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Managing Public Awareness and Community Engagement on Landslide Risk at the Petra Archaeological Park: The Case of the “Petra Sīq Stability Project”

Abstract

The Petra Archaeological Park, a World Heritage site since 1985, characterized by a spectacular landscape is also a fragile site facing a diversity of risks. Potential occurrence of rapid onset natural phenomena (landslides, flashfloods, earthquakes) pose a major threat to cultural heritage and the visitors. The Petra ‘Sīq’, a naturally formed gorge in the sandstone mountains is particularly at risk due to its narrow pathway, limited access points and recent active processes, which raised the attention to the geological conservation of the site and visitors’ safety. The UNESCO Amman Office, in partnership with the Department of Antiquities of Jordan and the Petra Archaeological Park has therefore engaged in a multi-year project aimed at the analysis of stability conditions of the ‘Sīq’ slopes through the installation of an integrated monitoring system for the detection and control of deformation processes and the definition of guidelines for implementation of mitigation measures against rock instability. Despite the technical nature of the project, a participatory approach towards different levels of stakeholders has been adopted, conscious of

how the awareness of the environmental hazards threatening the site can be crucial to ensuring that risk can be appropriately managed and mitigated. This paper aims at demonstrating the essential role that local stakeholders and indigenous communities can play in the management of a World Heritage property, in particular in relation to disaster risk reduction, and how their involvement and awareness of the issues at stake can be vital for the long term management of the property. Main focus will be put on project activities undertaken, results achieved and suggestions for steps ahead, aiming to present a useful case study for stakeholders and community engagement leading to the sustainable management of the heritage site.

Introduction

In the last decades, the number of disasters and associated losses has been progressively increasing (IFRC 2015; Munich Re 2016).

In landslide risk management, non-structural measures, as community preparedness, public awareness and communication strategies, can be successfully applied to mitigate landslide risk especially in developing countries (An-

derson 2013). Such strategies, along with the implementation of active measures for reducing landslide hazard, demonstrate the importance of involving the affected population and other stakeholders in the decision-making process for risk reduction (Nadim 2014).

According to the Hyogo Framework for Action 2005-2015, the main UN-wide policy on the subject of Disaster Reduction, increasing awareness on the importance of disaster reduction policies is a key objective to ensure the substantial reduction of disaster losses and enhance the resilience of communities to respond to disasters (UNISDR 2005).

Building on the Five Priorities for Action defined by the Hyogo Framework, the UNESCO World Heritage Committee approved at its 31st session in 2007 the Strategy for Risk Reduction at World Heritage properties having per objective to strengthen the protection of World Heritage sites and contribute to sustainable development by integrating concern for heritage into national disaster reduction policies and within management plans for World Heritage properties in their territories (UNESCO 2006).

The strategy was prepared by the World Heritage Centre, in co-operation with the States Parties, Advisory Bodies, and other international agencies and non-governmental organizations concerned by emergency interventions.

This same strategy is also reported on the Resource Manual on “Managing Disaster Risks at World Heritage Properties” produced by the World Heritage Centre in cooperation with ICCROM, ICOMOS and IUCN (UNESCO 2010).

In line with the above, in the last decade the UNESCO Office in Amman has engaged in the implementation of activities geared towards ensuring that preventive measures are in place in the main touristic areas of the site, and, specifically, in the ‘Sīq’, so to evaluate how the site can be best protected and preserved against natural risks and ensure that it is safe for the thousands of tourists who visit each year.

Scope of Work

The archaeological site of Petra (FIG. 1) lies in a large valley surrounded by mountain ranges. Its geology is dominated by Palaeozoic sandstone rocks that form most of the hand-carved Nabataean rock monuments of Petra. The ‘Sīq’ is a 1.2 km naturally formed gorge in the sandstone rocks that represents the main entrance to the archaeological site. Because of the religious niches and water management features, the ‘Sīq’, in its entirety, is considered as a monument of religious and historic significance, considerably contributing to the Outstanding Universal Value of Petra. The width of the ‘Sīq’ ranges from 3m to 15.70m. It is formed by very steep slopes with variable height from the ground level, from few meters at the entrance to several tens of meters in some areas of the path.

Petra is also a very fragile site facing a wide diversity of risks, ranging from those posed by



1. The ‘Sīq’ from the upper slopes, © UNESCO.

environmental factors, such as natural and geological hazards, as well as those attributed to tourism and the lack of adequate site management and emergency measures for tourist and monument safety. In recent years, natural phenomena, such as earthquakes, floods and landslides were registered as increasingly impacting the site, and most specifically the ‘Sīq’ posing a major threat to cultural heritage and visitors.

During the rainy season, water flows into the ‘Sīq’ from the surrounding wadis. In 1963, 24 tourists died as a result of a sudden flash-flood in the ‘Sīq’. Water management and the hydraulic system created by the Nabataeans, protected the monuments and the people from life threatening flash-floods, however those systems are now deteriorated and no longer protecting the site or visitors. A survey of the Nabataean hydraulic network in the ‘Sīq’ and the areas with direct impact on the ‘Sīq’ was conducted from 1996 to 2002 (PNT 2003). As a result of this project, the velocity of water flow during flash floods was reduced by restoring the existing floor of the ‘Sīq’ to its original pavement and grade.

Despite this intervention, the risk posed by landslides is still present in the ‘Sīq’ due to its specific geomorphology. In the last decade, several landslide events, mostly rock falls and rock slides, with different magnitude (volumes from $<1\text{m}^3$ to $>10\text{m}^3$) have occurred in the ‘Sīq’ (2009, 2015) and in the core area of the site (2009, 2010, 2016).

These recent events have prompted UNESCO Amman Office, in cooperation with the local authorities, to initiate a process for analysis, monitoring and urgent and long-term mitigation of landslide risk. Awareness and communication activities on natural hazards have been among the non-structural mitigation strategies implemented.

UNESCO Petra Risk Assessment and Mitigation Strategies

Preserving Petra’s Outstanding Universal Value for which the site has been inscribed

in the World Heritage List (UNESCO 2016), is one of the corporate UNESCO priorities for culture actions in Jordan, in line with the UNESCO Strategy for Risk Reduction at World Heritage properties (UNESCO 2006).

Since 2009, the UNESCO Office in Amman has supported the Petra Archaeological Park and the Department of Antiquities in assessing, managing and mitigating natural hazards in Petra World Heritage site.

Within the framework of the project “Risk Mapping at the Petra Archaeological Park” (2011-2012), a strategic partnership was established with the government and several partner organizations, including national and international universities, to map and document the natural and human-made risks in the core area of the property. A proposal for risk management at the Petra Archaeological Park to identify and prioritize continuous threats with cumulative and slow effects (not disaster risks) was elaborated and handed over to the government in 2012 (Paolini *et al.* 2012).

From 2009 to 2015, UNESCO engagements focused on addressing for the first time the impact of landslides phenomena in the ‘Sīq’. In 2009 a technical expertise in engineering geology was provided to the national authorities to support the consolidation of a fractured block in the ‘Sīq’.

Through the implementation of the projects “Rapid Risk Assessment” (2011) and “Sīq Stability”, Phase I (2009-2015) actions have been focusing on the analysis of the stability conditions of the ‘Sīq’ slopes based on a comprehensive documentation of the site, the installation of an integrated monitoring system for the detection and control of deformation processes and the definition of mitigation measures against rock instability (Delmonaco *et al.* 2015; Delmonaco *et al.* 2014; Delmonaco *et al.* 2013a, b).

The Petra “Sīq Stability” project Phase II (2015-2016) aims to operationally implement the mitigation of landslide risk in the ‘Sīq’ through the (a) application of priority and ur-

gent landslide mitigation interventions in the upper ‘Sīq’ plateau and on the ‘Sīq’ slopes to address immediate slope hazards in the short term; (b) capacity development of the national authorities to address the management of landslide risk at the site and implement mitigation measures in coordination with international experts; (c) awareness raising among different levels of stakeholders on landslide and other natural hazards occurring within the Petra Archaeological Park and specifically in the ‘Sīq’.

Public awareness and communication among a broad set of stakeholders, ranging from decision makers to the local community, fall into the third project component as non-structural mitigation strategies against natural hazards and shall be later incorporated into a wider management strategy for the site.

Risk Awareness Methodology and Implementation in Petra

The local community and the tourists are generally unaware of how the geological and hydraulic processes that shaped spectacular landscapes can be hazardous to people. Informed visitors can instead assume a certain degree of risk and responsibility for their own safety when visiting natural, cultural or recreational environments. In view of this, park public safety programs shall involve the communication of site-specific hazards to visitors, education and information programs that en-

courage self-reliance, cooperation with other departments, non-governmental organizations, tourism operators, concessionaires, and service providers (NPS 2006).

Data gathered showed that awareness of natural risks preparedness and mitigation, mostly at the community level, can be the foundation for risk prevention in Petra. Stakeholders and local communities can play a key role in the management of a geo-archaeological site, in particular in relation to disaster risk reduction.

The approach adopted in the “Sīq Stability” project aims at supporting the Petra Archaeological Park in raising awareness on heritage management and conservation, focusing on natural risks preparedness and mitigation. Different typologies of stakeholders were identified (decision makers, governmental institutions, NGOs and UN agencies, professionals/researchers, site business beneficiaries, tour guides, children, local community) and a set of targeted activities was selected for each of them (TABLE 1).

Overall, the strategy aims at: (a) achieving best practices on preservation and management of the site supported and endorsed by the national authorities; (b) making local communities, site beneficiaries, and other stakeholders engaged in the site with different capacities, aware of the activities undertaken in the ‘Sīq’ for the prevention of natural hazards; (c) ensuring that best practices are adopted by tourists

Table 1. Overview of target groups and related activities

Type of Activities ►	Field visits	Informal	Informative	Presentations	Workshop	Interactive
Target Groups ▼	Technical Meetings	meetings and site visits	material (ENG & ARB)	Lectures	High Level Conference	sessions
	Workshops					
1. Decision makers					×	
2. Other Gov. Institutions	×					
3. NGOs and UN agencies	×					
4. Professionals Researchers			×	×		
5. Site beneficiaries		×				
6. Tour Guides		×				
7. Local Community		×	×			
8. Children			×			×
9. Tourists			×			

when visiting the ‘Sīq’ in regards to the impact of natural hazards that might occur on site; (d) making the international community and the national authorities aware of the work that UNESCO is conducting in the ‘Sīq’.

In parallel to the priority landslide mitigation interventions carried out in the upper ‘Sīq’ plateau and on the ‘Sīq’ slopes from March to July 2016, as part of the project “Sīq Stability”, Phase II, a number of communication and public awareness activities on geological and geo-hydrological hazards were implemented, according to the strategy developed.

While some of the stakeholders’ categories could be addressed through convening meetings or field visits (decision makers, NGOs, UN agencies), some others required specific outreach methodologies because of their primary involvement during the implementation of the landslide risk mitigation works on site, as in the case of tourists, tour guides, site business beneficiaries and local communities.

At the end of the works, awareness workshops were specifically designed to address the local youth from the six communities located in the vicinity of the site in order to enhance their knowledge about the natural risks and mobilize their support for the preservation of the site.

The type of activities implemented varied in relation to the target group addressed and the timing of implementation (before or during the field works).

As for the activities implemented before or during the field missions, in order to ensure effective and efficient implementation, a comprehensive coordination and management system was set in place in cooperation with the Petra Archaeological Park in advance of each field mission and according to a preliminarily agreed check-list of actions.

Before the implementation of the field activities, community awareness workshops involving site business beneficiaries and tour guides from the local community were carried out in coordination with the project experts and the

local authorities. The primary aim of the workshops was to raise awareness on the geomorphological and hydraulic hazards characterizing the ‘Sīq’, promote a more responsible behavior conducive to risk prevention and, thus, ensure their cooperation during the upcoming field activities. This measure would apply to business beneficiaries as horse-driven carriage riders transporting tourists unrelentingly from the beginning to the end of the ‘Sīq’, often at high speed and with limited interest in the surrounding environment: having them informed on the specificity of the site and possible natural hazards can enhance their sense of responsibility and produce a transfer of information to the visitors.

As part of the actions taken before the implementation of works, communication materials as project brochures and informative flyers were disseminated to the hotel management units within the surrounding village of Wādī Mūsā and a warning on the upcoming activities was posted on the Petra Archaeological Park web site.

During the landslide risk mitigation works (FIG. 2), awareness raising activities were performed on site and focused on public awareness with tourists and site business beneficiaries. *Ad hoc* awareness materials on the project were prepared for distribution at the Petra Visitor Centre (project flyers, FIG. 3).

The same materials were distributed to tourists in the ‘Sīq’, at the beginning and at the end of the work site. Access to the work area (normally about 30 m in length) was temporarily blocked for tourists by using white and red striped tape and placing project banners (FIG. 4).

Dedicated UNESCO and Petra Archaeological Park staff stood at the beginning and at the end of the work site to share project flyers and provide general information on the activities being implemented (FIG. 5). The project team could also rely on the substantial support provided by the Jordan Civil Defense, the Petra



2. Landslide risk mitigation works, © UNESCO.

Archaeological Park rangers and the Tourism Police, whom engaged in public awareness activities with the tourists and the local community alongside their more institutional duties.

The whole project team, from the project experts to the workmen (all belonging to the local community) were involved in communicating with the general public on the risk stability phenomena present in the ‘Sīq’ (FIG. 6).

During the period following the implementation of the works (September-December 2016) a cycle of nine awareness workshops targeting the youth from the local communities in the vicinity of the site were organized in coordination with the Petra National Trust (PNT). The PNT is a Jordanian non-governmental organization, that aims to promote and coordinate Jordanian and international efforts to preserve Petra’s unique combination of antiquities, natural environment and human traditions (FIG. 7).

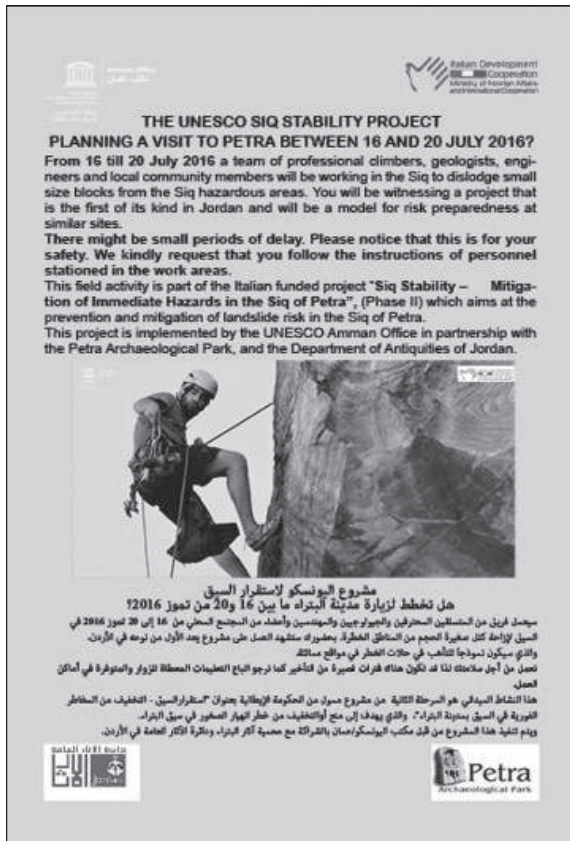
A total of 150 students of different age



3. Tourist flow in the ‘Sīq’ during the implementation of the landslide risk mitigation works, © UNESCO.

groups (10-13, 13-15 and 15-18) coming from the communities of Bayḍā, Umm Ṣayḥūn, Wādī Mūsā, aṭ-Ṭaybah, Rājif and Dulāgha participated in the workshop series. Through three types of Youth Engagement Programs implemented, the students could learn more about the significance of the site, the geological aspects that characterize it and the value of protecting Petra’s heritage. One specific programme was designed to provide an understanding of the risks the project is striving to mitigate in the ‘Sīq’ and the activities implemented by UNESCO to prevent landslides in the last decade. Hands-on activities were often arranged to facilitate the understanding of the concepts explained.

The activities undertaken proved successful in spreading awareness on the project at different levels and primarily within the tourists, site business beneficiaries and the local community. In light of this, it is foreseen that additional activities engaging the local youth will



4. Flyer of the risk mitigation works 2016, © UNESCO.



5. Banner of the risk mitigation works 2016, © UNESCO.

be organized during the following phases of the project and the final achievements of this work will be compiled and integrated in the management plan for the whole site, whose preparation is currently being developed by UNESCO and the local authorities (FIG. 8).

Conclusions

This study demonstrates the essential role that public awareness and communication on



6. Communication session on landslide mitigation works to visitors, © UNESCO.



7. Workshop participants prepare a model of the 'Siq', © UNESCO.



8. Students use colored sand mixed with plaster to create versions of the sandstone found in Petra, © UNESCO.

natural hazards can play as non-structural technique in the management and mitigation of landslide risk in the 'Siq' of Petra and further support the Petra Archaeological Park in the management of environmental risks at the site.

Despite the time limitations, project related experience reported and the challenges faced in the management of the tourist flow at one of the most visited sites in the world, this initiative can be regarded as a successful example

of cooperation between the national authorities and UNESCO for the improved management of a World Heritage Site.

Similar actions shall be then integrated in a management plan for the protection of the site that is currently being elaborated by UNESCO Amman in cooperation with the national authorities.

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