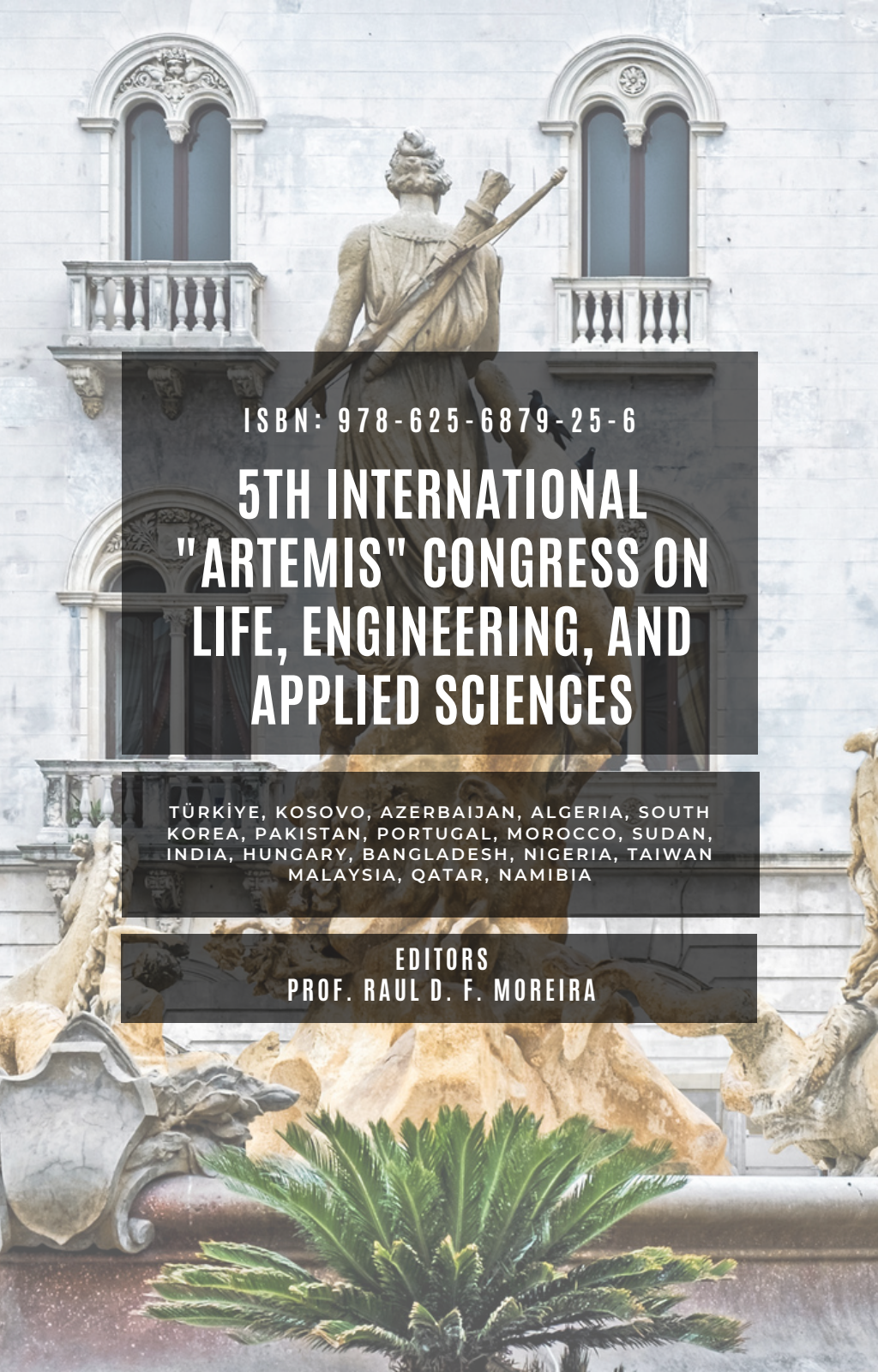

ISBN: 978-625-6879-25-6

5TH INTERNATIONAL "ARTEMIS" CONGRESS ON LIFE, ENGINEERING, AND APPLIED SCIENCES

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OCTOBER01-03, 2023

(ONLINE & FACE TO FACE PARTICIPATION)

ISBN: 978-625-6879-25-6

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BZT AKADEMİ YAYINEVİ®
BZT ACADEMY PUBLISHING HOUSE 2021©

TURKEY, USA
TR: +90543 671 0123 GR: +491774586777

INVESTIGATION OF DETERIORATION DEVELOPMENT IN CULTURAL BUILDINGS DUE TO ATMOSPHERIC AND HUMAN INFLUENCES, THE EXAMPLE OF YOUNG JESUS CHURCH

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ABSTRACT

Among cultural stone heritage, rock-carved monuments exhibit more permanent features than structures built with building stone. The widespread availability of easy-to-carve pyroclastic units, especially in Anatolia, has led to a rich rock-carved heritage in the region. The main threats to these monuments are the sensitivity of the rock unit from which the monument is built to atmospheric processes and the anthropogenic impacts to which the monument is exposed. While atmospheric processes evolve over time depending on the climate and geographical location of the region, human activities such as treasure hunting and vandalism can cause rapid destruction of monuments. In this study, Young Jesus Church carved into the pyroclastic rock in the Phrygian valley was investigated. It has been determined that both atmospheric deterioration processes and human influences have had an impact on the deterioration observed in this monument, from which the unique figures have partially survived to the present day. Within the scope of the study, visual deterioration analyses were carried out in-situ, and a basis was created for the restoration applications that need to be planned urgently.

Keywords: Young Jesus Church, Restoration, Rock, Deterioration, Afyon.

INTRODUCTION

The deterioration process of rocks starts with the first contact with the atmosphere and develops over time (Fener and İnce 2015). This development process is determined by factors such as rock properties (mineralogical, petrographic, index, strength, etc.), geographical location and regional climate. Depending on these factors, the deterioration process can sometimes take millions of years, and sometimes it can take decades. The monuments carved into the rock are built into units that were formed

millions of years ago. After the construction process, deterioration processes begin as the interior of the monument is exposed to the atmosphere. Since these monuments are protected against rain, snow and wind, their deterioration is expected to be less. However, abandonment of monuments due to loss of function over time accelerates deterioration processes (Hatır et al, 2019). In contrast, anthropogenic impacts such as scratches and influences cause instant damage. In addition, atmospheric processes are accelerated by the increase in porosity in the destroyed areas. This study investigated the deterioration of the Young Jesus church, which was carved into the rock in the Phrygian Valley about 1000 years ago.

STUDY AREA

Young Jesus Church, built by carving into the pyroclastic rock, has a single nave plan type (Figure 1). The naos (cella) is covered with a gable roof and there is a bench to the north of this monument. Although there are figures on the church walls, they cannot be identified due to damage It is estimated that the monument was built between the 11th and 12th centuries.

Figure 1. Young Jesus Church

MATERIALS AND METHOD

Within the scope of the study, the deterioration of the church of Young Jesus was investigated through visual examinations in-situ. The definitions in ICOMOS (2008) were taken as a basis for determining the types of deterioration in the monument.

RESULTS AND DISCUSSIONS

The deterioration of the rock-carved Young Jesus Church is concentrated on the façade and the ceiling of the monument. Large-scale contour scaling (Figure 2) type and black crust (Figure 3) anomalies were observed on the ceiling of the monument. This is thought to be caused by the ventilation gap opened in the ceiling of the monument (Figure 4).

The water seeping through this gap was absorbed by the ceiling and caused freeze-thaw processes to be active. In addition, these waters caused the surface to remain moist and triggered the formation of black crust (Figure 4).

Figure 2. Contour scaling and black crust on the monument ceiling

Figure 3. Black crust observed in the church

Figure 4. The gap in the ceiling of the monument for ventilation

Another type of deterioration due to atmospheric processes observed in the monument is biological colonization. Lichen and higher plant growths were detected on the exterior surfaces of the church (Figure 1). The loss of a fragment on the front façade of the monument, to the right of the entrance, is most likely of human origin, based on the impact marks.

The other cause of deterioration in the church is human influences. It was determined that these influences were the biggest factor in the destruction of the figures inside the monument. There are scratches on the figures and pits and fragment losses due to impact (Figure 5).

Figure 5. Anthropogenic influences on the figures

CONCLUSION

The deterioration of historic buildings is a complex mechanism that depends on human, biological and atmospheric processes. Anthropogenic influences are one of the factors that directly determine the speed of deterioration processes. In this study, long and short-term deterioration developments in the Young Jesus Church were investigated and the findings are given below.

- Atmospheric deterioration has developed in the interior of the church due to the effect of seeping water. The most prominent type of damage is the contour scaling observed on a large scale.
- The biggest factor that damages the aesthetic and historical value of the monument is the anthropogenic influences. Due to the damages, the figures cannot be identified today.

Reducing anthropogenic influences is of great importance in the transfer of historical buildings to future generations. For this, it will be important to control historical sites with security and camera surveillance.

REFERENCES

Fener, M., & İnce, İ. (2015). Effects of the freeze–thaw (F–T) cycle on the andesitic rocks (Sille-Konya/Turkey) used in construction building. Journal of African Earth Sciences, 109, 96-106.

Hatır, M. E., Korkanç, M., Başar, M. E. (2019). Evaluating the deterioration effects of building stones using NDT: the Küçükköy Church, Cappadocia Region, central Turkey. Bulletin of Engineering Geology and the Environment, 78, 3465-3478.

ICOMOS-ISCS. (2008). Illustrated Glossary on Stone Deterioration Patterns, Champigny/Marne, France.