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PROTECTION AND PRESENTATION OF THE "PILLOW LAVA" SITE NEAR THE VILLAGE OF MIRAVCI

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ABSTRACT

There are numerous geological, geomorphological, hydrological and other phenomena from inanimate nature on the territory of the Republic of Macedonia. Due to their exceptional and rare characteristics, some of them are surely worth visiting and therefore deserve adequate treatment and protection. The site called "Pillow Lava" is located near the village of Miravci and it exhibits unique geological and geomorphological features. This paper will focus on the fundamental values of the site and adequate measures for its protection will also be suggested.

Key words: protection, presentation, geodiversity, the "Pillow lava" site

INTRODUCTION

All occurrences and forms created by nature are recognizable in their own diversity. Lately, more attention has been dedicated to the diversity of inanimate nature or geodiversity (Pantić et al., 1998). "Geodiversity" can be defined simply as "the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (land form, physical processes) and soil features. It includes their assemblages, relationships, properties, interpretations and systems" (Gray, 2004). Geoheritage represents an important example of geodiversity and its frequent occurrence and prevalence is presented as a small fraction of the total geodiversity (Gjurović et al., 2006). The term "geoheritage" is used to refer to global, national, state-wide, regional, to local features of geology, such as its igneous, metamorphic, sedimentary, stratigraphic, structural, geochemical, mineralogic, palaeontologic, geomorphic, pedologic and hydrologic attributes, at all scales, that are intrinsically important sites, or culturally important sites, that offer information or insights into the formation or evolution of the Earth, or into the history of science, or that can be used for research, teaching, or reference (Brocx & Semeniuk 2007). Under the influence of various natural and anthropogenic processes, the occurrences of geoheritage can be subjected to degradation and even to complete destruction (Kolčakovski et al., 2000). Therefore, it is of high importance to undertake certain measures for their protection, as well as their preservation depending on their origin and size. They clearly deserve to be visited and therefore it is necessary to present them appropriately. This presentation can be

physical or on-the-spot, another way of presenting them is if they are placed in a museum or are published in science magazines and publications (Dangić, 1998).

The natural diversity in the Republic of Macedonia is exceptional. There is a plethora of natural phenomena that are still not well known. A typical example of a natural occurrence of geoheritage that is barely known is the "Pillow Lava" site located in near village of Miravci. What makes this site so interesting are the numerous geological features, such as so-called formations of spilitazed pillow basalts (magmatites-spilites) and other geomophological occurrences, such as the so-called small gorges with canyon characteristics, cascades, waterfalls and plunge pools. This site needs an adequate protection against the existing anthropogenic influence. It also needs to be properly presented for the abundance of phenomena it possesses in order to be more visited.

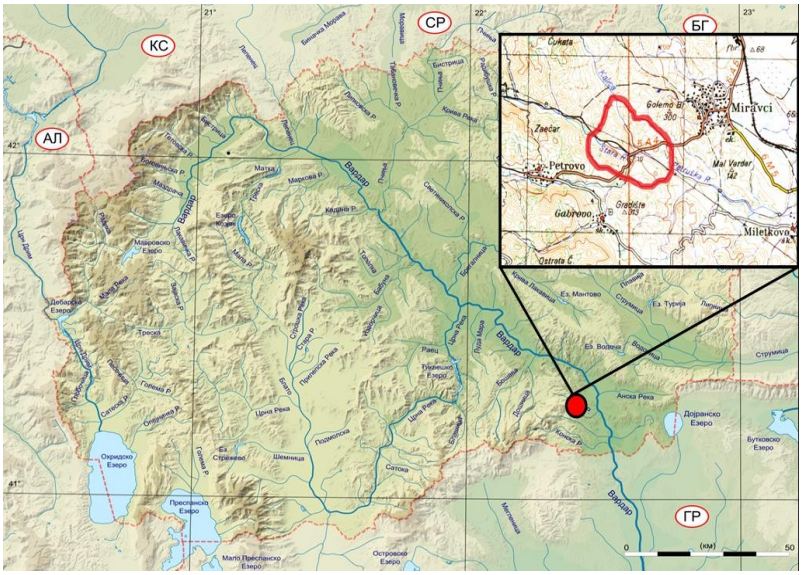


Figure 1: Location map on the "Pillow lava" site.

STUDY AREA

The "Pillow Lava" site (commonly known by the local inhabitants as "White Heaven") is located to the southwest of the village of Miravci. It stretches on east slopes of the Kozuf Mountain, 185 m above sea level, at the inflow of Stara River to Petrushka River. It is 2 km away from the village of Miravci, and 7 km from the E-75 highway. A local road passes through the site leading to the village of Petrovo.

BASIC CHARACTERISTICS OF THE SITE

Among other occurrences, the manifestation of spilitized pillow basalts (migmatites-spilites), can be included in the many evidences of volcanic activities that had happened on the territory of the Republic of Macedonia in the past (Boev, 2006). They have appeared in the Triassic–

Jurassic magmatism, as a result of magma running into the aquatic environment. As a result of the different temperature of the lava and the water, a circular formation appeared, giving the rocks an elliptic form. Based on their mineralogical properties, they are similar to diabases and they differ in the way in which they are formed, as they are formed into different size balls, ranging from a few cm up to 1 m (Gjuzelkovski, 1971/72). This type of rock formations can be seen along the E-75 highway, along the road section between Demir Kapija and the village of Udovo, as well as in the vicinity of the village of Miravci. Due to the fluvial erosion of Stara River and Petrushka River, these occurrences are starting to become visible on the surface of the terrain (Kolčakovski, 2011).

At the inflow of Stara River into Petrushka River, i.e. at the connection itself, both rivers have created small gorges with canyon characteristics which are 13m high. The spring of Stara River is located in Balija, Kozuf at an altitude of 1180 m. (Stojmilov, 2011) Through the course of Stara River, the unequal crossing form three cascades and two waterfalls with 500m distance between them. The first cascade is 9.2 m long and has formed a plunge pool at the bottom. Plunge pools can also be called well-like depressions formed in rocky riverbeds. They usually form at the bottom of waterfalls, and alongside rocky bottoms of riverbeds. They are formed in places where water and the material it carries exert strong whirlpool-like pressure. Plunge pools can appear in various dimensions. Their walls are smooth, almost polished, while the bottoms are made of gravel and other larger rocks (Kolčakovski, 2006). The plunge pool that has formed here is 11m wide and 3m deep (according to the field measurement done on the 17/04/2016). It has a well-like depression and its walls are smooth, almost polished, while at the bottom there is a presence of gravel (Fig. 2).

Down the river with 30m distance from the first cascade a second cascade is formed with the length of 8.2m. There is another cascade downstream with the length of 3.3 m. Right after the three cascades, at a distance of 8m, there is a waterfall which is 5.3m high. Just few meters downstream, there is a second waterfall which is 7m high. A plunge pool is formed at its bottom, which is larger than the first one and is 10m wide, 13m long and 4m deep (according to the field measurement done on the 17/04/2016).



Figure 2: The first plunge pool (photo by Todorova).

PROTECTION ON THE "PILLOW LAVA" SITE

The site is under multiple threats of anthropogenic influences contributing to the destruction or damage to all types of occurrences of geodiversity. Therefore, it is clear that such occurrences should be both preserved and protected. Geoconservation includes protection, physical managing and improvement of geo-regions of international and national importance for the purpose of scientific and educational exploitation (ProGEO, 2011). The occurrences of geoheritage can be protected on the very spot of creation in-situ, or separated from it ex-situ (Dangić, 1998). Ex-situ protection is protection of geological occurrences out of their natural original sites, which mainly refers to minerals/rock formations and fossils which are usually placed in museums or private collections (Law on Nature Protection, 2004). In-situ protection is protection of geological occurrences, protection of the place of creation or the place of natural occurrence of minerals/rock formations and fossils (Law on Nature Protection, 2004). According to Dangić (1998), there are two types of geoheritage protection, as follows: physical protection and combined physical protection and protection from degradation factors. Part of the conservation also includes scientific documentation of geological interests for protected regions, promotion of further necessary researches and managing plan which will be upgraded regularly. A program aimed at monitoring the geoheritage state in protected regions could be drafted, along with a program for restoration and reparation of all damage done (Dimitrovska, 2008).

Even though it occupies a relatively small area, this site is quite attractive due to its small gorges with canyon characteristics, with the plunge pools, cascades and waterfalls, as the phenomenon of pillow lava itself. According to field observations, it is recommended that this locality should be protected as soon as possible by applying the in-situ method. The occurrence of "pillow lava" along the E-75 highways, or more precisely, along the road section between Demir Kapija and the village of Udovo and the "Pillow lava" site near the village of Miravci, deserves to be protected as a natural monument, as it has already been suggested back in the Spatial Plan of the Republic of Macedonia (2002-2020). The Law on Nature Protection (2004) bans the construction of any buildings and overhead power lines, disturbing the landscape by constructing unessential buildings, fences, antennae, water pollution, rechanneling water flow etc. on the site. A building housing a restaurant has already been built on the site that has partially changed the surrounding ambience (Fig. 3). In order to prevent the destruction of the site in the future space can be given under concession to protect the rare occurrences.



Figure 3: The restaurant at the "Pillow Lava" site (Photo by Todorova).

PRESENTATION ON THE "PILLOW LAVA" SITE

Some of the aforementioned occurrences of geoheritage are easily accessible, while others require specific equipment to get to them and some of them can only be seen in museum collections simply due to the fact that only a certain part of them has been preserved and protected as opposed to being completely destroyed if left on the site.

The attractions that this site offers can be seen on the spot and have been displayed for visitors to see. A building housing a restaurant has been constructed around the first plunge pool that is open only during the summer season. Wood and iron materials have been used to build the restaurant, which disturbs the natural ambience. It is necessary to place wooden benches, rubbish bins and an informational board explaining the creation of "pillow lava", the plunge pool and small gorges with canyon characteristics on Stara River as well. The second plunge pool, cascades and waterfalls had not been subject to any landscaping works. In this section, a trail could be paved leading to the second plunge pool, which will be made from natural materials which would not disturb the natural ambience. The area around the second plunge pool needs to be cleaned, and wooden benches, tables and rubbish bins need to be placed. It is necessary to place a road sign informing visitors about the direction of the site on the local road that passes by the site. Recreational tourism, bicycle touring, fishing tourism, adventure tourism (jumping from rocks), mountaineering can be developed on the site, as well as specialized and educational visits on multiple levels of research and education processes. This rare natural beauty is very interesting for scientists, but it has not been explored and researched to a satisfactory degree. When it comes to this particular region, very little is known in the electronic media and newspapers. Some of the magmatic rock/spilites with circular shape can be displayed in the Museum of Natural History of the Republic of Macedonia in Skopje, in order to educate the general public about the way they have been created, as well as about the volcanic activity that has taken place on the territory of the Republic of Macedonia.



Figure 4: The occurrence of "Pillow Lava" along the E-75 highway near the village of Udovo (Photo by Todorova).

CONCLUSION

In order to make the occurrences of geoheritage more accessible to the general public, special attention should be paid to landscaping and arranging such sites, paying due attention not to disrupt their natural ambience in the process. In addition to the physical and spatial arrangement, and the proper care for the occurrences of geoheritage, there has to be a certain presentation that will contribute for a greater popularization of the objects, so visitors can have a complete picture for them.

The "Pillow Lava" site has a great geological and geomorphological significance. That is why, it is necessary to explore it in great detail. For that purpose, it is necessary to prepare a complete scientific study and to initiate legal protection thereof in the category of natural monuments. The favourable geographical position of the site and the vicinity of the Greek border, the Dojran Lake and the E-75 highway, as well as the proper presentation and protection of its rare characteristics can be more than enough to attract both domestic and foreign tourists. If this site is presented and promoted properly, it can surely become a touristic site of national importance. This will undoubtedly contribute to the opening of new restaurants, which on the other hand, will enable the local municipalities to draw even greater economic benefits.

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ЗАШТИТА И ПРЕЗЕНТАЦИЈА НА ЛОКАЛИТЕТОТ "PILLOW LAVA" КАЈ НАСЕЛБАТА МИРАВЦИ

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ИЗВОД

Појавите на геонаследството со цел да бидат повеќе посетени потребно е да бидат уредени, но сепак да се обрне внимание да не биде нарушен нивниот природен амбиент. Покрај уредувањето и грижата за појавите на геонаследството за посетителот да добие комплетна слика за нив, мора да има одредена презентација која ќе придонесе за поголема популаризација на објектите.

Локалитет "Pillow lava" има големо геолошко и геоморфолошко значење. Тој привлекува со интересните геолошки појави како што се т.н. формација на спилитизирани пилоубазалти (магматити-спилити), геоморфолошките појави т.н. мали кањон сатески долини, слапови, водопади и

џиновски лонци. Согласно теренските опсервации препорачливо е овој локалитет што поскоро да биде заштитен по методот на in-situ. Појавата на "pillow lava" долж автопатот Е-75 на делницата Демир Капија- село Удово и локалитетот кај населбата Миравци заслужуваат да бидат заштитени во категоријата споменик на природата како што се веќе предложени во 2004 година во Просторен план на Република Македонија (2002-2020). Согласно законот за заштита на природата (2004) од локалитетот ќе се елиминира изградба на инфраструктурни објекти, поставување на површински енергетски водови, нарушување на поважните видици со непотребни градби, огради, антени, загадување на водата, менување на водниот режим и др. На самиот локалитет изграден е угостителски објект кој делумно ја има променето амбиенталноста. За да се спречи понатамошното уништување на локалитетот, просторот може да се даде под концесија, со цел да се заштитат раритетните појави. Атрактивностите што ги нуди овој локалитет може да се видат на самото место и делумно се уредени за посетителите. На просторот околу првиот џиновски лонец има направено угостителски објект кој работи само во летниот период. На локалитетот може да се развие рекреативниот туризам, велосипедски туризам, риболов, авантуристички туризам (скокање од карпи) и планинарење, но мошне е погоден за стручно-едукативни посети на повеќе нивоа во образовниот и истражувачкиот процес. Оваа раритетна природна појава е доста интересна за научниците, но сепак сеуште не е доволно истражена и проучена. За овој предел малку се знае и во електронските и пишаните медиуми. Дел од магматските карпи-спилити кои имаат куглеста форма можат да бидат изложени во Природно-научниот Музеј на Република Македонија во Скопје сé со цел за подобро запознавање за нивниот постанок и вулканската активност што се одвивала на територијата на Република Македонија.

Заради тоа потребно е детално да биде истражен. За таа цел треба да се изготви целосна научна студија и да се превземе иницијатива локалитетот повторно да се предложи да биде заштитен со закон, во категоријата споменик на природата. Поволната географска положба на локалитетот со близината на граничниот премин со Република Грција, Дојранското Езеро и автопатот Е-75 како и со соодветна презентација и заштита за неговите раритетни карактеристики може да привлече повеќе домашни и странски туристи. Доколку овој локалитет соодветно се презентира и промовира може да стане туристичка атракција од национално значење. Сето тоа ќе придонесе за отварање на повеќе угостителски објекти со кои на општините што се наоѓаат во непосредна близина на локалитетот ќе им се овозможи да имаат поголем економски бенефит.