Cultural Heritage Site under Risk: A Case Study from Petra, Jordan

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ABSTRACT

One of the major problems facing the World Heritage Site of Petra is of salt damage caused by weathering effect; this study examined and monitored the salt types and distribution within four different monuments at the site; these were the Treasury, Palace Tomb, Deir Tomb, and the Theatre. The study examined the interaction of both single salts and the salts in mixed solutions and their effect on each other’s solubility, it also determined the ‘safe’ levels of relative humidity where salt damage in monuments or objects contaminated with these salts can be minimized. Following the current research observations, it might be assumed that salt damage could be avoided in a very straight forward way by controlling the surrounding relative humidity and temperature, which should be carefully planned since monuments of Petra are all located in an open area.

KEYWORDS: Weathering effect, salt damage, thermodynamic analysis, Petra/ Jordan
1. INTRODUCTION

Petra was listed as a World Heritage Site in 1985; despite the great economic benefits gained by tourism to this heritage site, a great pressure and negative impacts caused by the increasing influxes of tourists made UNESCO consider it as an endangered site (UNESCO 1993). There are some potential economic, sociocultural and environmental negative impacts that are threatening the future of the site in the absence of a sustainable management plan for the site. For negative environmental impact taking place at Petra, these take many forms; one of them is damage caused by tourists’ behavior while navigating within the site. The random climbing and movement on site's rock-cut features is leaving drastic effects. According to Tom Paradise, a geomorphologist from the University of Arkansas at Fayetteville, the fact that people are wearing shoes with soles that grab on everything instead of the rubber-soled working boots or soft sneakers, is causing the quick disappearance and loss of rock carved features; moreover, parts of the façade of the Khazneh [the Treasury] had lost sand because that is where tour guides let people sit, he indicates that this caused the loss of half a cubic meter of sandstone over few years. Another threat facing Petra is the rising level of humidity resulted by the crowds of the tourists present at the site, which is an obstacle facing the preservation of sandstone. An indicator of deterioration is presence of the white deposits on the walls of carved tombs, mainly the Treasury; according to Paradise, tests showed that the deposits are to be of stearic acid, when people rest by leaning against the wall with sweating hands, they leave a scum of fat behind (Lubick 2004). Horse and camel rides are also causing a problem to the site since the dust raised by these animals becomes encrusted on the sides of the Siq. (UNESCO 1993). Some graffiti is also to be seen on the rock cut Siq and tombs of the city. Littering can be also noticed although of the littering cans placed throughout the site. In addition to the danger caused by tourists and tourism development, other natural factors are negatively affecting the site; one of these is the corrosion of lower sections of façades by the wind which carries sand particles from the crumbling sandstone rock. Also, the water that infiltrates into the rock by capillary action enables vegetation to grow in the interstices, consequently resulting in the fracture of rock, and in worse cases rock fall (UNESCO 1993). Not less important than all previous problems is the one of salt damage caused by weathering effect; this study will examine and monitor the salt types and distribution within the four different monuments in the world Heritage site of Petra. The case study monuments are the Treasury, Palace Tomb, Dier Tomb, and the Theatre.

This research is part of a project that aims at measuring and estimating the different impacts negatively affecting the archaeological sites in Jordan. This will be done by selecting some particular sites that are exposed to different kinds of problems that are causing their deterioration. Different scientific methods are used to measure such impacts; these sites are as follows with some of the problems they are facing: Petra: salt damage, wear and tear, humidity, air/wind, existence of animals in the site, wrong conservation actions and vegetation; Amman Citadel: waste, traffic congestion, fires, being close to residential areas, illegal excavations, wear and tear, and vegetation; Jerash: crowding, festivals, wrong conservation actions, managerial problems, wear and tear, and traffic close to site and Ghor es-Safi: agricultural activities and illegal excavations.

The results of the research will help in achieving the following implications: increasing awareness about problems facing these sites, it will help also in developing a set of procedures to decrease and mitigate different negative impacts, as well as in developing standards for implementation when planning for the tourism development of these sites, and in putting guidelines to conserve sites appropriately, also to minimize and avoid the negative impacts caused by extensive visitation to these sites.

2. ABOUT THE SITE

The archaeological city of Petra with its 2000 sandstone rock-cut façades was hewed into colored sandstone and Limestone Mountains. The city of Petra lies hidden in the
Desert Mountains in the southern part of Jordan (35° 25′ E - 35° 28′ E and 30° 19′ N - 30° 21′ N), it is 255 km far from Amman (the capital of Jordan). The city of Petra occupies an area of 15 km² and is 900 to 1500 m above sea level. The archaeological park which includes the ancient city is accessed through an outer Siq (path) in which significant features as Obelisk tombs and Djen Blocks can be seen, then a natural gorge known as Siq with a length of 1200 m with the water channels system is still existing, as well as niches and the two statues of Dushara and al-Uzza gods. The Siq then widens upon the most magnificent of all Petra’s monuments al-Khazneh (meaning Treasury in Arabic), which is carved out of solid rock with a height of 40 m. The Siq continues through the ancient city were different features can be observed; these include the Street of Facades, the Amphitheater which can accommodate more than 6000 spectators, the Royal tombs (Urn Tomb, silk tomb, Corinthian Tomb and Palace Tomb), also the Mausoleum of Sextus Florentinius; that is in addition to the colonnaded street leading to triple-arched Temenos Gateway which marked the entrance into the courtyard or "temenos" of Qasr al-Bint, one of the main Nabataean temples in the city. Other remains include Nymphaeum, the Great Temple Complex, Temple of the Winged Lions, Petra Church, Blue Church, a number of high places (with their platforms for the purposes of giving animal sacrifices), al-Deir (the Monstery) with its huge façade (50 meters wide and 45 meters high), a big number of tombs as the Lion tomb, Garden Tomb, Tomb of the Roman Soldier, Triclinium (Feast Hall), as well as many other features (Map 1). In general, the remains of the city are dated to different periods within Hellenistic Period (2nd century B.C.) to Late Byzantine Period (6th century A.D.) (Causle 2003; Teller 2006). Map 1 shows the most important carved monuments in the city. The monuments of Petra are unique in their architecture, structure and durability. The presentation of the monuments of Petra is beyond the scope of this research; however, four of the monuments will be presented here as case studies, where the samples and the microclimate data for this research project were collected.

3. REFERENCES

References should be again in single column format and provided in alphabetical ordering starting with the first author’s surname and all names capitalized. Use the MAA-Reference style for references, which corresponds to Book Antiqua 9pts, 0.75 hanging indentation. To use references in the text use the following example (Binda et al., 2003; Walker, 2012).

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REFERENCES


