

Investigating the Effect of Malicious Factors on the Ancient Sites in Order to Maintain and Protect Them Using the Geographic Information System (GIS); Case Study: Budda-Bamiyan

Mohammad MOVAHEDI, Master degree in Geography and Urban Planning, Iran

Hossein REZAYE, Master degree in Architecture, Iran

QurbanAli AMIRI, Bachelor's degree in Engineering Geology and Exploration of Mine, Afghanistan

Zahra MIRZAIE, Bachelor's degree in Geographic Information System (GIS) , Afghanistan

Keywords: *Budda-Bamiyan — Geographic Information System — Risk Assessment.*

CHNT Reference: Movahedi, Rezaye, Amiri and Mirzaie. (2021). 'Investigating the Effect of Malicious Factors on the Ancient Sites in Order to Maintain and Protect Them Using the Geographic Information System (GIS); Case Study: Budda-Bamiyan', in CHNT – ICOMOS Editorial board. *Proceedings of the 26th International Conference on Cultural Heritage and New Technologies*. Heidelberg: Propylaeum.

Abstract

Ancient works are in the worst conditions due to the instability of their materials after exploration, which requires more monitoring and protection. Many factors, including natural and human, threaten ancient works and historical buildings which identifying and analysing them and providing results in the form of risks map can help explorers to protect the monuments optimally. This article is about the historical area of Bamiyan idols which are selected according to their historical dating and importance. In this article, all threatening factors for the study area including 5 natural factors (earthquake, rainfall, humidity, temperature difference and erosion) and 4 human factors (road networks, construction in the historical area, tourism and unauthorized drilling) were determined and weighted using hierarchical analysis method in order to systematically monitor the maintenance and management of ancient works and cultural heritage sites.



Fig. 1. Budda-Bamiyan Site Map

In this research, risk map of the historical sites of Bamiyan idols is provided due to the changes caused by human and natural risks by multi-criteria decision-making method for Analytic Hierarchy and Geographic Information System (GIS). Analytic Hierarchy method has been used to prioritize risks.

The Analytic Hierarchy Process (AHP) model is a decision-making method by which decisions could be made that are dependent on various criteria or multi-criteria decisions. Remote sensing for the application of archaeology tries to identify the effects and patterns of human activities on the ground. Types of multi-spectrum sensors are capable of identifying ancient remains. Archaeological discoveries and printed works of Eric Schmidt have been the first technical project in this area. Four overall stages are provided according to the shape (2) to evaluate each risk and its impact, as well as the classification of ancient works studied based on the vulnerability. In this regard, the available maps, satellite imagery and ground operations were used to prepare required information and the spatial database has been developed has been in the Geographic Information System (GIS). Figure (3) shows the study area at high, moderate and low risk level.

Please follow these guidelines strictly to ensure a smooth and quick review and publication process.

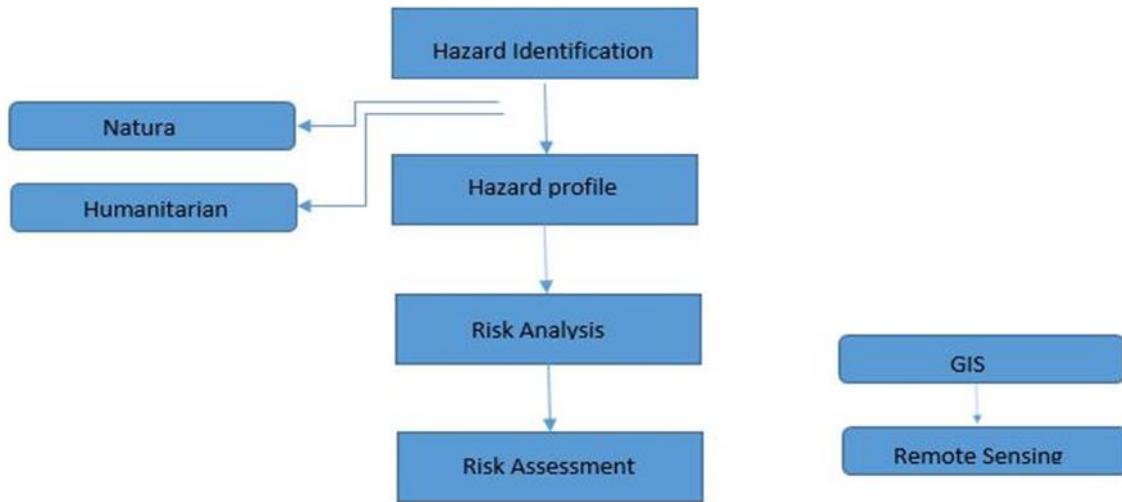


Fig. 2. The overall stages of the risk assessment of historical and ancient sites

In a simple view, Bamiyan cliff sediments are consisted of thick horizontal layers whose thickness varies of centimetres to meters consisting of different conglomerates which combined with clay, mud and sand as well as their mixed layers (see also Zou and Unold, 2002).

An important point in the compounds as well as interconnected layers in terms of combination, grain size, thickness and colour are very variable. In the field research of the blocks around the Buddha area, the thickness of the layers of the conglomerates in the western ceiling of the Salsal Budda is varying from several centimetres to several meters. The size (diameter) of its components usually varies from several centimetres to approximately 20 centimetres in the corresponding layers. Combination in each layer is equally variable and lithology of Mesozoic and Polyzoic courses are reflected in the vicinity of the Bamiyan Valley in the forms of volcanic, intrusive and old sedimentary components. Most of the conglomerate layers appear to be relatively weak cement.

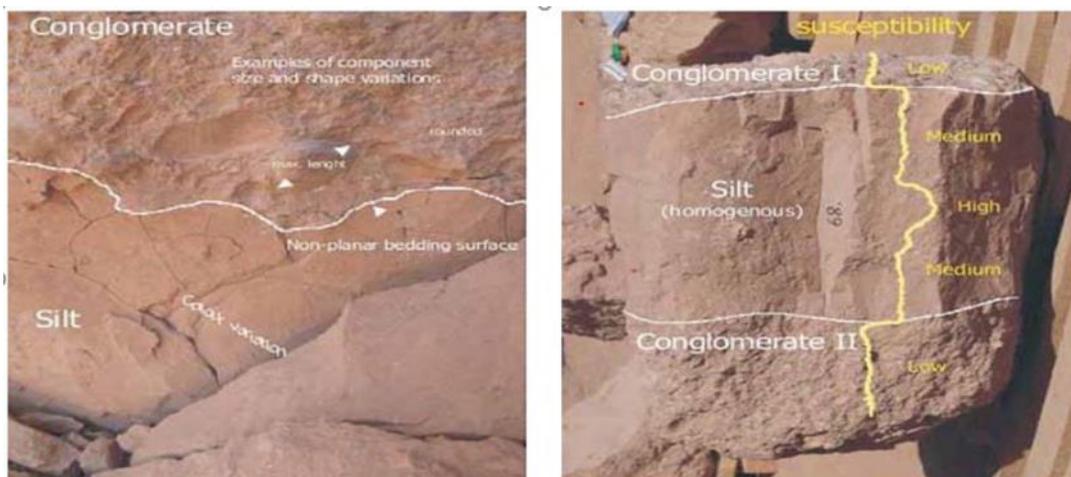


Image. 1. Analysis of rock texture in the Bamiyan Budda

For all risks, skilled experts' opinions were used, some information was collected from the risk history in Bamiyan's privacy. The history of the risk, also, has been investigated. We try to collect the raw data from the relevant departments such as the Meteorological Office, the National Office of Environmental Protection and the Ministry of Information and Culture of Bamiyan province and also field observations in order to analyse and achieve a general risk rate in Bamiyan's privacy.

The risk factors considered in this study include construction inside the area and the areas having experienced erosion, earthquake, rainfall, temperature difference, unauthorized drilling, road networks and tourists' route. To provide relevant information, available maps and satellite photos have been used. Fault maps are used to display the effects of earthquake. For the risks caused by rainfall and the temperature difference, respectively, the data from the National Environmental Protection Department and Meteorological Organization and their corresponding analyses were used.

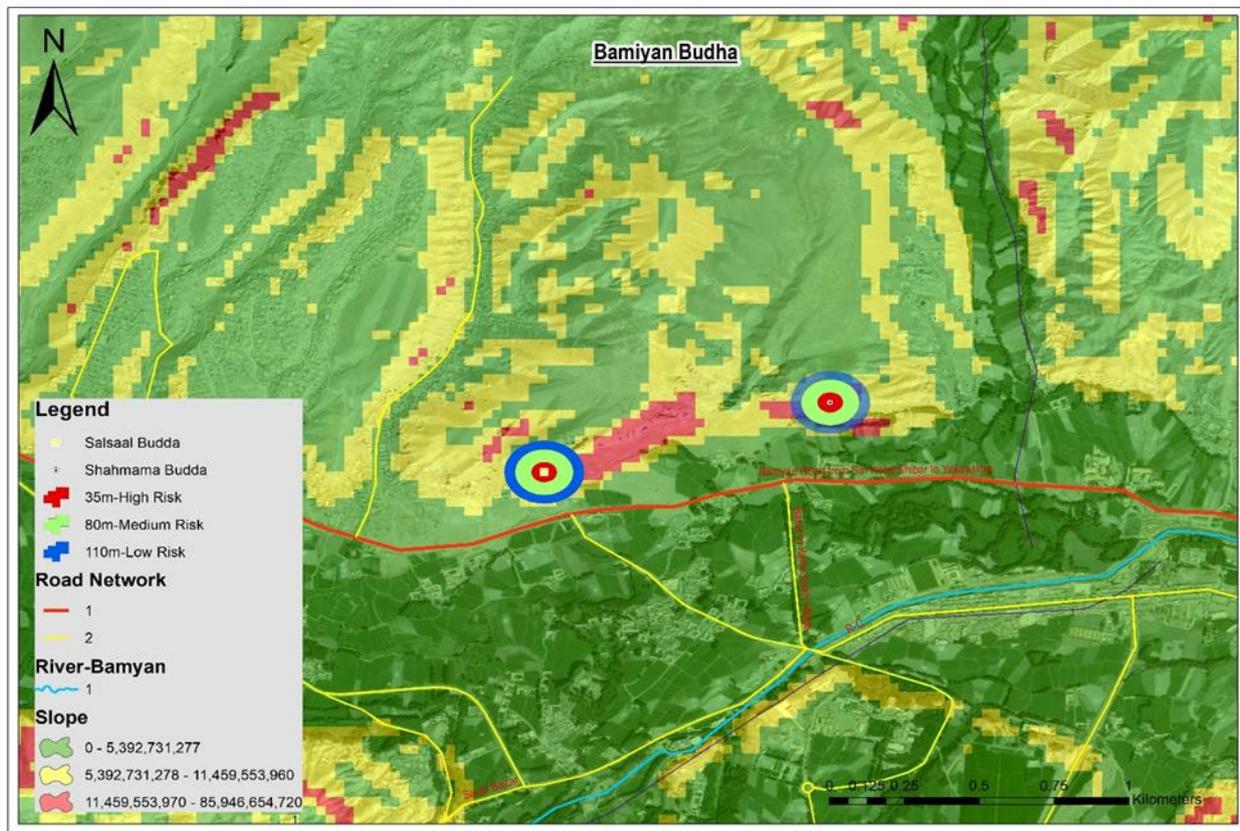


Fig. 3. The final map of the distinction of the Buddha's historical area to three classes; high-risk area, moderate-risk area, low-risk area

In order to maintain and protect the historical sites, the presence of a systematic method increases the ability of planning and ability to evaluate and model the way of risk performance. In most sites listed in UNESCO, the experts enjoy the abilities of geographical information system tools. In this regard, researchers chart the nature of the risks and scope of their impact in order to reach a general zoning map of region risk in order to show the risk areas with low, moderate and high steps. In this research, first, the natural and human factors effecting in destroying historical monuments are identified and then, figure (3) is produced after preparation of spatial layers for any factor and weighing them by the Analytic Hierarchy Process with use of the Geographic Information System (GIS) application, the map of risk-taking potential of Bamiyan's Buddha.

This map has a significant impact on solving of many repairing problems, as well as the focus of archaeologists' opinion in understanding of systematic monitoring in order to optimize the risks. This method is designed to be used in historical sites and created a systematic process and a proper tool for providing risk maps of historical and ancient monuments.

Reference:

A review of the management and administrative activities in the Hegmataneh ancient area from the past to now, Ranjbaran, Safari.

Impact of urban sprawl to cultural heritage monuments: The case study of Paphos area in Cyprus

Saaty, T. L. (1980). The Analytic Hierarchy Processes. New York: McGraw Hill. Spreafico, M. C., Franci, F., Bitelli, G., Girelli, V. A., Landuzzi, A., Lucente, C. C., ... Borgatti, L

Bamyan Satellite image, 2019, General Directorate of Geodesy and Cadastre

Afghanistan Shapefile, 2015, Ministry of Mines Petroleum