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# GEOMORPHOLOGICAL HERITAGE AND GEOCONSERVATON IN THE REPUBLIC OF MACEDONIA

**Abstract:** Regardless of its relatively small area (25,713 km²), Republic of Macedonia has a rich and diverse geomorphological heritage. The reason is primarily due to the turbulent geotectonic activity and dynamics of this part of the Balkan Peninsula, in the zone of collision of the African and European (Eurasian) continental plates and their sub-segments. Also, a high impact on the geodiversity was imposed by the significant climate changes of the past. Therefore, almost all genetic types of relief are present, with the exception of the typical aeolian forms. In terms of geodiversity, from the 38 mountains in the country, 12 are higher than 2,000 m and characterized with fossil glacial and periglacial landscape. There are several mountains with typical karst landscape, while some have unique weathering landforms. There are about 30 volcanic cones and few calderas, a number of deep valleys and canyons, etc. However, regardless of the abundant geodiversity, their protection and promotion (as geo-values) was not sufficiently addressed. Generally, more attention has been paid to biodiversity, assuming that threats to the geodiversity are not as dramatic and irreversible as to the biosphere. However, this course is drastically changed in the latest years, especially with the preparation and adoption of the National Strategy for Nature Protection, where geodiversity and geoheritage have very significant place. Within the Strategy, 79 new geomorphological sites are proposed for protection, reaching almost 180 protected geosites up to the year of 2027. Thus, the results from this paper represent an important step in completing the European geoheritage database by including the data from the Republic of Macedonia.

**Key words**: geodiversity, geoheritage, geoconservation, geoparks, Macedonia

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## Introduction

Geodiversity can be defined simply as the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (landform, 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 (Đurović & Mijović, 2006). For Brocx & Semeniuk (2007), the term geoheritage is used to refer to global, national, state-wide, and regional to local features of geology at all scales, that are intrinsically important sites, or culturally important sites, offering 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. But for Simić et al. (2010), besides geological importance, geoheritage must certainly contain geomorphological, pedological and special archaeological values, climate and hydrological values which have already been the subject of the study and research. As a part of geoheritage, geomorphological heritage has its specific characteristics: the aesthetic dimension, the dynamic dimension and the imbrication of scales. The specificities of geomorphological heritage induce particular methods of study and practices, adapted from classical geomorphology and borrowing from other related disciplines, essentially geography (Coratza & Giusti, 2005; Pereira & Pereira 2010; Brilha, 2016; Coratza & Hoblea, 2018). Similar distinction from geosite (geological site) is made by Panizza (2001), who develops a concept of geomorphosite, restricting its scope to those localities constituted by geomorphological landforms that are part of the geomorphological heritage.

The objects of geomorphological heritage that are distinguished by their representativeness, authenticity, typology and diversity have certain values such as esthetic; economic; functional; research; and education values. By applying their values, they can have a scientific, educational and recreational purpose. However, under the influence of various natural and anthropogenic processes, the occurrences of geomorphological heritage can be subjected to landscape degradation and even to complete destruction (Kolčakovski & Bogdanova, 2000). Therefore, it is of high importance to undertake certain measures for their protection, as well as their preservation. That is possible with geoconservation which covers a series of actions intended to preserve the geoheritage of a certain place (Brocx & Semeniuk 2007). Concern for geomorphological heritage has increased across the world over the last two decades. The increasing interest is supported by the growth in the volume of literature on this topic during this time (Gutiérrez & Martínez, 2012). There is still work to do, however, to achieve the integration of geoheritage as a fundamental parameter in environmental conservation and management.

Although of relatively small area, the Republic of Macedonia has rich geodiversity and numerous geomorphological sites. Because of that, first organized activities of their protection started as early as in 1960s. Currently the network of protected natural sites in the Republic of Macedonia includes 86 localities (covering 8.9% of the national territory), from which about 26 are the sites with geomorphological values. However, the number and area of protected geoheritage sites is very low compared to their abundance and their management usually is inappropriate. For that reason, the preparation of a new National Strategy for Nature Protection was started in 2016, with main focus on geodiversity and geoheritage. The Strategy (with detailed study as a supplemental part) was finished in

2017 and adopted by the Parliament this year (2018). The results in this paper, thus represent an important step in completing the European geo-heritage database by including data from Republic of Macedonia. In addition, they are important for the spatial development, proper planning for the purpose of the protection of the environment, as well as for the development of frameworks for realization of sustainable development.

## Materials and methods

As a basis for the identification of the geomorphological heritage, in addition to the already protected, or proposed to be protected geomorphological sites, as listed in the Spatial Plan of the Republic of Macedonia (JPPUP, 2004), we analyzed the previously published papers on the geomorphological characteristics of Macedonia (e.g. Kolčakovski, 2006; Milevski, 2015; and references therein). Also, our informations from almost 20-years of field research were used in identification of new valuable geomorphological sites. Considering the theoretical character of this study, general scientific methods were applied, principally analytical, comparative and synthetic methods (Simić et al., 2014). The evaluation criteria for the newly identified and proposed for protection geomorphosites, was established through the analyses of their essential geomorphological features, namely their genetic and morphological representativeness, size, national and regional rareness as well as their state of preservation.

## Results and discussion

### *Geomorphological heritage in the Republic of Macedonia*

The Republic of Macedonia is distinguished by its rich and diverse geomorphological heritage as part of the overall geo- and natural heritage. The reason for this is the dramatic geotectonic activity and dynamics in this part of the Balkan Peninsula, which is in the zone of collision between the African and European (Eurasian) continental plates and their sub-segments (Burchfiel et al., 2004). Additionally, significant climate change during the Quaternary, has had an impact on that diversity. Therefore, almost all genetic types of relief are present, with the exception of typical aeolian landforms (Kolčakovski, 2006; Milevski, 2015). In terms of geodiversity, the 38 mountains and mountain ranges which cover two-thirds of the total country area, are very unique. The rest are plains in the valley bottoms, large valleys, and the hilly landscape in some depressions. Given the differences in geospatial position, geotectonic structure and dominant geomorphological processes, the mountains are the "basis" of geodiversity in the Republic of Macedonia (Milevski, 2017). Also, in general each mountain has its own geomorphological values and distinctiveness. In some mountains it is the karst landscape, in the others (high ones) fossil glacial landscape and periglacial processes, on some a remarkable fluvial-denudation landscape, and there are also those that have combination of more geo-values.

From the 38 mountains and mountain massifs in the country, 12 are higher than 2,000 m, with 5 even higher than 2,500 m: Korab (2,753 m), Šar Planina (2,747 m), Baba (2,601 m), Mokra or Jakupica (2,539 m) and Nidže (2,520 m). Considering that during

the latest Pleistocene glaciation snow line was at about 2000 m, the high-mountain areas are characterized by well-preserved glacial landscape (Kolčakovski, 2006). This is especially remarkable on Šar Planina, Korab, Mokra (Jakupica), Jablanica and Baba Mountain (Pelister), and to some extent on the mountains of Bistra (2,163 m), Stogovo (2,268 m), Galičica (2,288 m) and Kožuf (2,166 m). The (fossil) glacial geo-complex is represented by cirques, troughs, moraines, sharp cliffs and peaks, traces of the movement of the glaciers, glacial shoulders etc. (Fig.1).


*Fig. 1. Glacial complexes on some of the high (above 2,000 m) mountains in the Republic of Macedonia with cirques on: A. Korab; B. Stogovo; C. Galičica; D. Cirques and glacial lake on Jablanica; and E. Cirques and troughs on Šara Mountain.*

The glacial geo-complex is followed by the periglacial (subglacial), which descends slightly lower to the heights of 1,800-1,700 m. It has been registered on all high (>2,000 m) mountains, even on those where there are no clearly expressed glacial forms: Nidže (2,520 m), Dobrova Voda (2,061 m), Osogovo Mountain (2,252 m), and represented by nivation cirques, rock glaciers, solifluction terraces and tongues, sliding blocks, etc. On the Baba Mountain (Pelister), there are characteristic periglacial landforms, blockfields, formed by weathering, solifluction, frost heaving, and sorting, and washing of granitic rocks (Stojadinović, 1962). There are such less significant phenomena on Jablanitsa, Osogovo and other mountains. In general, larger periglacial landforms are fossil, and smaller ones have contemporary activity, especially during long and cold winters. The preserved glacial and periglacial forms and complexes are especially important geomorphological heritage, not only for their attractive morphology, but also as a testimony to the paleo-geographic (and especially paleoclimate) changes in this regions in the last millennia. In this regard, they are interesting for research and for geotourism even on international level. Thus, the glacial and periglacial complexes on 4 high mountains (Korab, Bistra, Galičica and Pelister) are protected in the existing national parks, while on the 7 others mountains (Šar Planina, Stogovo, Jablanica, Mokra and Kožuf; and on Nidže, Osogovo Mountain and Dobrova Voda only periglacial), they are recently proposed for protection as a national geoheritage.

Due to the carbonate rocks in their lithology, the glacial-periglacial forms on some of the mountains are combined with the karst processes, creating a characteristic glacokarst complex. Such is the case with Bistra Mountain and Mokra (Jakupica and Karadžica), where cirques interchange with small karst polje's and dolines.

Bellow the fossil glacial and periglacial relief on the high mountains, as well as on the lower mountains below 2,000 m, depending on geotectonic and other factors, there are different geomorphological phenomena, landscapes and complexes. Karst rocks (mostly marble and limestone) cover 12% of the country (Temovski, 2012), hosting numerous surface and underground karst forms, most expressed on some mountains such as: Bistra, Galičica, the western part of Mokra (Jakupica) Massif, Suva Gora (1,857 m), Žeden (1,264 m), Baba Sač-Luben (1,764 m), Bukovik (1,528 m) etc. Here, the typical surface karst forms can be found, such as karst poljes, uvalas and dolines, with more than 400 explored caves, some of them having national and even wider significance.

Especially important are the karst terrains of the Mokra (Jakupica) Massif, hosting the largest cave systems, as well as a number of ice caves (Temovski, 2018), with Slovačka Jama (-650 m) as the deepest explored cave, and Matka Vrelo (Koritište) the deepest underwater cave (-230 m). The longest explored cave is Slatinski Izvor (3,942), located in the neighboring Poreče Basin. The karst system of Galičica Mt. is mostly characterized by the underground water flow from Prespa Lake to the Ohrid Lake. In addition, unique occurrences of hypogene karst have been registered (Temovski, 2017), where caves formed by hydrothermal and sulfuric acid speleogenesis (e.g. Provalata Cave) found in in Mariovo (Temovski, 2016). Because of that, 15 caves are recognized for first time as a national geoheritage and proposed for protection, reaching the total number of 70 geo-valuable caves in Macedonia.

From the other side, these karst terrains are drained by large karst springs, some of which are used for water supply of the cities and rural settlements in the Republic of Macedonia (Rašče, Rosoki, Kazan, etc.). Because of all this, these mountains, more

precisely their karstic parts, are very important (and mostly protected) for the overall natural heritage of the Republic of Macedonia.

In the geological structure of several mountains, gneisses, granites, granodiorites, andesite, ignimbrites and other rocks which are prone to denudation are dominant. Therefore, a denudation relief is present on them, which in many places is unusually expressed. Particularly remarkable occurrences of denudation landscape (boulders, stone walls, small denudation forms, chaos from blocks, etc.) are found on the Selečka Mountain (1,471 m), the Babuna range with Zlatovrv (1,422 m), the eastern branches of the Mokra Massif, the southern slopes of Ogražden (1,745 m), the southern slopes of Kozjak (1,355 m) to Stracin, mountain Mangovica (Milevski & Miloševski, 2008) and others. The denudation landscape of these mountains, in particular the Selečka Mountains and Zlatovrv, (Markovi Kuli site) constitutes a large complex with numerous and extremely diverse forms (Fig. 2) for which it has been considered as internationally unique (Kolčakovski & Milevski, 2012). These and other areas with a typical denudation relief are very important for the geomorphological heritage of the Republic of Macedonia and as such 12 new sites are recognized and should be fully protected, properly managed and promoted.

*Fig. 2. Protected geomorphological sites – natural monuments. left: denudation landscape at Markovi Kuli near Prilep (placed on the UNESCO World Heritage Tentative List); right: the earth pyramids at Kuklica near Kratovo.*

Most mountains in the central and eastern part of the Republic of Macedonia, are dominated by fluvial-denudation relief due to their lithology, steep slopes, weak vegetation cover, and especially high human impact. On these mountains, especially at their foothills, accelerated erosion created exceptional landscapes, such as on the western slopes of Plačkovica (1,754 m) and Vlaina (1,932 m) mountains, the southern slopes of the mountain range Bilino (1,703 m) with German and Kozjak, the southern slopes of Ogražden, Osogovo Mountains, etc. There are typical occurrences of badlands, earth pyramids, landslides, colluvial fans, with some of them, in terms of their dimensions and morphology, being important in national frames. Such are the earth pyramids in Kuklica (Fig. 2; Milevski, 2000), then Kukulje (on the small mountain Bejaz Tepe; 1,348), the badlands near Pehčevo and Crnik at the foot of Vlaina (Milevski, 2011; Kolčakovski,

2011), the large fans and landslides in the valley of Kamenička River (Osogovo Mountains) and the valley of the Radanjska River (Plačkovica Mt.).

On few mountains, palaeovolcanic landscape is more or less preserved as a remnant of the Tertiary (rarely Pleistocene) volcanism. Largest and morphologically best expressed is the Kratovo-Zletovo palaeovolcanic area in the northeast part of the country. From about 20 volcanic cones in this area, Plavica (1,297 m) and especially Lesnovo (1,167 m) with its top calderas are particularly well preserved and represent important national geoheritage. In their vicinity, there are numerous sites with "volcanic bombs" some of which are very large. On the western edge of Kratovo-Zletovo volcanic area near Kumanovo, a unique phenomenon of an eroded basaltic plateau persist, fragmented by erosion into 8 hills of volcanic cone shape. Another palaeovolcanic landscape is south of Kavadarci stretching to the Kožuf Mountain on the border with Greece. It consists of several Pliocene volcanic cones and the extensive volcanoclastic plateau of Vitačevo.

Apart from the mountains, the Republic of Macedonia has numerous forms and landscapes developed by fluvial erosion: deep valleys, gorges (in some places with canyon character), waterfalls, steps, river islands, etc. The gorge, as a larger shape of the fluvial relief, have a special geomorphological meaning. There are particularly deep and striking gorges in places where the rivers cut across deep layers of solid rocks (marble, limestone, quartzite etc.). Such are the gorge of Radika River with its canyon parts (Barič), the Great (Šiševska) Gorge of Treska (with the canyon Matka), the gorges of Vardar River (especially Demir Kapija, Taorska and Dervenska), Bregalnica River (Razlovska, Istibanjska), Pčinja River (Bislimska) etc. Along the river courses where there is an abrupt change of lithology with different erosional resistance, or on faults, waterfalls and steps are usually formed. Most waterfalls are of low height (3-10 m) or low water flow (<1 $m^3/s$). However, there are larger waterfalls such as on Belasica Mt. (Kolešinski, Smolarski, Gabrovski), on the Korab Massif (Projfelski, Dufski), Bistra Mt. (Tresonečki-Biljana step) and others. Significant number of gorges and waterfalls are already protected or proposed for protection, while during the work on the new Strategy, another 10 gorges and canyons and 6 waterfalls were recognized as significant for the national or regional geoheritage.

Due to the torrential regime of most rivers, their valleys are highly eroded, and there is an excessive accumulation of sediments in the downstream parts. With such deposition, small but unique river islands (Milevski, 2013) and meanders of Vardar River are created as well as the cut-off meanders of Vardar and Bregalnica, the large fan belts in the valleys of the Radanjska and Kamenička River (Milevski, 2009) interesting for research, and from educational and geotouristic aspect.

The former (Pliocene) and existing tectonic natural lakes, created numerous forms and occurrences of coastal landforms. Of the fossil ones, the large coastal terraces that are still well preserved in some depressions (e.g. Skopje, Berovo, Tikveš etc.) are especially noteworthy. Contemporary coastal processes and landforms are connected mainly with the two largest natural lakes, Ohrid and Prespa Lake, in form of: cliffs, sandy beaches, peninsulas, gulfs, and one typical island (Golem Grad in Prespa Lake). Certain coastal microforms occur even on older and larger artificial lakes, such as the Tikveš, Mavrovo, Kalimanci and others (Kolčakovski & Milevski, 2012), and especially interesting are the few small islands in them (Gradište, Kalata, etc.).

In the last centuries, the anthropogenic factor has a major direct and indirect impact on the landscape in the Republic of Macedonia. Through landscape degradation and alteration of natural vegetation, and especially by deforestation, the favorable, inclined and already uncovered terrains become exposed to excessive erosion. It causes a strong modification of the previous natural landscape, in certain places to the degree of destruction, with the formation of a whole system of rills, gullies, erosive pavements, landslides, badlands, earth pyramids, fans etc. In addition to the destructive impact on the environment, by excessive erosion are created some unique forms, which are significant as a geoheritage (Dragićević & Milevski, 2010).

Thus, with detailed recent valorization and inventarization of the geoheritage (for the aim of the Strategy), 79 new geomorphosites are identified and proposed for protection, from which: 5 structural complexes, 7 paleovolcanic sites, 10 gorges and canyons, 6 waterfalls, 3 river islands, 15 caves, 8 karst areas, 12 denudation sites, 5 glacial and 8 periglacial areas. Together with the already protected and the geosites proposed for protection by the Spatial Plan of the Republic of Macedonia (JPPUP, 2004), the total number of geoheritage sites (mostly geomorphological ones) reaches 180, which is a dramatic increase.

***Threats to the geomorphological heritage***

In addition to their importance, geomorphological heritage in the Republic of Macedonia is exposed to numerous threats, and part of has been already destroyed or degraded (Kolčakovski & Milevski, 2012). The main threats to the geomorphological heritage clearly are identified in the National Strategy (2018), including: constructions and mineral extractions, mechanical chemical and biological pollution, hazards impact, direct and indirect threats from climate change, threats from tourism etc. Among the threats, more prominent in particular, are:

- Construction and exploitative threats which cover: opening of new or extension of existing surface quarries; construction of buildings, factories, power plants, roads, channels and other objects in areas with significant geo-values; interventions in significant geosites or their immediate surroundings (caves, canyons, denudation forms, etc.); partial or complete flooding of significant geomorphological objects and areas by building artificial reservoirs etc.;
- Threats from direct mechanical, chemical and biological pollution like: installation of landfills and catchment areas close to or in significant geomorphologic objects; discharge and disposal of waste in or near geo-sites; discharge of wastewater and polluted substances in karst terrains etc.;
- Threats from geohazards (directly or indirectly caused by human behavior), such as: accelerated erosion, which much faster than usual destroys the geosites; activation of landslides and rockfalls, which can disrupt existing geoheritage; floods, forest fires etc. (Fig. 3);
- Threats arising directly or indirectly from climate change, such as: increased erosion, destruction of fossil glacial and periglacial forms, changes in the karst processes, etc.;

- Threats from tourism, such as: construction of touristic facilities and complexes in areas with significant geomorphological values (ski centers, accommodation facilities, cable cars, fish farms, caves); inadequate or excessive visit of geomorphologically significant objects (due to the limited capacity of a cave, an island, a denudation form, etc.); inadequate tourist arrangement on significant geomorphological objects and localities (inadequate paths, info boards, fences, sightings, road signs, etc.); performing tourist activities in geo-sensitive areas (on floodplains, river terraces, landslides, erosive terrains, moraines, etc.).


*Fig. 3. Threats to geodiversity through: A. intensified erosion along a newly formed coastal zone (Glažnja reservoir); B. Immersion of cliff and canyon parts with karst relief (accumulation Kozjak); C. Activation of landslide near the village of Stracin; D. Activation of rockfalls near the village of Kalimanci; E. Formation of a large tailing site in the valley of Kamenička River.*

### *Protection of the geomorphological heritage in the Republic of Macedonia*

The previous analysis shows that the territory of the Republic of Macedonia has numerous, significant and unique geomorphologic sites, phenomena and objects. However, regardless of that richness, not enough attention was put to their protection and promotion (such as geo-values) in the past. Main attention was set on biological

diversity, which may be justified given the dramatically increased threats to it and irreversible damage to the biosphere. Therefore, with the existing strategies for the protection of certain elements of nature, the protection of the geodiversity, i.e. the non-living nature of the Republic of Macedonia, was not covered, with those elements mentioned only in the framework of other documents and action plans, mostly through preservation of the landscape and protection of the landscape habitats. In the last decades, one of the top priorities of the EU countries, parallel with biodiversity, is geo-conservation and promotion of geoheritage, as well as sustainable use of geo-values.

First organized activities of geoheritage protection in Macedonia started in 1960-ties. Until the 2008, the geoheritage was protected in the framework of the natural heritage sites, and the Institute for Protection of Natural Rarities was the institution responsible for these activities. During this period, about 50 geomorphological sites have been identified and 22 have been legally protected. After 2008, these tasks are transferred to the Ministry of Environment and Space Planning following with legal protection on 4 new localities. Currently the network of protected sites in the Republic of Macedonia includes 86 areas covering around 8.9% of the national territory, from which 26 are the sites with geomorphological values. Presently, most of the geomorphological heritage is protected within the 3 natural parks (Mavrovo, Pelister and Galičica), 16 geomorphological natural monuments and 7 other protected areas (Fig. 4).

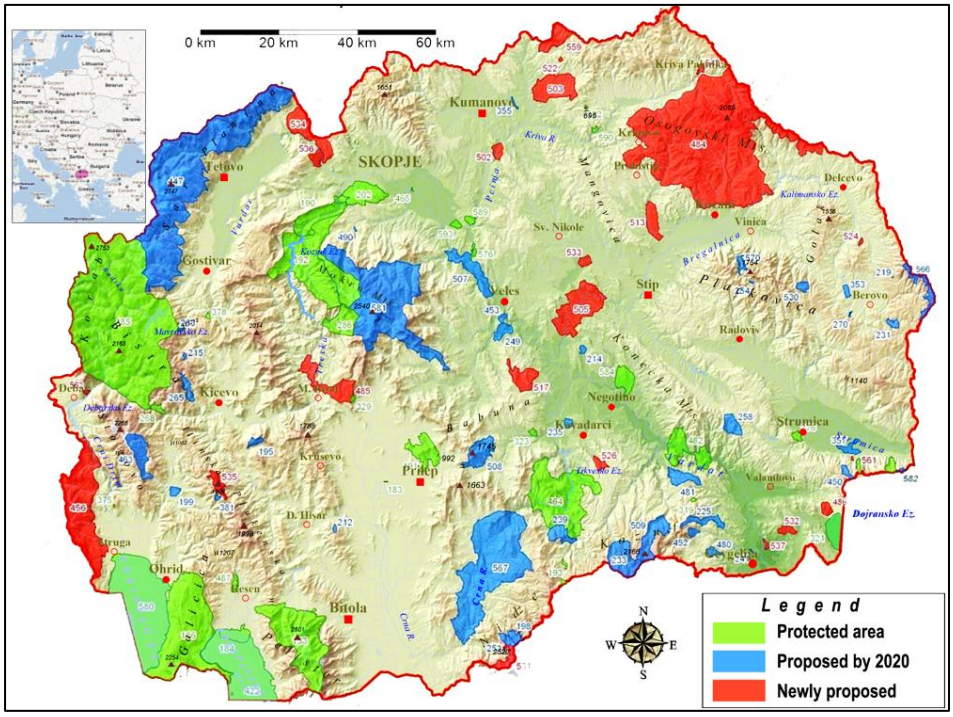


*Fig. 4. Map of protected areas and areas proposed for protection by spatial plan-2004-2020 and by the Study for geodiversity, geoheritage and other components of nature (with geomorphological sites). Adapted from Brajanoska et al., 2013.*

Key problems for the protection and preservation of the geomorphological and the overall geoheritage in the Republic of Macedonia are insufficient knowledge of their values, importance and their "non-renewal nature" i.e. permanent loss. To prevent, reduce or remediate the aforementioned threats and effects, number of activities and measures are proposed in the Strategy through strategic goals and action plans. The main goal in terms of geodiversity is to widely understand the significance and the need of better protection and management of the national geomorphological heritage as a part of the overall natural heritage identify. Furthermore, the number of measures and recommendations are suggested against the threats on geomorphological heritage, in function of better protection. National goals in geoconservation are defined including: A. protection, conservation and monitoring of the geodiversity; B. research, identification and inventorization of the geodiversity (and the geomorphological heritage); C. incorporating of the policy of geoconservation in the strategic documents of other sectors and institutions; D. establishing and practicing of sustainable use of geodiversity and geoheritage; E. Improvement of legislation according to the EU directives and practices; F. increasing of the public awareness about the uniqueness and significance of geodiversity; G. increasing the budget funding for geoconservation and management of geoheritage. Special attention is given to further research and protection of karst landscape because of its vulnerability to direct and indirect human impact and already high degradation. Also, very important goal considering geomorphological heritage is the identification and proposals of geoparks as a novel and successful form of sustainable tourism in valuable geosites (Joyce, 2010). In order to effectively protect and preserve geoheritage, it is necessary to supplement the legal regulations and to strengthen the institutions and units for the protection of geodiversity. It is also necessary to intensify scientific research, to strengthen through the media the awareness of the public in terms of the value and significance of the geoheritage in the Republic of Macedonia and to ensure long-term support of the public and the institutions in its protection. In this regard, it is necessary to monitor the processes and activities that endanger the geodiversity and to ensure the implementation of mechanisms for preservation and protection of the geomorphological heritage. Detailed mapping of the geomorphological heritage will be one of the key tasks with the goal of preparing of the suitable inventory as indicated by (Coratza & Regolini-Bissig, 2009).

## Conclusion

The previous analysis shows that the Republic of Macedonia has numerous, very important and unique geomorphological sites and areas. Given the diversity in area, height, position, geotectonic structure and dominant geomorphological processes, the mountains are the "foundation" of geoheritage in the country. High mountains have fossil glacial and periglacial relief, with some having large karst areas, or remarkable fluvial and denudation sites, and some characterized by multiple geo-values. Beside the mountains, most of the valleys, plains, depressions and coastal regions have their own geomorphological uniqueness. At the same time, all of them are more or less exposed to high human impact and degradation which increases the need for better protection of the geomorphological heritage. However, after more than 60 years of sporadic activities, only about 26 geomorphosites were protected, usually as part of the national parks or within biodiversity areas.

For comparison, in the flatland of Holland, there are 119 areas with over 1000 geomorphologic sites on the geoheritage list, and in the UK there are 3,000 geological and geomorphological objects of national and 8,000 objects of regional significance (Belij, 2007). Thus, it is important that the newly prepared and adopted National Strategy of Nature Protection (2017-2027), puts much more attention on geo (morphological) heritage and geoconservation in the Republic of Macedonia in accordance with ProGEO intention (2011). With detailed analysis and valorization of the geodiversity in the "Study of geodiversity, geoheritage and other components of nature (biological and landscape diversity)" which is part of the Strategy, 79 new geomorphosites are proposed for protection, from which 5 structural complexes, 7 paleovolcanic sites, 10 gorges and canyons, 6 waterfalls, 3 river islands, 15 caves, 8 karst areas, 12 denudation sites, 5 glacial areas and 8 periglacial sites. Overal, there is a dramatic increase in the total number of geomorphosites, which together with the protected ones and the geosites proposed for protection in the Spatial Plan of the Republic of Macedonia (JPPUP, 2004), reaches 180. The goal of the new Strategy is not only to establish the traditional protection, but also a sustainable use, management and promotion of the geomorphological heritage, especially through the form of geotourism and with establishment of geoparks. Hopefully, this Strategy will be implemented, at least in larger part, and will represent a good basis for an even better and more complete upgrade in the near future.



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# ГЕОМОРФОЛОШКО НАСЛЕЂЕ И ГЕОКОНЗЕРВАЦИЈА У РЕПУБЛИЦИ МАКЕДОНИЈИ

**Резиме:** Република Македонија има бројне, веома важне и јединствене геоморфолошке локације у односу на своју величину. С обзиром на разноликост појединих области, висину, положај, геотектонске структуре и доминантне геоморфолошке процесе, планине су "основа" геоморфолошког наслеђа у држави. Високе планине поседују фосилни глацијални и периглацијални рељеф, неке имају велике крашке површине или изванредне флувијалне и денудационе локалитете, а има и оних које карактеришу вишеструке гео-вредности. Осим планина, већина долина, равница, депресија и обалских регија имају своје геоморфолошке јединствености. Истовремено, све оне су мање или више изложене великом утицају људи и деградацији, што повећава потребу за бољом заштитом тог геоморфолошког наслеђа. Међутим, након више од 60 година спорадичних активности, само 26 геоморфолошких локалитета је заштићено до данас, обично као део националних паркова или у областима биодиверзитета. Ситуација се значајно променила с новом Националном стратегијом заштите природе (2017-2027), где је кључна пажња посвећена управо геодиверзитету, геоморфолошком наслеђу и геоконзервацији. У оквиру Стратегије предложено је 79 нових геоморфолошких локалитета за заштиту, од којих је 5 структурних комплекса, 7 палеовулканских локација, 10 клисура и кањона, 6 водопада, 3 речна острва, 15 пећина, 8 крашких локалитета, 12 денудационих локалитета, 5 ледничких локалитета и 8 периглацијалних локација. Циљ новог приступа није само подстицање традиционалне заштите, већ и одрживо коришћење, управљање и промоција геоморфолошког наслеђа, посебно кроз геотуризам и у форми геопаркова.