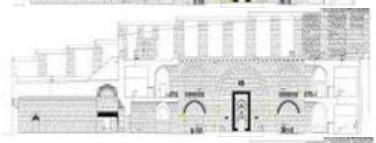
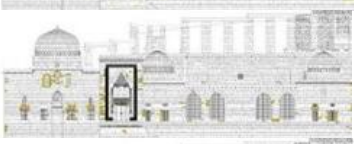
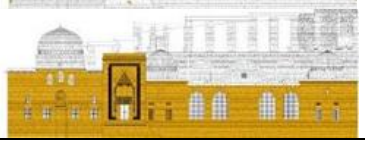
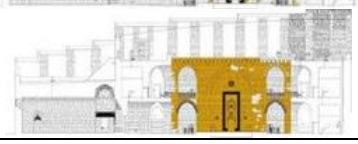
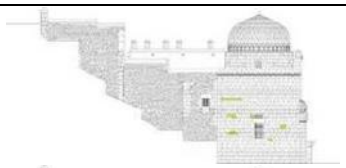
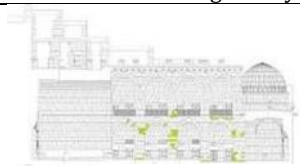
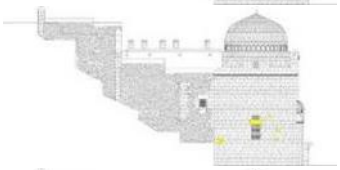
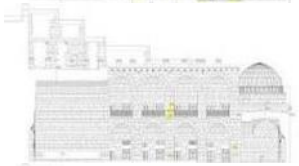
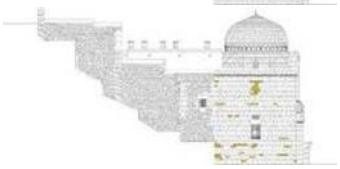
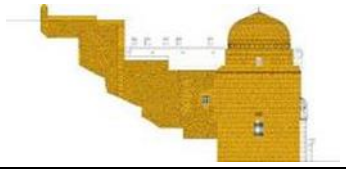
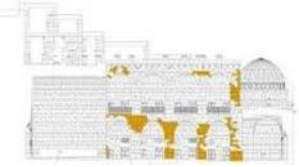
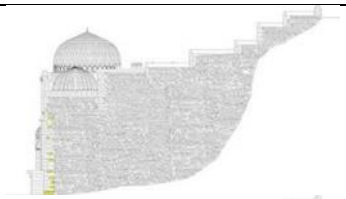
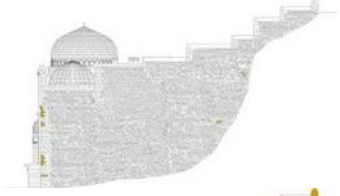
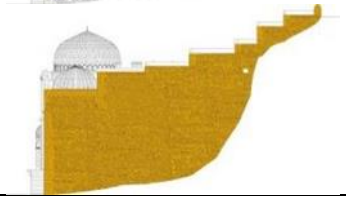
Physical Deterioration Type	Facade Deterioration Ratio	Ratio (%)	Facade Deterioration Ratio	Ratio (%)
	South Facade		South Facing Courtyard Facade	
Joint Discharge		6.6		11
Capillary Crack		1.9		1.2
Fragment Breakage		8		10
Surface Abrasion		100		83
	West Facade		West Facing Courtyard Facade	
Joint Discharge		0.9		8.1
Capillary Crack		0.6		1.2
Fragment Breakage		2.5		13
Surface Abrasion		100		20
	East Facade			
Joint Discharge		0.5		
Fragment Breakage		0.7		
Surface Abrasion		100		

Table 4. Analysis of chemical deterioration in Şehidiye Madrasah by mapping method.

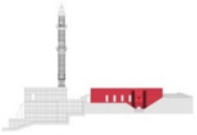
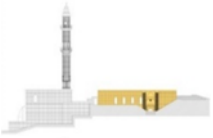
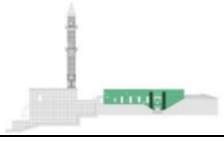
Chemical Deterioration Type	Facade Deterioration Ratio	Ratio (%)	Facade Deterioration Ratio	Ratio (%)
	East Facede		South Facing Courtyard Facade	
Color Variation		100		100
Salinization		100		100
Bacteria Formation		98		43
	North Facing Courtyard Facade		East Facing Courtyard Facade	
Color Variation		88		94
Salinization		100		100
Bacteria Formation		42		82

Table 5. Analysis of chemical deterioration in Kasımiye Madrasah by mapping method.

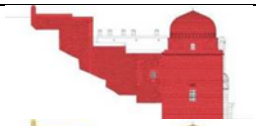
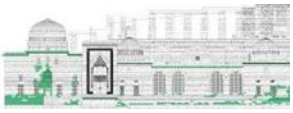
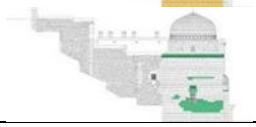
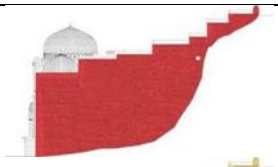
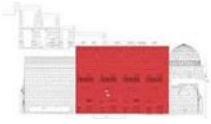
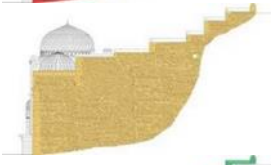
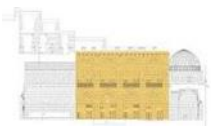
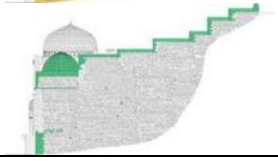
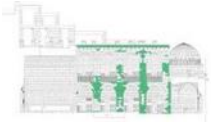
Chemical Deterioration Type	Facade Deterioration Ratio	Ratio (%)	Facade Deterioration Ratio	Ratio (%)
	South Facade		West Facade	
Colour Variation		100		100
Salitisation		100		100
Bacteria Formation		5.6		7.9
	East Facade		West Facing Courtyard	
Colour Variation		100		100
Salitisation		100		100
Bacteria Formation		18		47

Table 6. Analysis of biological deterioration in Şehidiye Madrasah by mapping method.

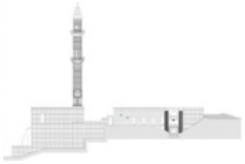
Biological Deterioration Type	Facade Deterioration Ratio	Ratio (%)	Facade Deterioration Ratio	Ratio (%)
	North Facing Courtyard Facade		East Facade	
Plant Formation		0.1		0.2
Moss Formation		1.3		

Table 7. Analysis of biological deterioration in Kasımiye Madrasah by mapping method.

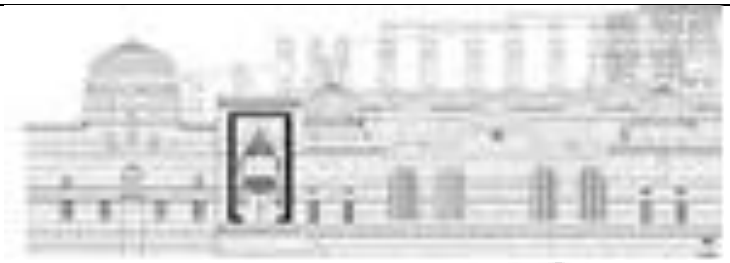
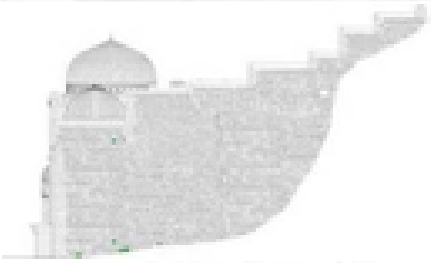
Biological Deterioration Type		Facade Deterioration Ratio	Ratio (%)
South Facade	Plant Formation		0.2
East Facade	Plant Formation		0.1
South Facing Courtyard Facade	Moss Formation		1.8

Table 8. Analysis of anthropogenic deterioration in Şehidiye Madrasah by mapping method.

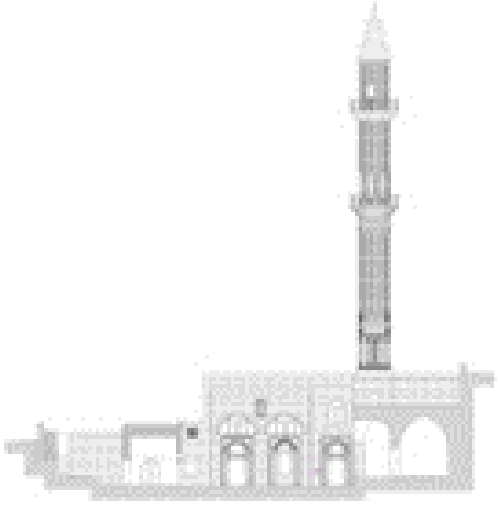
Anthropogenic Deterioration Type		Facade Deterioration Ratio	Ratio (%)
North Facing Courtyard Facade	Sharp Instrument Use		0.1

Table 9. Analysis of anthropogenic deterioration in Kasımiye Madrasah by mapping method.

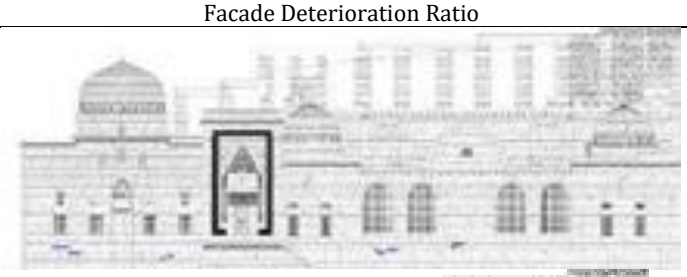
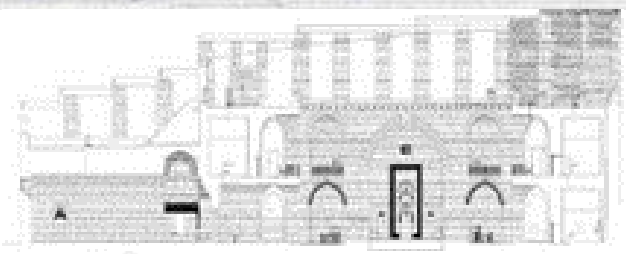
Anthropogenic Deterioration Type		Facade Deterioration Ratio	Ratio (%)
South Facade	Sharp Instrument Use		0.4
South Facing Courtyard Facade	Sharp Instrument Use		0.9
West Facıng Courtyard Facade	Sharp Instrument Use		1.6

Table 10. Deterioration of the facades of the Şehidiye and Kasımiye madrasas.

		Abrasion	Capillary Crack	Joint Emptying	Fragment Breakage	Colour Variation	Salinization	Bacteria Formation	Plant Formation	Moss Formation	Sharp Instrument Use
Şehidiye Madrasa	East Facade	✓	✓	✓	✓	✓	✓	✓	✓	x	x
	North Facing Courtyard Facade	✓	✓	✓	✓	✓	✓	✓	x	x	x
	South Facing Courtyard Facade	✓	✓	✓	✓	✓	✓	✓	✓	✓	x
	East Facing Courtyard Facade	✓	✓	✓	✓	✓	✓	✓	✓	x	✓
Kasımiye Madrasa	South Facade	✓	✓	✓	✓	✓	✓	✓	✓	x	✓
	East Facade	✓	✓	✓	✓	✓	✓	✓	✓	x	x
	West Facade	✓	✓	✓	✓	✓	✓	✓	x	x	x
	South Facing Courtyard Facade	✓	✓	✓	✓	✓	✓	✓	x	✓	✓
	West Facing Courtyard Facade	✓	✓	✓	✓	✓	✓	✓	x	x	✓

According to the visual and mapping method analyses, it was determined that the most common type of deterioration in both Şehidiye and Kasımiye madrasas was chemical deterioration and the least common type of deterioration was anthropogenic deterioration. In terms of physical deterioration, fragment breakage was the least common type of physical deterioration, while surface abrasion was the most common type. In chemical Deterioration, discoloration and salinization, and in biological Deterioration, plant growth was the most common type of Deterioration observed on the facades. It is possible to observe the use of sharp tools in both buildings as anthropogenic deterioration. Table 10 shows the deterioration observed on the facades of both Şehidiye and Kasımiye madrasas together.

As a result of the study, the stone deterioration in the Şehidiye and Kasımiye madrasahs was analyzed comparatively. The distribution of deterioration on the façades and their causes were explained. It is expected that the data obtained at the end of the study will provide solutions for the renovation works to be carried out in the coming years. To minimize these deteriorations in the buildings, necessary studies should be carried out and solution proposals should be presented.

Author contributions

Ayşe Biçen Çelik: Conceptualization, Methodology, Field study; **İlhami Ay:** Conceptualization, Methodology, Writing-Original draft preparation, Validation; **Şefika Ergin:** Investigation, Writing-Reviewing and Editing; **Murat Dal:** Investigation, Writing-Reviewing and Editing

Conflicts of interest

The authors declare no conflicts of interest.

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