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DETERIORATION ON THE STONE SURFACES OF THE DIYARBAKIR NEBI MOSQUE (1)

DİYARBAKIR NEBİ CAMİİ TAŞ YÜZEYLERİNDEKİ BOZUNMALAR

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Öz: Amaç: Çalışma, Nebi Camii'nin doğal taşlarında meydana gelen bozunma türlerini ve bozunmalara sebep olan etkileri belirlemeyi ve yapıyı korumanın önemine dikkat çekmeyi amaçlamaktadır. Çalışmanın kapsamını, güncel literatür ışığında, gözleme dayalı araştırmalarla elde edilen bulgular oluşturmaktadır. **Yöntem:** Çalışmada, Diyarbakır'da bulunan Nebi Camii'nin bazalt taşında ve kireçtaşında gözlemlenen bozunmalar yerinde fotoğraflanarak incelenmiştir. Fotoğrafların yanı sıra cephelerdeki bozunma türleri haritalama yöntemiyle işlenmiş ve bozunma türlerinden etkilenen taş yüzeylerin alanları hesaplanmıştır. Elde edilen sayısal veriler, bozunma tiplerini nicel olarak karşılaştırmak için kullanılmıştır. **Bulgular:** Yapının taş malzemelerinde yoğun olarak, sıcak-kuru iklimde sıklıkla gözlenen, çatlak oluşumu, oyuklanma, aşınma gibi fizikomekanik bozunmalara rastlanmıştır. Fizikomekanik bozunmaların yanı sıra kimyasal bozunmalardan korozyon, siyah kabuk oluşumu, çiçeklenme/tuz kristalleşmesi ve mikrokarst oluşumu ile biyolojik etkilerin sebep olduğu bozunmalar gözlenmiştir. Antropojenik bozunmalar kategorisinde incelenen hatalı onarımların sebep olduğu bozunmalar da yapıda görülen hasarları oluşturmaktadır. Çalışmada tespit edilen bozunmalara ek olarak bozunmaya neden olan nem, rüzgar, hava kirliliği ile hatalı onarım gibi etkenlerin ortaya çıkarılması elde edilen bulgular arasındadır. **Sonuçlar:** Tarihi ve kültürel miras olma niteliği taşıyan Diyarbakır Nebi Camii doğaltaş bozunmaları çevresel faktörlere bağlı olarak hasar almaktadır. Çalışmada, yapıyı oluşturan bazalt ve kireçtaşının teknik özellikleri belirlenmiş ve bozunma türlerine yer verilmiştir. Yapıya dikkat çekilerek gerekli önlemlerin alınması konusunda farkındalık oluşturulmaya çalışılmıştır.

Anahtar Kelimeler: Ayrışma, Bazalt, Kireçtaşı, Kültürel Miras

Abstract: Aim: The study aims to determine the types of deterioration that occur in natural stones of the Nebi Mosque, and the effects that cause them to deteriorate, and to draw attention to the importance of protecting the building. The scope of the study is constituted by the findings obtained by observation-based research in light of the current literature. **Method:** In the study, the deteriorations observed in the basalt stone and limestone of the Diyarbakır Nebi Mosque were examined by photographing in-situ. In addition to the photographs, the types of deterioration on the facades were processed using the mapping method and the areas of the stone surfaces affected by the deterioration types were calculated. The obtained numerical data were used to compare the degradation types quantitatively. **Findings:** In the stone materials of the building, physicomechanical deterioration such as crack formation, alveolization, and abrasion, which are frequently observed in hot-dry climates, were found. In addition to physicomechanical deterioration, chemical deterioration types such as corrosion, black crust formation, efflorescence/salt crystallization, and microkarst formation and deterioration caused by biological effects were observed. Deterioration caused by faulty repairs examined in the category of anthropogenic deterioration also constitutes the damage observed in the building. In addition to the deterioration detected in the study, it is among the findings to reveal the factors that cause deterioration, such as humidity, wind, air pollution, and faulty repair. **Results:** Diyarbakır Nebi Mosque, which is a historical and cultural heritage, is damaged by natural stone deterioration due to environmental factors. In the study, the technical properties of basalt and limestone forming the structure were determined and the types of deterioration were included. Attention was drawn to the structure and awareness was tried to be created about taking the necessary measures.

Keywords: Weathering, Basalt, Limestone, Cultural Heritage

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INTRODUCTION

As a result of its location at a crossroads connecting the east to the west and the south to the north (Tuncer, 1996: 15), the province of Diyarbakır has hosted many civilizations and monumental structures bearing the traces of these civilizations throughout its history. Although the date of the foundation of the city cannot be determined exactly, the settlement date of the region dates back to 7000 BC. Known by different names in different periods, the oldest known name of the city was given by the Assyrians as "Amedi" (Parla, 2007: 2465). Diyarbakır Suriçi area, an urban protected area, has preserved the settlement tissue surrounded by city walls until today (Kejanlı and Dinçer, 2011: 95). It is possible to observe the structures belonging to the Byzantine, the İnaloğulları, the Nisanoğulları, the Artuklu, the Akkoyunlu, and the Ottoman Periods in the region. Structures such as mosques, masjids, madrasahs, churches, hans, and baths in the Suriçi area have frequently been the subject of studies due to their unique characteristics and bearing the traces of the period they were built. One of the examples that have survived to the present day among these structures is the Nebi Mosque, a work of the Akkoyunlu Period. Although the main material of the building is Karacadağ basalt, which is the local stone of the region, limestone was used in the wall (almaşık duvar) and columns on the north façade. As with all stone structures, the Nebi Mosque, which is the subject of study, was affected by the deterioration of the basalt and limestone that constitute its building materials. The deterioration of stone begins as soon as the stone artifact or structure is built and continues gradually as the building is in contact with the physical environment (Lewin, 1983: V). Internal and external factors responsible for the deterioration of natural stones work together to affect the structure. No deterioration factor acts alone, each factor is under the simultaneous influence of the other. The exposure of any effect to the deterioration action may make the material more susceptible to the subsequent deterioration action of another effect (Fassina, 1993: 1). Parameters such as the type of stone, its physical and chemical properties, its origin, and its location in the quarry where the stone was extracted constitute internal effects (Deplazes, 2005: 32). Deterioration, defined as physical or chemical weathering, begins with the interaction between stone and external influences such as climate, biosphere, or pollution. The decay of artifacts made of stone has attracted the attention of many interested observers over the centuries. For example, Ancient Greek and Roman authors (Vitruvius) mentioned efforts to intervene in the decay processes (Lewin, 1983: V). Today, with the increasing deterioration of stone monuments, the danger of irreparable loss of cultural and architectural heritage has led to worldwide efforts to protect the monuments (Fitzner, 2004: 677).

Classification of the factors that causes the deterioration of stone monuments, together or alone, makes it easier to identify the cause and process of the deterioration. The types of factors causing this deterioration are given in Figure 1 with their general titles.

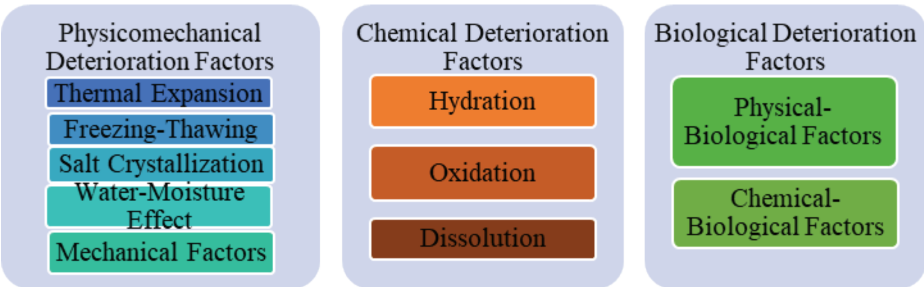

Figure 1. Classification of Factors Causing Deterioration of Stone Monuments (Öcal and Dal, 2012: 27)

In order to determine and implement the restorative steps as a stage of the systematic approach to conservation, the architect should make a diagnosis by getting to know the structure thoroughly. Interventions that are launched without comprehending the characteristics of the structure, the causes of the structure's deterioration, and the process of its deterioration, resulting in a loss of time and effort. In addition, the damage to the structure increases due to the delay of the interventions to the structure (Dal and Artık, 2008: 60). In this context, the history, location, and architectural features of the Nebi Mosque, which is the subject of the study, were examined and the deterioration in building materials was investigated.

AIM

Nebi Mosque is a very significant building for Diyarbakır. Therefore, an examination has been made by considering both the direction and the location of the structure in terms of the types of stones used in the mosque and the deteriorations that occur on these stone surfaces. Thus, both the amount of deterioration could be compared, and the deterioration types could be determined in terms of quantity and quality. In this process, the study aims to determine the types of deterioration in the natural stones of the Nebi Mosque and the effects that cause them to deteriorate and to draw attention to the importance of preserving the structure. In line with the study's findings, it aimed to create a resource for the

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practices and studies to be carried out to protect the Nebi Mosque and similar stone structures to inherit to future generations.

SCOPE

Within the scope of the deterioration types and the factors causing the deterioration in Diyarbakır Nebi Mosque, the deterioration observed on the surfaces of the basalt stone and limestone, which are the main structural elements of the building, were examined. Attention is drawn to the importance of correct determination of the deterioration factors and the technical properties of natural stone materials. The study is the first to deal with the deterioration of the stone surfaces of the Diyarbakır Nebi Mosque, which is a historical monument. The results obtained from the study can guide the studies and applications to be carried out to understand and determine the causes of deterioration in the Nebi Mosque and similar monuments.

METHOD of the RESEARCH

In this study, the deteriorations observed in basalt stone and limestone, which are the building materials of the Nebi Mosque in Diyarbakır, were examined and the factors and effects that cause deterioration were investigated. The research has started by examining the historical and architectural features of the Nebi Mosque. The deteriorations in the structure were determined in the light of previously published literature and were examined in four categories as physicomechanical, chemical, biological, and anthropogenic. Each type of deterioration is classified into sub-headings in the indicated categories and described with samples photographed by on-site observation. In addition to the photographs, the deterioration types included in each deterioration title as sub-headings were processed on the façades of the mosque by using the mapping method. Thus, the surface area of the stones affected by the deterioration in the surface area of each façade could be calculated. The ratio of the deterioration types occurring on the façades to the façade area has been revealed, and the façade area/deterioration area of each deterioration has been presented as a percentage. The data obtained by the mapping method were used for quantitative comparison as well as for presenting the characteristics of the deterioration types occurring on the façades. The deteriorations occurring on the stone surfaces of the building were compared proportionately by using tables and graphs under titles.

LIMITATIONS of the RESEARCH

The structure subject to research is restricted to the Nebi Mosque, built with natural construction materials, located in the Suriçi region, where traditional settlement tissues dominate in Diyarbakır. In addition, the surfaces of natural stone materials were examined and evaluated to detect and analyze the deterioration in the structure. The examination was carried out on the exterior surface of the mosque's main building.

PROBLEM of the RESEARCH

Stone artifacts that have survived as a historical and cultural heritage are faced with the negative effects of deterioration that occurred in natural stone building materials as long as they are open to atmospheric effects. Destruction is inevitable for structures that are affected by the consequences of human actions as well as atmospheric effects, due to the failure of appropriate applications selected according to the technical characteristics of the building materials and the type of deterioration, at the right time. It is crucial for preventive and restorative steps to determine the damages that will lead to the loss of the common architectural heritage of the buildings, taking into account the environmental effects. In this context, the deterioration of natural stone materials of Diyarbakır Nebi Mosque, which is an architectural heritage that should be inherited to future generations, should be examined and classified according to environmental factors.

HYPOTHESES of the RESEARCH

The study was carried out with the assumption that determining the deterioration in the structure at the right time and in the right way is an important step in providing the continuity and integrity of the structures that need to be preserved. The types of deterioration occurring on the surfaces of basalt stone and limestone, which are the natural stone building materials of Diyarbakır Nebi Mosque, which is the subject of the study, were examined with the assumption that the correct determination of the deterioration types occurring in the structures and the technical properties of natural stone materials will be a source for the steps of prevention and treatment of damage caused by deterioration.

FINDINGS

Diyarbakır Nebi Mosque has been examined in terms of its history, location, architectural features, and technical characteristics of natural stone materials. Basalt stone was used as the main building material in the Nebi Mosque, which is a structure of the Akkoyunlu Period, as in the historical buildings of different periods in Diyarbakır. In addition to basalt stone, limestone was used in the wall of the late comers' portico on the north façade of the building, in the column body and bases. The deteriorations observed on the surfaces of the basalt stone and limestone used in the building were examined and the findings were presented in detail under headings.

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HISTORY, LOCATION and ARCHITECTURAL FEATURES of DIYARBAKIR NEBI MOSQUE

History and Location of Diyarbakır Nebi Mosque

Although the exact date of construction is not known, it is thought that it was built in the last period of Akkoyunlu who dominated Diyarbakır during the 15th century, or after 1515, when Diyarbakır passed to the Ottomans. (Tuncer, 1996: 76). Governor Abdullah Pasha from Köprülü had a dome-shaped baldachin tomb built with iron bars for his wife and daughter in 1718 (Tuncer, 1996: 76). The original mosque, which is a work of the Akkoyunlu period and located to the east of the current mosque, was expropriated and demolished in 1955 and joined Gazi Avenue, which was being enlarged at that period. Repairs of the mosque were made in 1954-1962, 1974-1975-1976, and 2006 (Tuncer,1996: 76; Top and Koç, 2011: 235-236).

The Nebi Mosque belongs to the Kasap Hacı Hüseyin Foundation and is registered in the title deed on the map section 3, block 142, parcel 102 on Gazi Avenue in İnönü Boulevard (Top and Koç, 2011: 235). Diyarbakır Nebi Mosque is at the intersection called Dörtyol in İnönü Boulevard, at the northwest corner of the junction of Gazi Street and İnönü Boulevard (Figure 2).

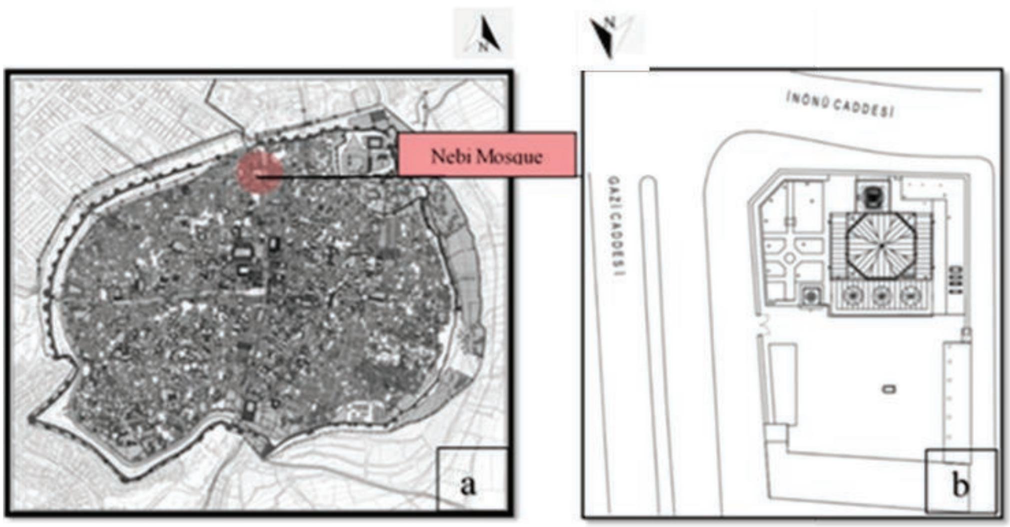

Figure 2a. The Location of the Nebi Mosque in Suriçi[1] b. Site Plan of the Nebi Mosque (Karaca and Öztürk, 2019: 4)

1 www.csb.gov.tr/db/diyarbakir

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Architectural Features of Diyarbakır Nebi Mosque

In front of the transversely rectangular mosque, there is a three-domed late comers' portico with arcades on the north façade. The walls of the mosque are built in the late comers' portico with black basalt and white limestone (almaşık duvar), while the other façades are built with black basalt stone. In the front façade, three-pointed arches are resting on two limestone columns in the middle and resting on walls on the sides. The bases are square at the bottom and pear-shaped at the top and are made of limestone. While the column shaft and base are made of limestone, the capitals are of black basalt stone. The pointed arches, which form the late comers' portico and sit on stone corbels, are made of black basalt stone and white limestone. The molding is used to frame the pointed arches. (Figure 3a, b, c.) (Top and Koç, 2011: 236).

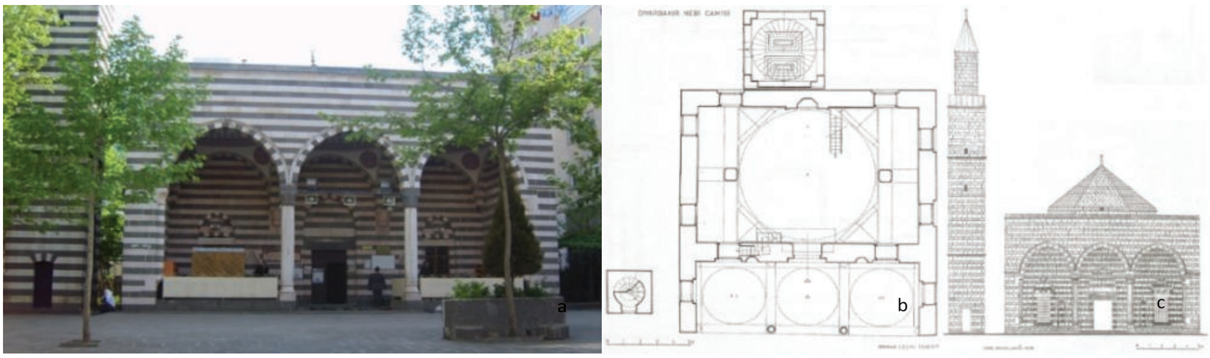

Figure 3a. Nebi Mosque's North Façade-The Late Comers' Porticoe b. Plan of Nebi Mosque (Tuncer, 1996: 78) c. Nebi Mosque's North Façade (Tuncer, 1996: 79)

The central dome covering the harim section of the mosque is carried by the north and south walls and one pillar on each side. The dome is composed of a basalt masoned octagonal drum and a lead-coated cone; however, the plan shows that the building has a hexagonal base with two columns on both sides. There are hand-drawn patterns on the dome and squinches are used as transition elements. Except for the central dome in the harim, there are barrel vaults on the sides (Tuncer, 1996: 76; Top and Koç, 2011: 237).

The minaret of the Nebi Mosque is aligned with the north face and built as a separate mass; it is detached. The entrance door of the square planned minaret, which has a very high body, is on the north façade of the minaret and has a segmental arch. The steps and the balcony railing are made of stone. The cylindrical and short body of the minaret, made of black ba-

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salt and white limestone (almaşık duvar) like the north façade of the mosque, is divided into sections with three moldings up to the balcony. The body of the minaret has embrasures.

On the south façade, there is a square-planned tomb covered with iron bars in the form of a dome. The tomb was built in 1718 by the Governor of Köprülü, Abdullah Pasha, for his wife and daughter.

There are toilets in the north of the mosque courtyard. The toilets are covered with barrel vaults. The part where the toilets are located has changed in form as a result of the interventions made at different times, but it can be said that it preserves its originality in terms of function (Tuncer, 1996: 84; Top and Koç, 2011: 237-238).

Façades of Diyarbakır Nebi Mosque

The façades of the Nebi Mosque were examined separately to see the effects of the types of deterioration (Table 1).

Table 1. Façades of Diyarbakır Nebi Mosque

North		Among the façades, the only façade with a black and white masonry (almaşık duvar) is the north façade. There is a three-domed late comers' portico on the façade. The domes are not visible from the outside as a result of the high surrounding walls. Two rectangular windows on the façade are enclosed in pointed-arched niches.
South		On the south façade of the mosque, there is a mausoleum covered with a dome belonging to the wife and daughter of Governor Köprülü Abdullah Pasha. There are two rectangular windows enclosed in pointed-arched niches on the south façade.
East	 	There are two rectangular windows with flat arches on the east façade of the mosque. The minaret of the mosque is located close to the east façade.
West	 	On the western façade of the mosque, there are a total of three windows, two of which are rectangular and enclosed in pointed-arched niches, and one with a segmental arch.

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STONE MATERIALS in DIYARBAKIR NEBI MOSQUE and THEIR FEATURES

Throughout history, stone material has been widely used in buildings and works. In addition to the high bearing feature of the stone material and its rich aesthetic properties, its potential to provide climatic comfort, and fire resistance, and it performs all these features sustainably and ecologically cause it to be preferred frequently (Yardımlı and Dal, 2021: 27).

In Diyarbakır Nebi Mosque, basalt stone, the main building material of the region, as a feature of Diyarbakır mosques before the Ottoman Empire, was used. In the façade arrangements of the mosques belonging to the Akkoyunlu Period, when the Nebi Mosque was built, two-color stonework made of ashlar basalt stone (black) and limestone (white) draws attention (Haspolat, 2014: 21). On the north façade where the late comers' portico is located, and the minaret of the Nebi Mosque, there is a masonry made of Karacadağ basalt and reefal limestone (almaşık duvar) (Table 2). The stone types used as building materials in the mosque are also related to the geology of the region.

Table 2. Rock Type of the Main Structure and Columns of Nebi Mosque (Toprak and Kavak, 2012: 26)

Rock Type of Main Structure	Rock Type of Column	Rock Type of Column Capital	Rock Type of Column Base
Karacadağ Basalt	Miocene Limestone	Karacadağ Basalt	Miocene Limestone
Miocene Limestone	(Reefal Limestone)		(Reefal Limestone)
(Reefal Limestone)			

Technical Features of Basalt

Basalt stone, the main building material of the Nebi Mosque, is the surface stone of gabbros, a gray, black, greenish, dark-colored basic rock. Basalt, a fine-grained, dense, hard, durable, dark black and gray colored igneous rock, is a volcanic type of the gabbro group (Öcal and Dal, 2012: 15). It contains plagioclase, quartz, pyroxene, olivine, and biotite in its composition. The cooling rate that varies depending on the depth of the magma determines whether the basalt is porous or non-porous. Non-porous stones are more rigid and difficult to process. Porous basalt stone was used as the main building material in the Diyarbakır Suriçi area. Although it is difficult to process, it has been determined that non-porous basalt stone is used in elements with bearing functions such as columns, column capitals, jambs, lintels, and sills (Erçin Kahveci and Kadayıfçı, 2013: 66). It is widely used in building, road, and bridge works due to its resistance to abrasion, climatic conditions, and pressure. One of its most important features is that it is found in the form of hexagonal prism columns in the field (Öcal and Dal, 2012: 15; Erçin Kahveci and Kadayıfçı, 2013: 68). Karacadağ basalt, which is widely extracted from the Karacadağ volcanic mountain in Diyarbakır province, spreads in the form of an ellipse in a north-south direction in an area of 10000 km^2 with an average thickness of 80 meters (Erçin Kahveci and Kadayıfçı, 2013:56).

Technical Features of Limestone

Rocks that contain more than 90% $CaCO_3$ (calcium carbonate) in their chemical composition and can also consist of stone-forming organisms such as coral, foraminifera, and algae are called limestone. It takes different names according to the percentage of limestone and sandstone in the stone and the percentage of calcium carbonate. Their hardness is around 3 according to the Mohs scale. The textures of limestones determine properties such as water absorption, abrasion, and compressive strength. Cream-colored or nearly white-colored limestones are often used as different building blocks with natural cobblestone (Öcal and Dal, 2012: 16-17). The Miocene reefal limestones, which are used as a building material in the north façade wall of the Nebi Mosque, column shaft, and column base, are defined as spar calcite cemented grain stones of red algae and coral fragments. It is frequently used in buildings due to its advantages such as its durability, its less porous structure compared to other rock types, and its ability to be extracted into large blocks with more suitable thickness. Its physical properties have similar values to the physical properties of basaltic rocks. Today, Miocene reef limestone and Plio-quaternary basalt are mined from most of the quarries produced in the Diyarbakır region (Toprak and Kavak, 2012: 27).

DETECTION and ANALYSIS of DETERIORATIONS OBSERVED on the FAÇADES of DIYARBAKIR NEBI MOSQUE

The mechanism of deterioration depending on environmental factors can be considered under three main headings: physicomechanical, chemical, and biological deterioration (Öcal and Dal, 2012). In addition to the three main topics, anthropogenic deteriorations are also examined in the study (Figure 4).

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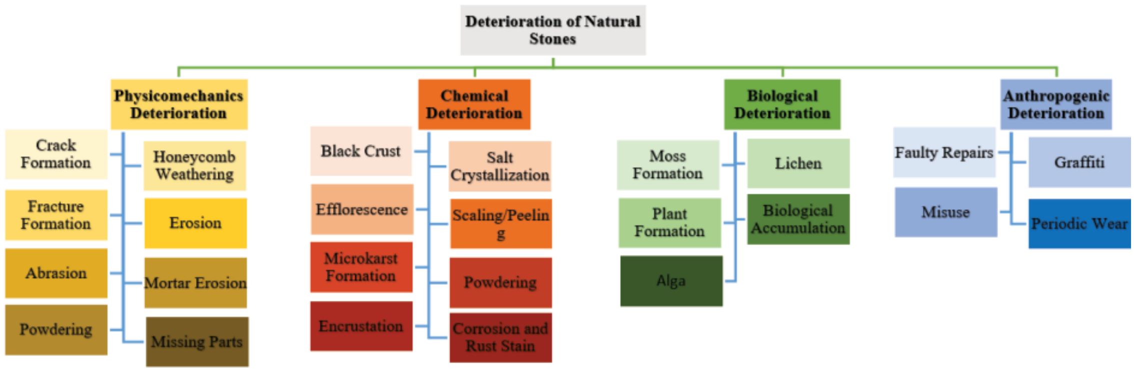

Figure 4. Classification of Deterioration Types Observed in Natural Stones (Hasbay et al., 2018: 2-8; Hasbay and Hattap, 2017: 28-40)

TYPES of PHYSICOMECHANICAL DETERIORATION OBSERVED in DIYARBAKIR NEBI MOSQUE

Physical weathering is the weakening of the bonds and fragmentation of the stones, without any change in the structure of minerals that form the stones. Physicomechanical deterioration in natural stones is caused by factors related to temperature changes, humidity, salt crystallization, and wind (Öcal and Dal, 2012: 29-35). While chemical deterioration is prominent in humid and hot regions, physical deterioration is prominent in cold and arid regions. This kind of dissolution is common in Turkey, Eastern Anatolia, Southeastern Anatolia, and Central Anatolia regions. In arid and semi-arid areas where daily and seasonal temperature differences are high, the high heat created by the sun in the dry season following heavy rains causes the water on the surface of the stone to evaporate rapidly by applying strong pressure to the pores of the stone. Especially in hard stones such as basalt and granite, the repetition of the shocks caused by this sudden temperature change at different intensities disrupts the mechanical balance of the stone and reduces its resistance (Öcal and Dal, 2012: 32). In Diyarbakır Nebi Mosque, due to the hot and arid climate of the Southeastern Anatolia Region where it is located and the effects of this climate on the stones, which are the main building materials of the mosque, many physicomechanical deterioration types have been encountered and these deteriorations are examined under headings.

Crack Formations

It is the phenomenon of separation of the bond between the molecules of the minerals forming the stone or the natural cement in the structure of the stone along, without complete separation. It occurs as a result

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of the physical forces (impact, shock, vibration, weight, inappropriate support or contact) applied by mechanical external effects (Doğruer, 2019: 32; Çetin, 2014: 1-2). Cracks are classified as capillary and structural cracks according to their depth. While capillary cracks are a few millimeters thick, they appear on the surface and do not pose a structural hazard alone, while structural cracks are deep and dangerous for the entire structure. Although it does not pose a structural danger by itself, the acceleration of capillary crack development causes new cracks and fractures, causing the stone to crumble and fragmentation (Öcal and Dal, 2012: 30; MEB, 2013: 14-15). In Nebi Mosque the capillary cracks were mostly found in the white limestone on the north façade, and the structural cracks were mostly found in the basalt stone used in the window jambs (Figure 5). Because of the ground subsidence over time and thermal expansion, the behavior is shown to tensile, and pressure has changed. As a result of this behavior change, the shear and pressure seen in the structural elements caused cracks.

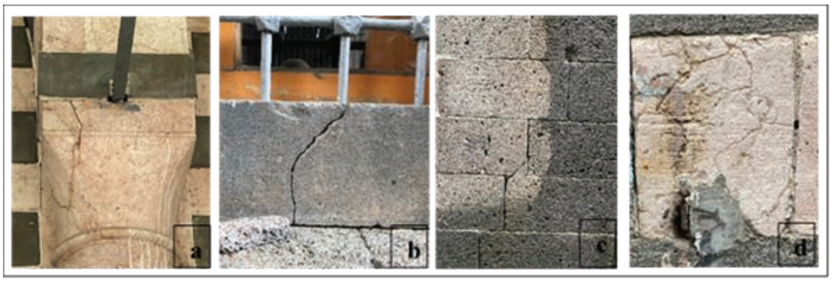

Figure 5. Capillary and Structural Crack Formation a. Corbel on the Arch on the North Façade b. Window on the West Façade c. West Façade Wall d. East Façade Wall

Alveolization

It is a type of deterioration in the appearance of honeycomb or sea sponge with pits, which is seen in non-homogeneous stone types due to atmospheric conditions and erosion, especially in dry climates. The pits are seen in interconnected forms on the stone surface, measuring a few cm or 1 meter depending on the progress of the deterioration (Çetin, 2014: 10). The surface loss caused by alveolization causes the stone to decrease in cross-section. It also paves the way for other types of deterioration, as it causes an increase in the area to be exposed to deterioration (MEB, 2013: 13). In the Nebi Mosque, the deterioration in the form of alveolization in the basalt stone is seen in different sizes and spread over the façades depending on the dry climate and erosion (Figure 6).

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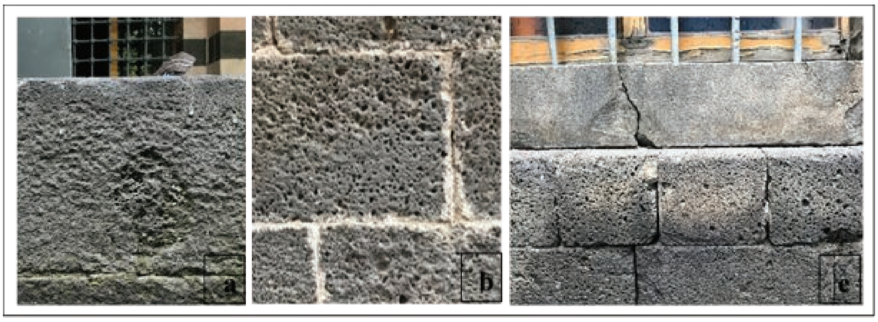

Figure 6. Alveolization a. Raised Floor of the North Façade b. West Façade Wall c. Window on the South Façade

Abrasion/Loss of Surface

This type of deterioration occurs when the stone surface becomes rough due to water, wind, wetting-drying, and then dissolves and melts as it is washed after the loosening phase. Depending on the internal structure of the stone or external effects, various degrees of surface losses occur (MEB, 2013: 11). The physical and chemical structures of stones can differ in the same type of rocks and even in different parts of a single block. Therefore, the physical and chemical structure of the stone according to the rock type and section of the block is an important parameter affecting the type and degree of erosion (Çetin, 2014: 8). The abrasion/surface losses seen for basalt stone in Nebi Mosque were seen in the parts of the wall ex close to the ground and increased in the parts where the wall meets the ground. (Figure 7a). Abrasion/surface losses due to wetting-drying cycles were observed at the high points of the wall façades, especially in the regions under the gutters (Figure 7b). Rounding, which is a result of granular dispersion, is observed on the limestone surface located on the north façade and minaret of the Nebi Mosque (Figures 7c, d) (Öcal and Dal, 2012: 87).

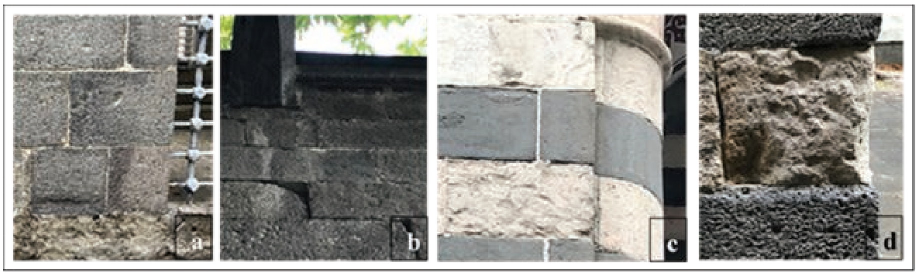

Figure 7. Abrasion / Loss of Surface a. Mausoleum Wall on the East Façade b. West Façade Wall c. North Façade Wall d. Minaret Wall on the West Façade

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Mortar Erosion

Since the mortar used when placing the stones forming the wall is less resistant to abrasion than the structure of the stone itself, it may weaken and dissolve over time, especially as a result of washing, and can be separated from the stones. This situation creates gaps of various depths and sizes in the joints between the stones, causing the floor and ceiling surfaces to be exposed (Figure 8). Mortar erosion accelerates other types of deterioration and causes loss of fragments and strength in stones (Hasbay and Hattap, 2017: 31). On the walls of the Nebi Mosque, mortar erosion was encountered as a result of washing at the junction points of the walls with the arch and lintel.

Figure 8. Mortar Erosion a. South Façade Wall b. South Façade Arch c. South Façade Wall

Missing Parts

It is the separation of a part of the stone from the main mass as a result of the breaking of the bond between the minerals forming the stone. Any effect that creates pressure by increasing the volume in the inner structure of the stone, causes cracks and starts to push the weakened part. One of these effects is the increase in volume caused by the rusting of metal elements such as cramps, dowels, or railings placed on the stone (Figure 9c, d). It can also occur as a result of the roots of plants with woody roots entering into the existing cracks on the stone, where the plant swells and grows with the water it absorbs. In addition, as a result of shifts and sudden changes in the load on the blocks, parts may break off at the corners and edges of the blocks (Figure 9a, b) (Çetin, 2014: 3; MEB, 2013: 12).

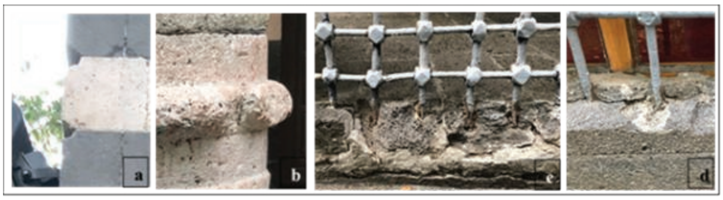

Figure 9. Missing Parts a. North Façade Wall b. Column Bracelet on the North Façade c. Mausoleum Wall on the East Façade d. East Façade Window

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TYPES of CHEMICAL DETERIORATION OBSERVED in DIYARBAKIR NEBI MOSQUE

Chemical deteriorations observed in stone monuments are the changes that occur in the chemical structure of the rocks such as dissolution and weathering as a result of the solution, oxidation, and hydrolysis events under the influence of humidity level and temperature (Öcal and Dal, 2012: 35-37; Çetin, 2014). High temperatures and the presence of fluids determine the speed of chemical processes that carry out chemical deterioration. Since moisture is the carrier of atmospheric pollutants in the air, there will be no chemical reactions of erosion even in the most severe pollution without moisture. Even if surfaces are not visibly wet in the presence of moisture, abrasion may occur. With this feature, chemical deterioration is observed more in tropical regions with high temperatures, abundant precipitation, and low evaporation rate compared to dry and cold regions (Fassina, 1976: 36; Öcal and Dal, 2012: 38).

The chemical reaction of gases with water into acids often affects stone monuments negatively. Rainwater falling from the atmosphere to the earth and having an average pH of 6, melts carbonate stones by showing the same effect as it contains melted atmospheric gases (Öcal and Dal, 2012: 35; Çetin, 2014: 1-2). In addition to external factors such as temperature and precipitation, atmospheric pollutant concentrations such as sulfur and nitrogen oxides, which are generated by the combustion of fossil fuels with carbonaceous aerosol emissions, have a negative impact on stone monuments, especially in urban areas (Basu et al., 2020: 8; Çetin, 2014: 2)

The resistance of rocks to chemical processes, which is one of the parameters that determine the effects of chemical weathering, varies according to the minerals that constitute the rocks. For example, basalt, which contains abundant calcite, plagioclase, and pyroxene minerals, decomposes rapidly since the minerals in its content are not chemically resistant (Öcal and Dal, 2012: 38).

Black Crust

It occurs in the form of dark gray-black encrustation when atmospheric particles, including air pollution, dissolve calcium carbonate (CaCO3) in the structure of calcium carbonate-based stones and turn them back into calcium carbonate (CaCO3) or gypsum (CaSO4.2H2O). It usually occurs on surfaces that are not directly washed with rainwater but remain moist for a long time (Öcal and Dal: 93, 2012; Çetin, 2014: 6-7; MEB, 2013: 18). The roughness created by the newly formed black crusts catches new particles (acid gases, aerosol dust, and carbonaceous particles), causing more roughness development, initiat-

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ing a cycle. Repeated cycles of wetting and drying cause channels to be opened in the crust by absorbing the water by the calcite grains, which are absorbed at varying rates depending on the porosity of the stone. The gypsum crust containing soot, tar, and fly ash particles in the air thickens but remains porous. As a result, the crust can thicken indefinitely, albeit at a decreasing rate (Ausset and Lefèvre, 2000: 329; Fassina, 1993: 6-7).

The main building material basalt stone and limestone, have been subjected to black crust/encrustation as a result of increased fuel consumption and exhaust gases due to the long winter season. The thickness of the black crust observed in the stones used in the building generally varies according to the way the region where the stone is located receives rain directly or indirectly. While the black crust observed in the regions receiving direct precipitation is observed in a thinner and evenly distributed manner (Figure 10a), the black layers observed in the regions receiving indirect precipitation and remaining humid are thicker and rough (Figure 10, c, d) (Fassina et al., 1976: 209).

Figure 10. Black Crust a. North Façade Wall b. The column on the North Façade c. West Façade Wall d. Window Lintel on the West Façade

Efflorescence/Salt Crystallization

Soluble salts which are found naturally in stone materials cause deterioration in the structure as a result of the stone material's absorption of water from the ground through capillarity or the reaction of acidic gases in the atmosphere with the stone surfaces. (Torraca, 1983: 110). One of the damages that lead to deterioration is that soluble salts absorb water in liquid (via osmosis) or vapor form (with hygroscopic behavior). and prevent drying. Another type of damage is the crystallization of soluble salts on the surface of the stone material by the evaporation of water and forming a weathering called efflorescence. The surface takes on a white and powdery appearance as salts accumulate on the surface as a result of crystallization. Efflorescence increases when the amount of water in the stone material and the relative humidity in the air is high and the wind speed is low (Torraca, 1983: 110; Öcal and Dal, 2012: 101-102; Çetin, 2014: 2; MEB, 2013: 19). In the Nebi Mosque, the deterioration in the form of efflorescence has been observed intensely in the lower part of the gutters in the walls, which are the parts where drying occurs slowly, due to the water effect. At the same time, efflorescence was observed on the north wall of the building, as the water leaking from the dome increased the critical moisture level in the stone materials (Figure 11).

Figure 11. Efflorescence/Salt Crystallization a. North Façade Wall b. North-East Façade Wall c. West Façade Wall d. East Façade Wall

Scaling/Peeling

It is a type of weathering seen as separation, blistering and exfoliation with a maximum thickness of 0.5-1mm parallel to the stone surface in cases where the stone artifact is exposed to atmospheric pollution and wind effects. When the separations parallel to the stone surface occur in the form of multiple layers with varying thickness, it is called "exfoliation" (Öcal and Dal, 2012: 79-80-81; MEB, 2013: 15-16; Hasbay and Hattap, 2017: 34). Exfoliation type deterioration is mostly seen in sedimentary stones and some metamorphic stones (Figure 12; Çetin, 2014:9-10).

Figure 12. Scaling/Peeling a. Pendant on the North Façade b. Window on the South Façade

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Microkarst Formation

The reaction of rocks containing carbonate with CO2 dissolved in air or water is called "carbonation". The carbonation reaction plays a role in the formation of "karstification" (chemical dissolution of carbonate solutions), especially in stones containing calcium carbonate (Öcal and Dal, 2012: 37). Since the acidic nature of the water (carbonic acid) accelerates the dissolution, the low pH characteristic of acid rains increases the formation of microkarst. The voids created by the dissolution cause the stone material to have a perforated appearance (Öcal and Dal, 2012: 36; Hasbay and Hattap, 2017: 35; Çetin, 2014: 11; Artık and Turan, 2018: 57). Due to the calcium carbonate content of the white limestone used in the part where the north façade and the north façade meets the east façade of the Nebi Mosque, microkarst formation was observed (Figure 13).

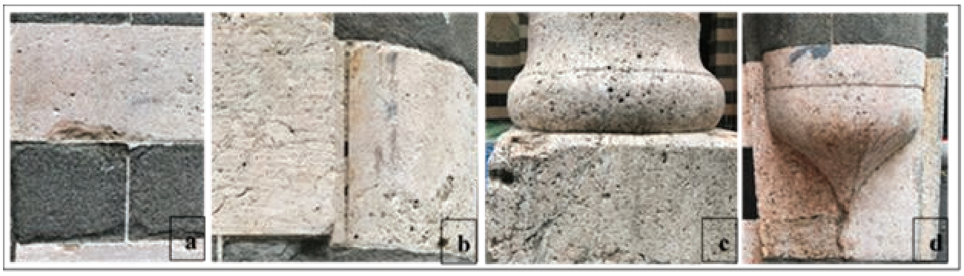

Figure 13. Microkarst Formation a. North Façade Wall b. North Façade Wall c. The column on the North Façade (Left) d. North Façade Wall

Corrosion and Rust Stain

Corrosion occurs when the iron is oxidized by contact with oxygen, water, or acid in the air. Acid, which can be easily formed by the combination of carbon dioxide (CO2) in the air with water, can cause corrosion. The structure of the iron changes due to the effect of corrosion and takes a rough appearance, its volume increases and its cross-section expands. As a result of the expansion in the iron elements such as iron clamps, windows, and railings, deterioration such as cracks and fragmentation can be observed in the stones. Corrosion that occurs in iron elements used as the connection part of the structural element embedded in the stone surfaces or its close vicinity causes rust stains by flowing over the stone surfaces with washing. The rust stains examined under the title of metallic stains are reddish-orange (Öcal and Dal, 2012: 106; MEB, 2013: 21-22). Corrosion-induced deterioration observed in the structure can be seen in Figure 14.

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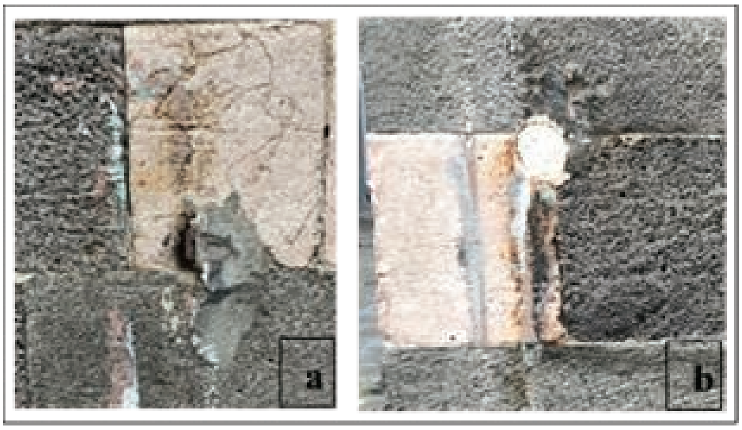

Figure 14. Corrosion and Rust Stain a. East Façade Wall b. West Façade Wall

TYPES of BIOLOGICAL DETERIORATIONS OBSERVED in DIYARBAKIR NEBI MOSQUE

Biological deterioration is physical and/or chemical damage to structure or artifacts by biological organisms. It is divided into two groups as biophysical and biochemical deteriorations (Griffin et al.,1991: 187-188). Deterioration of stone due to biological activity occurs as a result of colonization, alone or in combination, by plants and microorganisms such as bacteria, cyanobacteria, algae, fungi, and lichens. The effects of other organisms, such as animals that nest on the stone surface or in it, are also considered biological colonization. Biological colonization should not be confused with material accumulation due to external effects such as dust and dirt on the stone surface (Vergès-Belmin, 2008: 64).

Biological deterioration is generally a secondary deterioration process that starts as a result of other types of deterioration triggered by environmental factors. Primary damage that triggers biological deterioration can be in the form of a roughened surface or an accumulation of inorganic or organic matter on the surface. Biophysical damage can be observed in the form of surface splits or fragmentations. Biochemical damage is the direct effect of the metabolic processes of biological organisms on the exposed stone. Organisms that use oxygen for respiration produce carbon dioxide, which becomes carbonic acid and contributes to soluble salt formation and dissolution of the stone (Griffin et al.,1991: 188).

Moss Colonization

Moss growth is a form of biodeterioration that requires a constantly moist environment.

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Generally, reasons such as water rising from the foundation of the building and water accumulation caused by faulty architectural details are effective. If the building material is porous, there is a water source available at the beginning of this pore and there is a force that will push the water towards the pore, the structure absorbs water (Aydın and Lakot Alemdağ, 2015: 3). As the mosses prevent the drying of the surface covered by holding the water, it makes the structure vulnerable to deterioration. In addition to the fact that mosses cause color changes on the stone surface, they pose a danger to the structures because they create pores of different sizes on the surfaces (Öcal and Dal, 2012: 38; MEB, 2013: 21). The high humidity of the north façade of the Nebi Mosque made the stone surface on this façade open to moss colonization (Figure 15a).

Lichens

Lichens, a self-contained combination (symbiotic relationship) of fungi, algae, or cyanobacteria, play a role as a type of biological deterioration in the decomposition of structures and artifacts made of stoneTheir spongy structure keeps the water within it and causes the stone surface covered by it to remain constantly wet and accelerates the deterioration process. The lichen acids (the group of water-soluble polyphenolic compounds) and oxalic acid they excrete cause the stones to wear. At the same time, dead thalli of lichens (lichen body) cause biological accumulation as organic matter. The growth of alga and ferns can occur in an area exposed to sufficient soil and organic matter accumulation (Griffin et al.,1991: 191; Öcal and Dal, 2012: 48-49; Adamo and Violante, 2000: 231). Lichen colonization was found on the north façade, which is a relatively humid area in the Nebi Mosque (Figure 15b).

Plant Colonization

The soil and dust carried to the walls of the neglected and worn monuments due to the wind make the environment suitable for the germination of plant seeds. Plant diaspores carried by animals or wind, germinate and grow on the walls of the monument and create a microclimatic environment. In this case, plants decompose the structure both physically and chemically. The growth of plant roots in stone building material causes cracks due to the physical pressure they create, and the structure becomes open to leakage of water and chemical solutions. In addition, plants alone cause deterioration in the structure with carbonic acid (H_2CO_3) formed by the combination of carbon dioxide released by respiration with water or moisture in the air and the acids they form during their physiological actions (Öcal and Dal, 2012: 38,49-50). In the Nebi Mosque, plant colonization was observed as a result of the seeds carried by the effect of the wind in the area where the mausoleum wall and the south façade meet (Figure 15c.).

Figure 15 a. Moss Colonization-Raised Floor on the North Façade b. Lichen Colonization-Minaret Wall on the North Façade c. Plant Colonization-Mausoleum Wall on the East Façade

TYPES of ANTHROPOGENIC DETERIORATION OBSERVED in DIYARBAKIR NEBI MOSQUE

In the formation of anthropogenic deterioration, the growth of the human population and the processes such as housing and infrastructure construction that develop due to population increase are effective. In addition to the direct effects of human actions such as faulty repair, misuse, graffiti vandalism, and periodic wear, negative effects such as air pollution and tourism that cause indirect damage also constitute anthropogenic deterioration. Anthropogenic deterioration, which is dangerous in itself for buildings, also causes the building to become vulnerable to atmospheric effects and the negative effects of the environment (Öcal and Dal, 2012: 54; Hasbay and Hattap, 2017: 40; MEB, 2013: 11).

Faulty Repairs

Wrong decisions taken for repair in buildings cause the stone material to deteriorate and become vulnerable to damage. Faulty repairs consist of using incorrect materials such as the use of cement as a binder and supplementary material (Figure 15a, h, l, m, n), incorrect chemical methods or incorrect mechanical methods such as rasping, and also applications such as painting and plastering stone surfaces (Figure 15b, c, f, i, j). The use of cement together with natural building stones, contrary to the original material frequently encountered in the Nebi Mosque, caused stone deterioration in the building. The stone surface in contact with the cement mortar or filling material is exposed to deterioration such as salinization and crack formation due to volume growth while drying. Cement prevents breathing of the surface which is covered cement due to

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its low porosity and does not dry. Therefore, weathering occurs on the stone surface due to wetness (Öcal and Dal, 2012: 56; MEB, 2013: 22-23-24) Corrosion-related rust stains and cracks (Figure 15d, e), another type of deterioration observed in the Nebi Mosque, constitute the faulty repair as a result of not well insulating metal elements such as cramps and railings used in joining stone blocks (Figure 15; Öcal and Dal, 2012: 56-57).

Figure 16. Faulty Repairs a. North Façade Wall b. South Façade Wall c. East Façade Wall d. North Façade Wall e. Mausoleum Wall on the West Façade f. Column on the North Façade g. West Façade Wall

DETECTION of the DETERIORATIONS OBSERVED in DIYARBAKIR NEBI MOSQUE by MAPPING METHOD

The deteriorations that occurred in Diyarbakır Nebi Mosque were determined by visual analysis and presented as photographs. In addition to the visual analysis, the deterioration headings were examined separately by using the mapping method on the façades. Subheadings under each heading are presented using different colors (Tables 3,4,5,6). In addition, the ratios of the deterioration areas occurring on the exterior of the building to the areas of the façades are presented. These ratios were calculated by detecting the areas of deteriorated stone surfaces. Table 3 shows the location of the physicomechanical deteriorations observed on the façades and the ratios of deterioration areas to the façade areas in Diyarbakır Nebi Mosque. According to the table, the most common type of physicomechanical deterioration on façades is alveolization, with a total rate of 10%. Alveolization is mostly observed in the basalt stone located on the north façade, with a rate of 6%.

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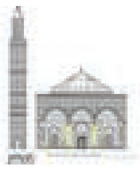
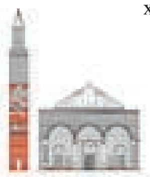
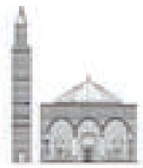
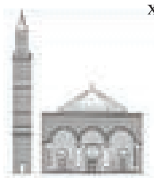
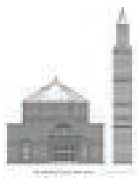
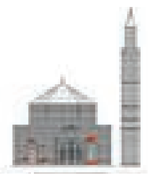
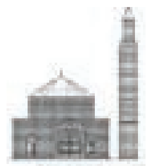
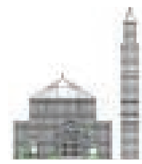
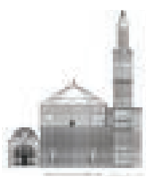
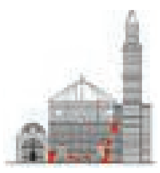
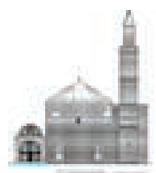
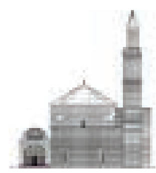
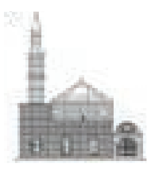
Table 3. Physicomechanical Deterioration Types Occurring on the Façades of Diyarbakır Nebi Mosque

THE LOCATION OF PHYSICCMECHANICAL DETERIORATIONS ON THE FACADES			
NORTH FACADE			
xxx 	xxx 	xxx 	xxx 
AREA RATIO			
2%	6%	0,1%	0,02%
SOUTH FACADE			
 xxx	 xxx	 xxx	 xxx
AREA RATIO			
0,02%	2%	1%	xxx 1%
WEST FACADE			
			
xxx	xxx	xxx	xxx
AREA RATIO			
0,02%	2%	1%	1%
WEST FACADE			
			
xxx	xxx	xxx	xxx
AREA RATIO			
0,02%	1,5%	0,01%	2%

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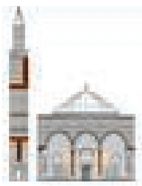
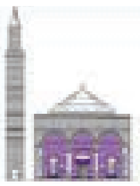
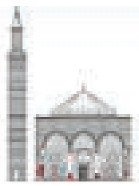
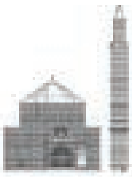
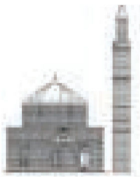
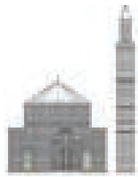
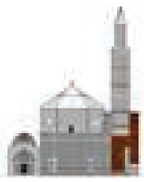
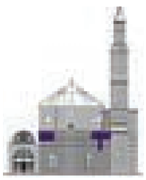
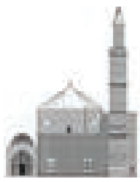
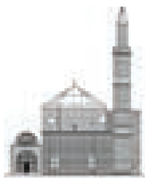
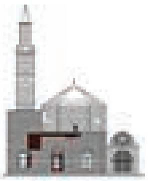
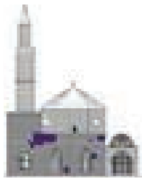
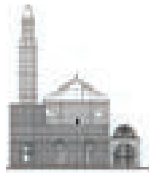
The locations of the chemical deteriorations and the ratios of the deterioration areas to the façade areas are shown in Table 4. According to the table, the two most common types of chemical deteriorations on façades are black crust formation and efflorescence, with the same rate of 19%. The black crust formation is mostly observed on the surfaces of the limestone and basalt stone located on the east façade with a rate of 9%. Efflorescence type deterioration is mostly observed on the surface of basalt stone, located on the north façade.

Table 4. Chemical Deterioration Types Occurring on the Façades of Diyarbakır Nebi Mosque

<table>
<tr><td>
xxx xx</td><td colspan="2">
xxx</td><td>
xxx</td></tr>
<tr><td colspan="4">AREA RATIO</td></tr>
<tr><td>0%</td><td colspan="2">13%</td><td>1%</td></tr>
<tr><td colspan="4">SOUTH FACADE</td></tr>
<tr><td>
xxx xx</td><td colspan="2">
xxx</td><td>
xxx</td></tr>
<tr><td colspan="4">AREA RATIO</td></tr>
<tr><td>0,05%</td><td colspan="2">0,08%</td><td>0,03%</td></tr>
<tr><td colspan="4">SOUTH FACADE</td></tr>
<tr><td>
xxx xx</td><td>
xxx</td><td>
xxx</td><td>
xxx</td></tr>
<tr><td colspan="4">AREA RATIO</td></tr>
<tr><td>9%</td><td>3%</td><td>0,03%</td><td>0,03%</td></tr>
<tr><td colspan="4">SOUTH FACADE</td></tr>
</table>

 xxx ■ xx	 ■ xxx	 ■ xxx
AREA RATIO		
4%	3%	0,02%

The locations of the biological deteriorations on the façades and the ratios of the deterioration areas to the façade areas are shown in Table 5. The most common type of biological deterioration on façades is plant colonization, with a rate of 0.04%. Moss and lichen are observed only on the north façade, and plant colonization is observed only on the east façade.

Table 5. Biological Deterioration Types Occurring on the Façades of Diyarbakır Nebi Mosque

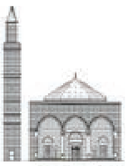
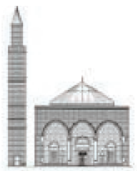
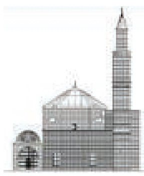
THE LOCATION OF PHYSICCMECHANICAL DETERIORATIONS ON THE FACADES		
NORTH FACADE		EAST FACADE
 ■ Moss Colonization	 ■ Lichen Colonization	 ■ Plant Colonization
AREA RATIO		
0,02%	0,03%	0,04%

Table 6 shows the locations of the anthropogenic deteriorations observed on the façades and the ratios of deterioration areas to the façade areas. The only type of anthropogenic deterioration on façades is faulty repair with a rate of 1%. Faulty repairs are mostly observed on the south façade with a rate of 0.5%.

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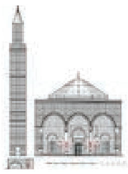
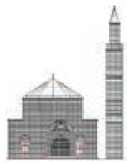
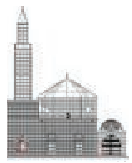
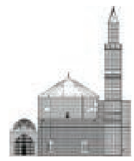
Table 6. Anthropogenic Deterioration Types Occurring on the Façades of Diyarbakır Nebi Mosque

THE LOCATION OF PHYSICCMECHANICAL DETERIORATIONS ON THE FACADES			
NORTH FACADE	SOLTH FACADE	WEST FACADE	EAST FACADE
 Faulty Repairs	 Faulty Repairs	 Faulty Repairs	 Faulty Repairs
AREA RATIO			
0,3%	0,5%	0,02%	0,03%

RESULTS and EVALUATION

In Diyarbakır, Nebi Mosque which has survived to the present day as the Akkoyunlu Period structure, deteriorations have been observed in the basalt stone and limestone due to internal and external effects. The deteriorations detected by photographing were evaluated under four headings as physicomechanical, chemical, biological and anthropogenic deterioration and presented in tables (Table 7).

Table 7. Distribution of Headings of Types of Deterioration Observed in Diyarbakır Nebi Mosque by Façades

	Types of Deterioration	North	South	East	West
Physicomechanical Deterioration	Crack Formation	+	+	+	+
	Alveolization	+	+	+	+
	Fracture Formation				
	Erosion				
	Abrasion	+	+	+	+
	Mortar Erosion		+		+
	Powdering				
	Missing Parts	+		+	

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Chemical Deterioration	Black Crust	+	+	+	+
	Efflorescence/Salt Crystallization	+	+	+	+
	Scaling/Peeling	+	+		
	Microkarst Formation	+		+	
	Powdering				
	Encrustation				
	Corrosion and Rust Stain			+	+
Biological Deterioration	Moss Colonization	+			
	Lichen	+			
	Plant Colonization			+	
	Biological Accumulation				
	Alga				
Anthropogenic D.	Faulty Repairs	+	+	+	+
	Graffiti Vandalism				
	Misuse				
	Periodic Wear				

As a result of the evaluations, the types of deterioration observed in the structure were calculated numerically according to their subtitles (Figure 17a). In this comparison, the most common type of deterioration is physiomechanical deterioration (42.10%) and the least common type of deterioration is biological deterioration (7.89%). The deterioration types according to the facades of the building are shown graphically in Figure 17b. Physicomechanical and chemical deterioration due to effects such as temperature changes, salt crystallization, humidity, wind and air pollution, and anthropogenic deterioration due to direct or indirect effects of humans are observed on all façades of the building. While physicomechanical and chemical deterioration is observed at close rates, anthropogenic deterioration rates are less. Algae and lichen colonization under the title of biological deterioration, which has the least rate of all deterioration, was observed only on the north façade due to the relative humidity (Figure 17b)

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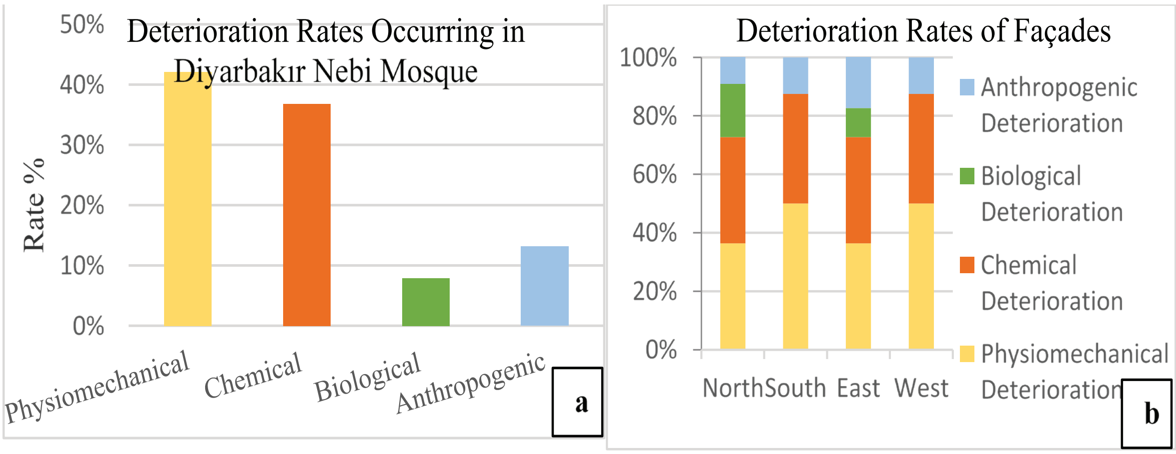

Figure 17a. Graphical Representation of the Deterioration Rates Occurring in Diyarbakır Nebi Mosque b. Graphical Representation of the Distribution of Deterioration Types in Diyarbakır Nebi Mosque by Façades

In addition to the numerical data obtained from the distribution of the presence of types of deterioration according to the facades, the façade area/deterioration area ratios were detected using the façade mapping method. The obtained proportional data are presented in Tables 4,5,6, and 7 according to the façades and types of deterioration. The areal ratios of the types of deterioration observed according to the façades were compiled and presented in Table 8.

Table 8. Areal Ratios of Deterioration According to Façades (by Mapping Method)

	DETERIORATION TYPES				
FAÇADES	Physicomechanical	Chemical	Biological	Anthropogenic	Total
North	8%	20%	0,06%	0,3%	28,3%
South	2%	0,4%	0,04%	0,5%	2,94%
East	4%	12%	0	0,007%	16%
West	4%	8%	0	0,002%	12%
Total	18%	40%	0,1%	1%	59,3%

According to Table 8, chemical deterioration is the most common type of deterioration in terms of area, with a rate of 40%. Physicomechanical deterioration follows chemical deterioration, with a rate of 18%. The proportion of the anthropogenic type of deterioration is 1%. Biological deterioration was the least common type of deterioration, with a rate of

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0.01%. According to the total deterioration area ratio of the façades, the façade with the highest deterioration rate is the northern façade. The façade with the lowest deterioration area is the south façade, with a rate of 3%. The data in Table 7 were acquired by determining the numerical distribution of the deterioration types on the façades of the mosque. The data in Table 8 were acquired by calculating the areal ratios of the deterioration types on the façades obtained by the mapping method. As a result of comparing the data in Table 7 and Table 8, it was concluded that the most common type of deterioration numerically is physicomechanical deterioration, while the most common type of deterioration in terms of areal ratio is chemical deterioration.

Physicomechanical deterioration is more common in conditions where arid climate and hard natural stone coexist. In this context, the structure has been exposed to more physicomechanical deterioration numerically, as it is located in the Southeastern Anatolia Region with a hot-arid climate and the basalt with hard structure stone is used as the main building material. Physicomechanical deteriorations such as cracks, alveolization, and abrasion/surface loss were encountered on all façades of the building due to temperature changes, humidity, and wind effects. Chemical degradation, which includes black crust formation caused by air pollution, which is a disadvantage of the building's location in an urban area, and efflorescence/salt crystallization due to the water-moisture effect, has the highest percentage in terms of areal ratio. As an internal effect, the chemical susceptibility of the minerals in basalt has increased the rate of chemical deterioration. Among the chemical deteriorations, microkarst formation, stands out as it causes damage to the limestone used in the building. Algae and colonization, which are biological deterioration, were observed on the north façade of the building due to the moisture and porosity of the natural stone, and plant colonization was also observed on the south façade. Faulty repair, one of the anthropogenic deteriorations, caused damage to the building due to faulty decisions of material and technic. The cement material used especially as a filling material in the structure has caused cracks. Also, corrosion of metal materials that are not well insulated caused rust stains.

Diyarbakır Nebi Mosque, which is a historical and cultural heritage, is damaged by natural stone deterioration due to environmental factors. If the factors of the deterioration and the properties of natural stone materials are not determined correctly, it will be difficult to inherit the structure to future generations with its unique characteristics. Preventive and restorative works must be carried out at the right time and in the right way to extend

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the life of buildings. In this context, the technical characteristics of the basalt and limestone forming the structure should be determined and measures should be taken against the types of deterioration.

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