

## INTERNATIONAL PROSPECTS OF THE ASPIRING GEOPARK BELOGRADCHIK ROCKS

**Dimitar Sinnyovsky<sup>1</sup>, Natalia Kalutskova<sup>2</sup>, Nikolai Dronin<sup>2</sup>, Valentina Nikolova<sup>1</sup>**

<sup>1</sup> University of Mining and Geology "St. Ivan Rilski", 1700 Sofia, [sinsky@mgu.bg](mailto:sinsky@mgu.bg)

<sup>2</sup> Moscow State University "M. V. Lomonosov", Moscow, [nat\\_nnk@mail.ru](mailto:nat_nnk@mail.ru)

**ABSTRACT.** Geopark Belogradchik rocks passed through another unsuccessful application for Global Geoparks, although all instructions of the previous UNESCO mission were implemented. According to these recommendations a new concept of the geopark was developed including establishment of a management body, expanding of the geopark area, and scientific description of at least 50 geosites of aesthetic, scientific and cultural value. Since then geopark has come a long way to its present state of Aspiring UNESCO Geopark. First of all geopark area was enlarged to the territory of 1373 sq. km between Bulgarian-Serbian border and Danube including four municipalities Belogradchik, Dimovo, Chuprene and Ruzhintsi. A new management body of the geopark was established - nongovernmental organization Association for Development of North-West (ADNW) registered by three municipalities Belogradchik, Dimovo and Makresh. Over the past four years the geopark area has undergone significant scientific investigations. First of all a solid geodatabase was developed, including geodiversity description, scientific dossiers of 72 geosites, and geological map of the area. The application dossier was applied in November 2014 and the mission of UNESCO was conducted at the end of June and the beginning of July, 2015. On 30 September 2015 the Global Geoparks Network Bureau inform us that at its meeting on 18 September has discussed the evaluation of our application and decided that at this stage Geopark Belogradchik rocks has not yet reached sufficient maturity to be declared a Global Geopark, and asked all stakeholders at Belogradchik to work for at least two more years on establishing a strong Global Geopark. The main reasons for the unsuccessful application could be summarized as follows: increasing requirements of the Global Geoparks Network, missing action plan, refusal of Chuprene and Ruzhintsi municipalities to participate in the ADNW, and refusal of the Ministry of Environment and Water to support preliminary activities prior to the UNESCO mission concerning geopark infrastructure: information panels with interpretation of the geological history for the general public, geotrails, information centres. The new concept of the geopark will be developed on a strong agreement between the participating municipalities, state support of the geopark activities, clear geopark funding, management plan for development of the geopark area, sustainable regional development policy strategy and importance of geotourism and other alternative forms of tourism – ecotourism, rural tourism, cultural tourism. It will be also developed considering the common requirements for conservation, protection and promotion of natural and cultural heritage sites and monuments, in areas hosting significant natural heritage of international importance through the establishment of aspiring UNESCO Global Geoparks in the light of the new International Geoscience and Geoparks Programme (IGGP) of UNESCO.

**Key words:** Aspiring Geopark Belogradchik rocks, UNESCO Global Geoparks

### МЕЖДУНАРОДНИ ИЗМЕРЕНИЯ НА КАНДИДАТСТВАЩИЯ ГЕОПАРК БЕЛОГРАДЧИШКИ СКАЛИ

**Димитър Синьовски<sup>1</sup>, Наталия Калуцкова<sup>2</sup>, Николай Дронин<sup>2</sup>, Валентина Николова<sup>1</sup>**

<sup>1</sup> Минно-геоложки университет "Св. Иван Рилски", 1700 София, [sinsky@mgu.bg](mailto:sinsky@mgu.bg)

<sup>2</sup> Московски държавен университет „М. И. Ломоносов“, Москва, [nat\\_nnk@mail.ru](mailto:nat_nnk@mail.ru)

**РЕЗЮМЕ.** Геопарк Белоградчишки скали премина през още една неуспешна кандидатура за Глобален геопарк, въпреки че бяха изпълнени всички указания на предишната мисия на ЮНЕСКО от 2010 г. Съгласно тези препоръки бе разработена нова концепция за геопарка, включваща създаване на управително тяло, разширяване територията на геопарка и научно описание на поне 50 геотопа с естетическа, научна и културна стойност. Оттогава геопаркът извървя дълъг път, за да достигне сегашното си състояние на кандидатстващ ЮНЕСКО Геопарк. Преди всичко площта бе разширена до 1373 km<sup>2</sup>, разположени между сръбско-българската граница и р. Дунав, включваща четири общини: Белоградчик, Димово, Чупрене и Ружинци. Създаден бе управителен орган на геопарка - неправителствена организация Сдружение за развитие на северозапада (СРСЗ) регистрирана от общините Белоградчик, Димово и Макреш. През последните четири години площта на геопарка претърпя значителни научни изследвания. Преди всичко бе разработена солидна геобаза данни, включваща описание на георазнообразието, научни досиета за 72 геотопа и геоложка карта на района. Апликационното досие бе подадено през ноември 2014 г., а мисията на ЮНЕСКО се проведе в края на юни и началото на юли, 2015 г. На 30 септември 2015 г. Бюрото на глобалните геопаркове ни информира, че на заседанието си на 18 септември 2015 г. е обсъдило нашата молба и е решило, че на този етап геопарк Белоградчишки скали все още не е достигнал достатъчна зрялост, за да бъде обявен за Глобален геопарк и изиска всички заинтересовани страни в Белоградчик да работят най-малко още две години за създаване на силен глобален геопарк. Като основни причини за неуспешната кандидатура, могат да се посочат нарастващите изисквания на Глобалните геопаркове, липсата на план за управление, отказът на общините Чупрене и Ружинци да участват в СРСЗ и отказът на Министерството на околната среда и водите да подкрепи предварителните дейности преди мисията на ЮНЕСКО относно инфраструктурата на геопарка: информационни табла с тълкуване на геоложката история за широката общественост, създаване на геопътеки и информационни центрове. Новата концепция за геопарка ще бъде разработена въз основа на сигурно споразумение между участващите общини, държавна подкрепа за дейностите на геопарка, ясно финансиране, план за управление на площта на геопарка, устойчива регионална политика и стратегия за развитие и разработване на геотуризм и други форми на алтернативен туризъм – екотуризъм, селски туризъм, културен туризъм. Тя също така ще бъде разработена съгласно общите изисквания за консервация, опазване и популяризиране на обектите на природното и културното наследство, в области със значимо природно наследство с международно значение чрез създаване на кандидатстващ Глобален геопарк на ЮНЕСКО в светлината на новата Международна програма на ЮНЕСКО за геонауки и геопаркове.

**Ключови думи:** Кандидатстващ геопарк Белоградчишки скали, Глобални геопаркове на ЮНЕСКО

## Introduction

Geoparks are territories with particular geological heritage and sustainable territorial development strategy. These are areas of interest for scientific research and education but also aim to provide the necessary conditions for development of natural and cultural tourism. The newly proposed concept of Geopark Belogradchik rocks (Sinnyovsky, 2014a) is based on the famous natural monument “Belogradchik rocks” near the town of Belogradchik, situated on the territory of 1373 sq. km between the ridge of the West Balkan and the Danube in NW Bulgaria (figs. 1, 2). The applying area covers southeast part of Vidin district, including four municipalities: Belogradchik, Dimovo, Chuprene and Ruzhinci where the natural beauty of the geological phenomenon Belogradchik rocks is supplemented by geosites of scientific and cultural value.



Fig. 1. Administrative map of Vidin District with the application area (2015): 1 – Geopark area; 2 – State border; 3 – District boundary; 4 – Municipal boundary; 5 – District centre; 6 – Municipal centre

The southwest part of the area has an alpine landscape, while its northeast part is a hilly plain. In this area three morphological zones can be distinguished, whose boundaries are largely predetermined by the existing tectonic units (fig. 2):

- Balkan - medium to high alpine relief with altitude of the highest peaks over 2000 m;
- Fore-Balkan - transient low mountain relief, typical of the northern peripheral parts of the Balkan chain with highest peaks 900-1100 m;
- Danube Plane - hilly plain relief with altitude gradually reduced to 30 m at the Danube.

The Balkan zone is composed mainly of Neoproterozoic and Early Paleozoic metamorphic and igneous rocks. This is the true Balkan part of the area with typical alpine relief: steep

peaks and deep valleys. Midzhur Peak (2168 m) at the Serbian-Bulgarian border is the highest peak of Serbia.

The Fore-Balkan zone is composed of Paleozoic and Mesozoic rocks. It coincides entirely with the large Belogradchik anticline. In its core Paleozoic and Triassic rocks are exposed and the limbs are composed of strong Upper Jurassic – Lower Cretaceous limestones, forming an impressive inverse relief. The Fore-Balkan unit is represented by ridges, plateaus, hills, valleys and gorges. The highest peaks in this unit are located on the protruding limestone ridges building the anticline limbs with NW-SE direction, cut by deep gorges of Stakevska, Chuprene and Lom rivers, originating from the West Balkan.



Fig. 2. Satellite map of the area

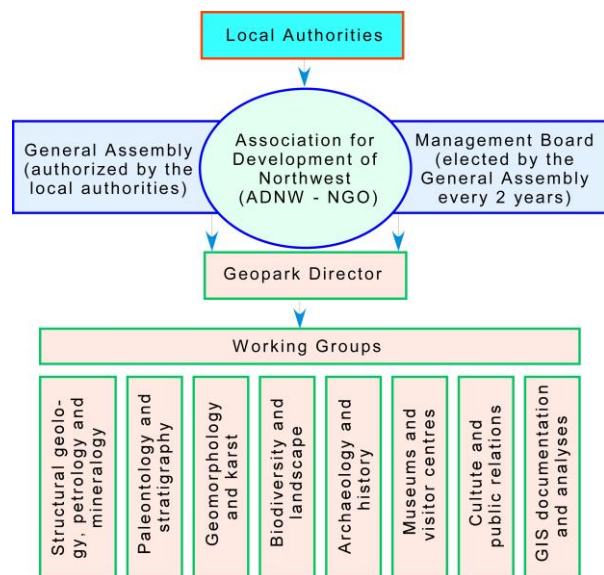


Fig. 3. Organigram of the proposed Geopark (Sinnyovsky, 2014a,d)

The Danube Plane is a part of the Moesian platform. It has a flat and hilly terrain with an average altitude of 130 meters crossed by up to 100 m deep river valleys of Archar, Skomlya and Lom rivers with SW-NE direction. It is composed mainly of Neogene and Quaternary sediments.

According to the previous recommendations of UNESCO mission - 2010 to establish a management body, non-governmental organization Association for Development of North-West (ADNW) was registered to coordinate the geopark activities and to promote the application of the area with adaptive structure designed to geopark management (fig. 3) (Sinnyovsky, 2014d).

## Regional geological setting and geodiversity

Diverse geological structure of each applying area is an important prerequisite for evaluation and development of a geopark. It should comprise a number of internationally important geological heritage sites or a mosaic of geological entities of special scientific importance, rarity or beauty (Guidelines and Criteria for National Geoparks, 2007). A UNESCO Global Geopark must contain geology of international significance which is independently evaluated by scientific professionals in the relevant discipline of Earth Science (Statutes of the IGPP Programme, 2015). The application dossier for membership in the Global Geoparks should include general geological information for the proposed geopark area. Moreover, annex 2 (Section B "Geological setting" of the application dossier) is required as an additional and separate copy for geological desktop evaluators, presented separately from International Union of Geological Sciences (IUGS) of UNESCO.

The proposed geopark area near Belogradchik town includes parts of four major tectonic zones: West Balkan, West Fore-Balkan, Kula zone and Moesian platform (fig. 4).



Fig. 4. Tectonic units and major faults: 1 – Peri-Carpathian thrust; 2 – Fore-Balkan fault; 3 – Vedernik thrust; 4 – Vratsa thrust; 5 – Plakalnitsa thrust

West Balkan zone is represented by Berkovitsa and Vratsa units, separated by Plakalnitsa thrust. The southern boundary of the zone is outside the area. Northwest boundary with Fore Balkan is the Vratsa thrust. West Balkan zone is composed of Neoproterozoic high-grade and Cambrian low-grade metamorphic rocks, covered by Late Paleozoic terrigenous deposits.

The Berkovitsa unit builds the southern part of the West Balkan zone. The oldest rocks of the unit are the rocks of the

ophiolitic Chernivrah metabasic complex (Neoproterozoic) composed of three metamorphic units: Kopilovtsi metagabbro and ultrabasites, Monastir metabasites and Ruptsi pillow lavas (Haydoutov, 1984; Angelov et al., 2006b). The younger Berkovitsa low-grade metamorphic complex (Cambrian) is composed of chlorite-sericite and quartz-sericite schist, diabase, keratophyre, gabbro, marble, meta-sandstones and tuffs (Haydoutov et al., 1979; Angelov et al., 2006a). Stakevtsi massiv (Cambrian) (Ivanov, Haydoutov, 1964) is composed of biotite and amphibole gneiss, granite-gneiss, gneiss-schist, muscovite-chlorite and granate schist, amphibolites, leucocratic granite and granodiorite. The youngest rocks in Berkovitsa unit are Carboniferous and Permian continental terrigenous deposits: conglomerates, sandstones, siltstones, argillites and coal shales of Stakevtsi, Levishte, Milina, Midzhur and Rikovtsi Formations (Tenchov, Yanev, 1963, Yanev, Tenchov, 1972, 1976). The Vratsa unit is a restricted narrow strip between Plakalnitsa and Vratsa thrusts, northeast of Berkovitsa unit. It is composed of low-grade metamorphic rocks of the Berkovitsa low-grade metamorphic complex (Cambrian): chlorite-sericite and quartz-sericite schist, diabase, meta-sandstones and tuffs, covered by terrigenous continental Carboniferous and Permian deposits of Stakevtsi, Levish, Starchovdol and Vran Formations.

West Fore-Balkan zone includes Montana and Belogradchik units separated by the Vedernik thrust. The Montana unit is restricted between Vratsa thrust from SW and Vedernik thrust from NE. Its pre-Mesozoic basis is represented by the Sredogriv metamorphites (Ordovician-Silurian): metamorphosed sandstones, siltstones and conglomerates with olistoliths of basic and acidic igneous rocks. They are covered by Lower Permian terrigenous complex composed of continental conglomerates, breccia-conglomerates, gravelites, sandstones and siltstones with andesite and dacite tuffs, lavas and breccias. Mesozoic sedimentary cover is represented by Lower Triassic sandstones, Jurassic terrigenous-carbonate deposits and thick Middle Jurassic – Lower Cretaceous carbonate complex. The Belogradchik unit occupies the outer zone of the Fore-Balkan. It is composed of more variegated rocks of different ages and types. Pre-Mesozoic basement of the unit is composed of Devonian, Carboniferous and Permian sedimentary, igneous and volcanic rocks. Devonian is represented by two units – Struindol diabase and Shashka siltstone (Angelov et al., 2006a). Carboniferous rocks are of different origin. The igneous rocks are united in Belogradchik Pluton (Upper Carboniferous) composed of granite, plagiogranite, porphyry granite, granodiorite and diorite. The Upper Carboniferous Rayanovtsi Formation is composed of different sedimentary and volcanic rocks: conglomerates, gravelites, sandstones, siltstones, shales, basalt and andesite-basalt lavas and breccias with thin tuff interbeds. Permian is represented by diorite and granodiorite porphyry dikes, plagiogranite and dacite porphyry. Triassic is composed of red Buntsandstein sandstones and conglomerates (Belogradchik and Slivovnik Formations) forming the famous Belogradchik rocks, covered by sandy, biogenic and nodular limestones and dolomites (Kaluger, Edivetar, Babino and Toshkovdol Formations) (Tronkov, 1981; Tronkov, Sinnyovsky, 2014). Jurassic sediments overlying transgressively the Triassic carbonates, are the sandstones and gravelites of the Kichera Formation (Middle Jurassic) (Stefanov, Tzankov, 1970; Tchoumatchenko, 1978). This unit is represented by four

official members with type sections in the area: Venets, Kreshtenitsa, Granitovo and Oreshets, whose rocks were used as building stones for the medieval Belogradchik fortress and the medieval mosque in Belogradchik town. They are covered by sandstones, marls, zoogenic and silty limestones (Bov and Polaten Formations) and thick limestones of the West Balkan Carbonate Group (Middle Jurassic – Lower Cretaceous) including the famous “ammonitico rosso” facies. The youngest rocks of the unit are the clayey limestones and marls of the Salash Formation (Berriasian-Barremian) cropping out in the limbs of the Belogradchik anticline.

Kula zone is composed of Cretaceous and Paleogene sediments. The building lithostratigraphic units are: Rabisha Formation (Albian-Cenomanian) – marls and limestones, Kula Formation (Turonian-Maastrichtian) - turbidites, Kladorub Formation (Campanian-Paleocene) - siltstones and marls, Ruzhintsi Formation (Campanian-Paleocene) – sandstones, conglomerates and breccias (Tzankov, 1972; Sinnyovsky, 2013b, 2015). Single section of the so called “couche-rouge” facies of the Mediterranean type Upper Cretaceous is discovered near Ruzhintsi village: Mirkovo Formation (Coniacian-Santonian) – motley limestones and marls and bituminous shale of the Krasava Member of Zavala Formation (Campanian) (Sinnyovsky, 2013a,b; 2015). The outcrops of these rocks are very restricted, because they are almost entirely covered by Neogene and Quaternary deposits. One of the most important geotopes in this zone is the iridium layer at the K/T boundary in Kladorub Formation near Kladorub village (Sinnyovsky et al., 2002; Sinnyovsky, 2003,2004). Another important geotope is the Lower/Upper Cretaceous boundary in Rabisha Formation at Rabisha Mound, with proved thermal maximum on the basis of nannofossil and palynological evidence (Sinnyovsky, Pavlishina, 2014).

Moesian platform is covered entirely by Neogene and Quaternary deposits. Neogene rocks are represented by several lithostratigraphic units: Opanets Formation (Langhian - Lower Serravalian) – marls and clays with shelly limestones, Dimovo Formation (Upper Wolinian – Lower Bessarabian) – sands and sandstones with clays and limestones, Krivodol Formation (Upper Bessarabian) – clays with sandy conglomerate and limestone interbeds, coal shale and lignite coal, Furen Formation (Upper Bessarabian) – limestones with intercalations of sandstones, sands and clays, Smirrenski Formation (Upper Tortonian - Messinian) – alternation of clays, sands, sandy clays and marls, Archar Formation (Upper Messinian) – quartz sands, Brusartsi Formation (Levantian-Piacenzian) – sandy clays, sands and lignite coal (Kojoumdzieva, Popov, 1988). Quaternary is represented by Eopleistocene, Pleistocene and Holocene deposits. Eopleistocene is composed of fluvial-proluvial deposits, covering the Neogene rocks and cropping out at 90-100 m above the river beds. Pleistocene is represented by aeolian-fluvial, aeolian and aeolian-fluvial-deluvial deposits. Most interesting of these modern deposits are the aeolian clays called “loess”. They are deposited in aeolian way by the wind in periglacial environment in drying condition of the glacial deposits in the flooding planes of the glaciers.

As can be seen from the above-described brief geological situation Geopark Belogradchik rocks has an exceptional geodiversity. By this criterion it has no analogue in the

European Geoparks Network. Here are encountered nearly all varieties of igneous, sedimentary and metamorphic rocks ranging from Proterozoic to Quaternary. During the elaboration of the application dossier for membership in the Global Geoparks Network scientific description of 72 geosites was made: 24 of aesthetic value, 25 of scientific value, 8 geomorphological and karst features, 3 of historical value and 12 non-geological sites (Sinnyovsky, 2014a).

Most of the geosites of aesthetic value are located in the buntsandsten facies on the territory of the natural landmark “Belogradchik Rocks”. The list is complemented by extensive karstified fields with picturesque rock arcs and more than 50 caves. The largest one, the Magura Cave, is of aesthetic, scientific, archeological and cultural value. Besides the geological and archeological significance it is of great importance for the local and national wine industry. This is the only place in Bulgaria where naturally sparkling wine “Magura” is produced, aging in one of the branches of the cave.

The geological sites of scientific value are developed on the basis of the remarkable variety of sedimentary, igneous, volcanic and metamorphic rocks. Some of these sites represent geological events of global significance like, for example, the iridium layer at the Cretaceous/Tertiary boundary. Other sites of continental value are outcrops of well known and widely spread in Europe facies like buntsandstein, ammonitico rosso and couche-rouge. Buntsandstein, the indigenous rock of the Belogradchik rocks, is deposited in the German Basin and is of scientific value for the Triassic history of Europe.

Non-geological sites of continental value are also very important part of the concept. The Paleolithic wall paintings in Magura cave are into the indicative list of UNESCO’s cultural heritage. Among the sites of archeological value there are numerous Latin strongholds and ruins. In the northern part of the area are preserved ancient ruins of the capital city of Coastal Dacia Province - Ulpia Trajana Ratiaria. So far the most valuable for the ancient history of the area is the evidence for the first human settlement in Europe recently found by the French-Bulgarian archaeological expedition in Kozarnika Cave.

The geopark concept was disseminated in many publications at different levels: national scientific conferences (Sinnyovsky, 2012a,b,c, 2013a,b, 2014c, 2015) international conferences (Sinnyovsky, 2011; Kalutskova et al. 2012; Kalutskova, Sinnyovsky, 2015), scientific journals (Sinnyovsky et al., 2011; Tronkov, Sinnyovsky, 2005, 2014; Sinnyovsky, Pavlishina, 2014), websites (Sinnyovsky, 2012d, 2014b,c), international magazines (Tronkov, Sinnyovsky, 2012) and monographs (Sinnyovsky, 2013, 2015).

## The new concept of Geopark Belogradchik rocks

Belogradchik is an emblematic place not only for the Bulgarian geoconservation, but also for the GEOPARK Initiative of UNESCO. GEOPARKS Programme was first widely publicized at the Belogradchik Workshop of ProGEO’1998 Meeting by UNESCO representatives Patzak and Eder (1998). From this point of view the correct management of the geoheritage is among the major

prerequisites for sustainable development of the Belogradchik area. Maintaining and extension of the tourist facilities will increase the interest to the natural and cultural wonders of the area and will attract more visitors. Geopark initiative gives the area unlimited possibilities to popularize its geological heritage and to develop its tourist potential.

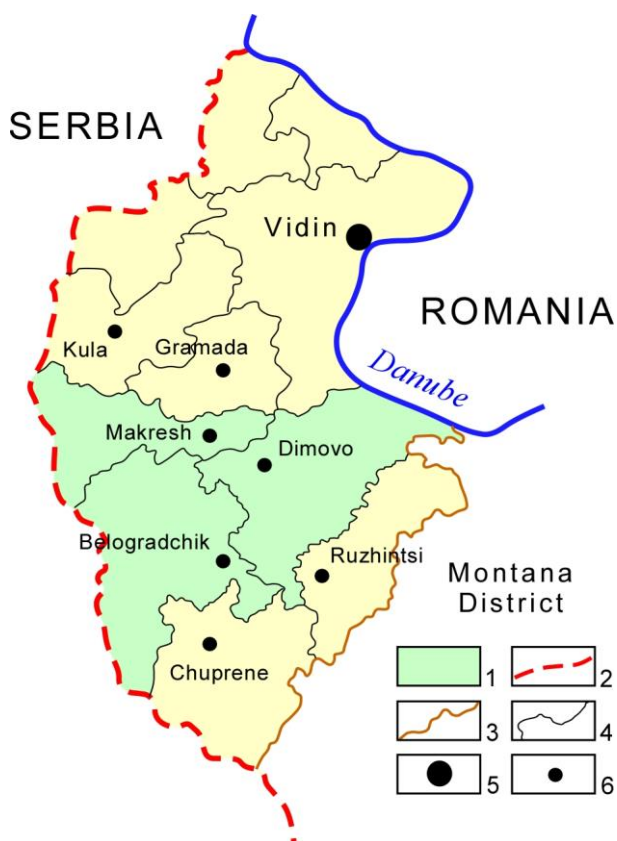


Fig. 5. Administrative map of Vidin District with the new geopark territory (2016): 1 – Geopark area; 2 – State border; 3 – District boundary; 4 – Municipality boundary; 5 – District centre; 6 – Municipality centre

The new geopark territory of 1049 sq. km (fig. 5) fully meets the requirements of the Global Geoparks for well-defined limits and large enough surface area to serve local economic and cultural revival of the area. Thus the new proposed territory, established on the basis of a strong agreement for geopark development and effective management of the area will contribute to the rapid implementation of the UNESCO recommendations and new application for membership in Global Geoparks. Development of more geosites gives opportunity to all settlements of the involved municipalities to take part in regional planning and strategy for regional sustainable socio-economic and cultural development, safeguarding the environment. This is the only chance for the local community to acknowledge and restore its remarkable natural and cultural heritage in a way that will enable the next generation to be proud of it.

From this point of view the refusal of Chuprene and Ruzhintsi municipalities to take place in this regional initiative is rather surprising and inexplicable. This unexpected act put to the test initiative for geopark development in the most underdeveloped region in Bulgaria and Europe. The application for membership in Global Geoparks showed also the sincere disengagement of the central state institutions to this process.

The withdrawal of Chuprene and Ruzhintsi municipalities from ADNW and the refused support from the central institutions compromised the application of the designated area and predestined the failure of the UNESCO mission in 2015. These events disappointed the promoters of the geopark initiative and local stakeholders. However, the Municipality of Belogradchik has an extensive experience (more than century) in management and maintenance of natural and cultural heritage and great potential in the local development. It is involved in the environmental protection by municipality programmes on environment, waste management and air quality. The municipality has an experience in conservation of natural and cultural heritage maintaining natural and historical museums, historical and archeological sites, astronomical observatory and tourist infrastructure (ecotrails, geotrails, velotrails).

This great potential predetermines establishment of new concept for Geopark Belogradchik rocks involving new actors and initiatives. The participation of the municipality in National operational programs and EU co-financed projects (cross-border cooperation Bulgaria-Serbia and Bulgaria-Romania) as project partner and lead partner is a guarantee for the future geopark infrastructure development. The involvement of the third member of the ADNW - Makresh municipality, which contributes with its variegated geological structure and beautiful mountain landscape, can largely replace the remarkable landscape of the Chuprene area.

The new concept of the geopark will be developed on a guaranteed involvement of the participating municipalities in the ADNW, state support of the geopark activities, clear geopark funding, management plan for development of the geopark area, sustainable regional development policy strategy and geotourism development, including other alternative forms of tourism – ecotourism, rural tourism and cultural tourism. Taking into account the significant change of the geopark area the list of the geosites will be supplemented by new non-geological geosites (predominantly of cultural value, for example Rakovitsa Monastery) and geosites of scientific value concerning Neoproterozoic, Early Paleozoic, Tertiary and Quaternary stratigraphic units.

## Conclusions

Development of Geoparks in Bulgaria is in its crucial stage. At the moment GGN Bureau thinks that Geopark Belogradchik rocks has not yet reached sufficient maturity to be declared a Global Geopark and requires all stakeholders at Belogradchik to work for at least two more years on establishing a strong Global Geopark. This requires new geopark concept that will guarantee a successful application in Global Geoparks. The exceptional geodiversity of sedimentary, igneous, volcanic and metamorphic rocks ranging from Precambrian to Quaternary, and the remarkable historical and cultural heritage of continental value are the necessary basis for geopark's development. However, the previous unsuccessful applications showed that geological and cultural prerequisites are not sufficient for membership in Global Geoparks. The new concept of the geopark will be developed on a strong agreement between the participating actors, state support of the geopark activities, clear geopark funding, new action plan,

sustainable regional development policy strategy and geotourism development, according to the common requirements for conservation, protection and promotion of natural and cultural sites and monuments in areas with significant natural heritage of international importance in the light of the new International Geoscience and Geoparks Programme (IGGP) of UNESCO.

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