CONTENTS

Geotourism potential in the Podhale, Orava, Liptov and Spiš regions (Southern Poland/Northern Slovakia)

ANNA CHROBAK
Department of Geology, Institute of Geography, Pedagogical University of Cracow, ul. Podchorążych 2, 30-084 Kraków, Poland
(E-mail: achrobak@up.krakow.pl)

ABSTRACT
Tatra Mountais are the most attractive place in the Polish and Slovak border. It is caused of unique nature, landscapes and history. Tourists who traveling to Tatras are accommodated in the villages and cities around Tatra Mountains in 4 ethnographical regions (Podhale, Orava, Liptov and Spiš). This places also offer a good regional food, culture events or entertainment (e.g. spa & wellness, ski resorts, thermal water fun complexes, etc.). The geodiversity around the Tatra Mountains gives also an opportunity to make various geotourist attractions (geosites) in this region. The article presents a map of over 200 potential locations which can be used as the geosites. All of them have been categorized by the morphological type of the site. There are geological outcrops, riverbeds, lakes, caves, peat bogs, landscapes, landslides, springs, etc. Some of this places are well known in tourism (Chopok Mountain), but some of them are unknown, hidden and not described in tourist guides (Belá Landslide). The geosites are very interesting from the geological, geomorphological or hydrological point of view, but they need to be discovered and prepared for tourism. The geotourism gives this opportunity and the region around Tatra Mountains can gain next tourist attractions: geosites, educational paths or even geoparks.

Key words: geotourism potential, geosites, geotourism categorization, Podhale, Orava, Liptov, Spiš regions

INTRODUCTION

Geotourism deals with inanimate nature, earth sciences: especially geology, geomorphology and landscape, (Hose, 1995, 2000; Słomka, Kicińska-Świderska, 2004; Joyce, 2006; Dowling, Newsome, 2006, 2010). The main purpose of destinations in geotourism are geosites: geological outcrops, quarries, landscapes, riverbeds, peat bogs, springs, etc.

Podhale, Orava, Liptov and Spiš are ethnographical regions located around Tatra Mountains (Fig. 1). It is the best location for geotourism in Poland and Slovakia. There are amazing landscapes, gorges, outcrops, river valleys and many interesting places which can be used in geotourism. In this paper author proposed a map of over 200 geosites located around Tatra Mountains which are assigned to one of the eleven categories.

RESEARCH AREA

The study area is located in following physical-geographical regions: Zakopane Basin, Spisz – Gubałówka Foothills, Kotlina Orawsko – Nowotarska, Pieniny and a part of Beskid Żywiecki and Gorce in Poland (Kondracki, 2010) and Oravske Beskydy, Podbeskydská brázda, Podbeskydská vrchovina, Oravská kotlina, Oravská Magura, Oravská vrchovina, Skorušinské vrchy, Podtatranská brázda, Chočské vrchy, Podtatranská kotlina, Kozie chrbty, Hornádska kotlina, Levočské vrchy, Spišská Magura, Pieniny and a part of Ľubovnianska vrchovina, Volovské vrchy,

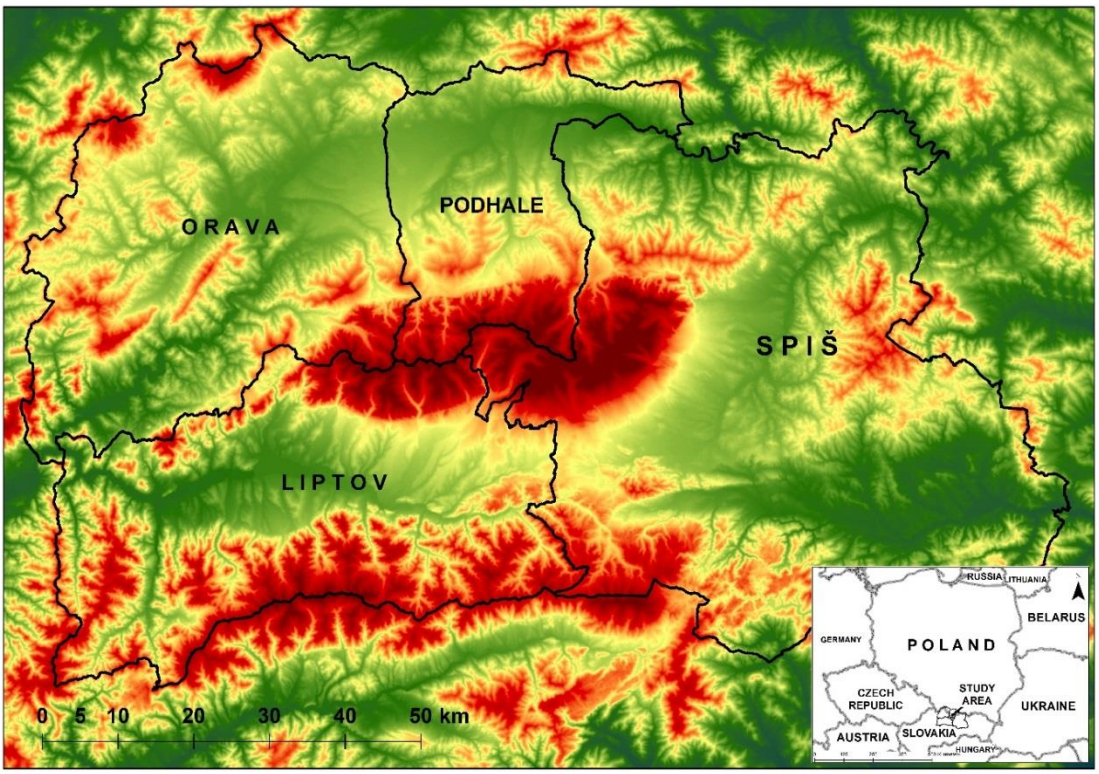


Fig. 1 Research area with ethnographical regions. Source: Administrative map of Poland, available online: www.codgig.gov.pl, administrative map of Slovakia, available online: https://www.geoportal.sk.

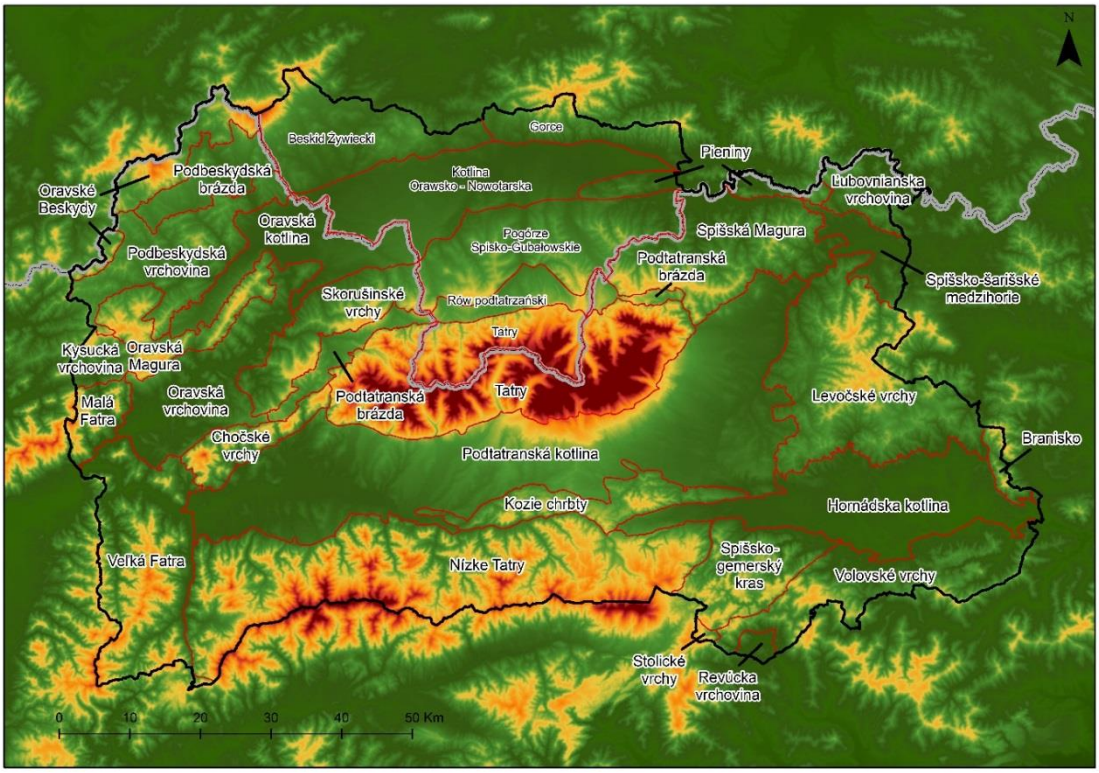


Fig.2 Physical-geographical regions via Kondracki and Mazur & Lukniš, Source: Kondracki J., 2010, Geografia regionalna Polski, PWN, Warszawa; Urbánek J., Beták J., Jakál J., Lacika J., Novotný J., 2009, Regional geomorphological division of Slovakia: old problem in new perspectives, Slovak Geography at the Beginning of the 21st Century, Geographia Slovaca, Geografický ústav SAV, Bratislava, 26, s. 237-259.

Nízke Tatry, Veľká Fatra, Malá Fatra, Kysucká vrchovina, Spišsko-gemerský kras, Revúcka vrchovina, Branisko and Spišsko-šarišské medzihorie in Slovakia (Mazur & Lukniš, 1986) (Fig.2). Geology and relief of this area are very diverse.

From the geological point of view, the Central Carpathian Paleogene (Podtatranská Skupina/Flisz Podhalański) has the largest area. It is built from sandstones and shales of the Borove (warstwy szaflarkie), Huty (warstwy zakopiańskie), Zuberec (warstwy chochołowskie) and Biely Potok (warstwy ostryskie) Formations (Gołąb, 1954, 1959; Gross, et al., 1980, 1984, 1993, 2008; Watycha, 1959; Janocko, et al., 1999, 2000). This geological formations it can be seen in Zakopane Basin, Spisz-Gubałówka Foothills, Oravská Magura, Oravská vrchovina, Skorušinské vrchy, Podtatranská brázda, Podtatranská kotlina, Hornádska kotlina, Levočské vrchy and Spišská Magura.

Orawa-Nowy Targ Basin (Oravská kotlina) is located on the north from the Spisz-Gubałówka Foothills and Oravská Magura. In Paleogene this bending occurred and the lake was formed. In the Pleistocene, the fluvioglacial gravels from Tatra rivers was accumulated in the lake up to 300 m. 10000 years ago, when the climate was warmer than in Pleistocene, the peat bogs have begun to form and they covered almost a half of this area nowadays (Obidowicz, 1988; Łajczak, 2009).

Pieniny Klippen Belt is located on the north from the Central Carpathian Paleogene. There is a range of Jurassic and Cretaceous sedimentary rocks (limestones, dolomites, marles, radiolaries). It is a border between Outher and Inner Carpathians (Birkenmajer, 1958; Nemčok et al., 1990).

Nízke Tatry Mountains and Chočske Vrchy Mountains are built from sedimentary rocks of Križna and Choč Nappes. In the Kozie Chrbty Mountins there are very interesting geological structure. There are magma rocks: basalts, porfires and andesites belong to Choč Nappe (Gross, et al., 1993; Biely, et al. 1997; Vozar, 1977).

The most northern parts of the study area (Gorce, Beskid Żywiecki Mountains, Oravske Beskydy, Podbeskydská brázda, Podbeskydská vrchovina) are built from sandstones of Magura Nappe (Gross, et al. 1993; Watycha, 1977), (Fig. 3).

In Slovakia, close to the faults, there are a lot of travertines, which form a very interesting rock formations (Bizubova, 2008).

In the central part of the research area there are Tatra Mountains, a mountain range originating from the Alpine orogeny. It is built from kristalinicum rocks and sedimentary rock from 3 nappes: Autochton, Križna and Choč (Passendorfer, 1983). The geology and relief of the Tatra Mountains are not the main purpose of the research but there are part of almost every landscape geosite (Fig. 4).

The plenty of geomorphological, egsogenic processes which results it can be seen in the research area, additional raise the geotourism value of the area. There are: deep river valleys (e.g. Prosiecka Dolina Valley (Fig. 5), Jarabinsky Prielom George), interesting river connections (e.g. Orava and Váh or Tichý Potok and Kôprový Potok), limestone rocks (e.g. Skalná päsť Outcrop, Sedem kostolov Outcrop (Fig. 6), Obłazowa Rock), travertine formations (e.g. Vyžne Ružbachy, Bešeňova, Siva Brada), landslides (e.g. Jezersko, Osturňa), caves (e.g. Demänovská Jaskyňa Slobody (Demänovská Cave of Liverty), Dobšinská Ľadová (Dobšinská Ice Cave), Važecká), peat bogs (e.g. Bór na Czerwonem, Slaná Voda) etc.

Also important is the human impact and the geosites can also be made in quarries (e.g. Rogoźnicka Skałka, Kvetnica (Fig. 7), Tvrdošín) old mins and adits. Also interesting for geotourism are old buildings, which were made of rocks: churches (e.g. Chochołów, Spišská Kapitula) or castles (e.g. Spišsky Hrad, (Fig. 8) Czorsztyn).

The diverse geological structure and relief

are the basic criterion to make the geotourism on researched area.

METHODS

In order to crate the geotourist map of Podtatrze Region the author used the following methods:

- Review available databases with geosites in Poland and Slovakia
- Field works, where every geosite was found, marked in GPS, described and photographed
- Consultations with specialists how each geosite was made
- Making a geotourist card for each geosite (Tab. 1)
- Categorization of the geosites using the origin criterion
- Making the geotourist map in ArcMap program

THE MAP

The geotourist map of Podtatrze Region presenting 203 geosites, which are belong to the one of eleven categories:

- Landscapes 40 geosites
- Outcrops 73 gosites
- Quarries 15 geosites
- Peat bogs 6 geosites
- Riverbeds 16 geosites
- Springs 16 geosites
- Waterfalls 5 geosites
- Landslides 6 geosites
- Lakes 8 geosites
- Caves 8 geosites
- Others 10 geosites (Fig. 9)

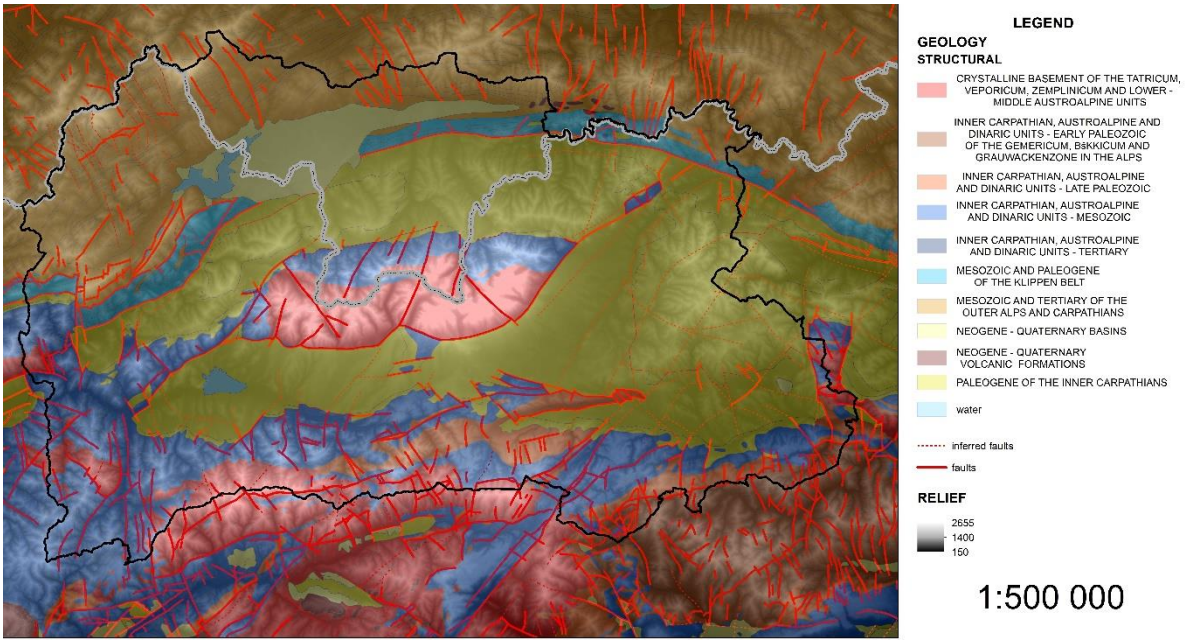


Fig. 3 The geological map of research area. Source: Lexa, J., Bezák, V., Elečko, M., Mello, J., Polák, M., Potfaj, M., Vozár, J. (eds.), Schnabll, G.W., Pálenský, P., Császár, G., Ryłko, W., Mackiv, B. (coeds.), 2000: Geologická mapa Západných Karpát a priľahlých území, 1 : 500 000, MŽP SR a ŠGÚDŠ, Bratislava

Fig. 4 High Tatras from Popradska Kotlina (Poprad Basin). Photo by: A. Chrobak

Fig. 5 Prosiecka Dolina Valley
Photo by: A. Chrobak

Fig. 6 Sedem kostolov Outcrop
Photo by: A. Chrobak

Fig. 7 Kvetnica quarry. Photo by: A.Chrobak

Fig. 8 Spišsky hrad. Photo by: A. Chrobak

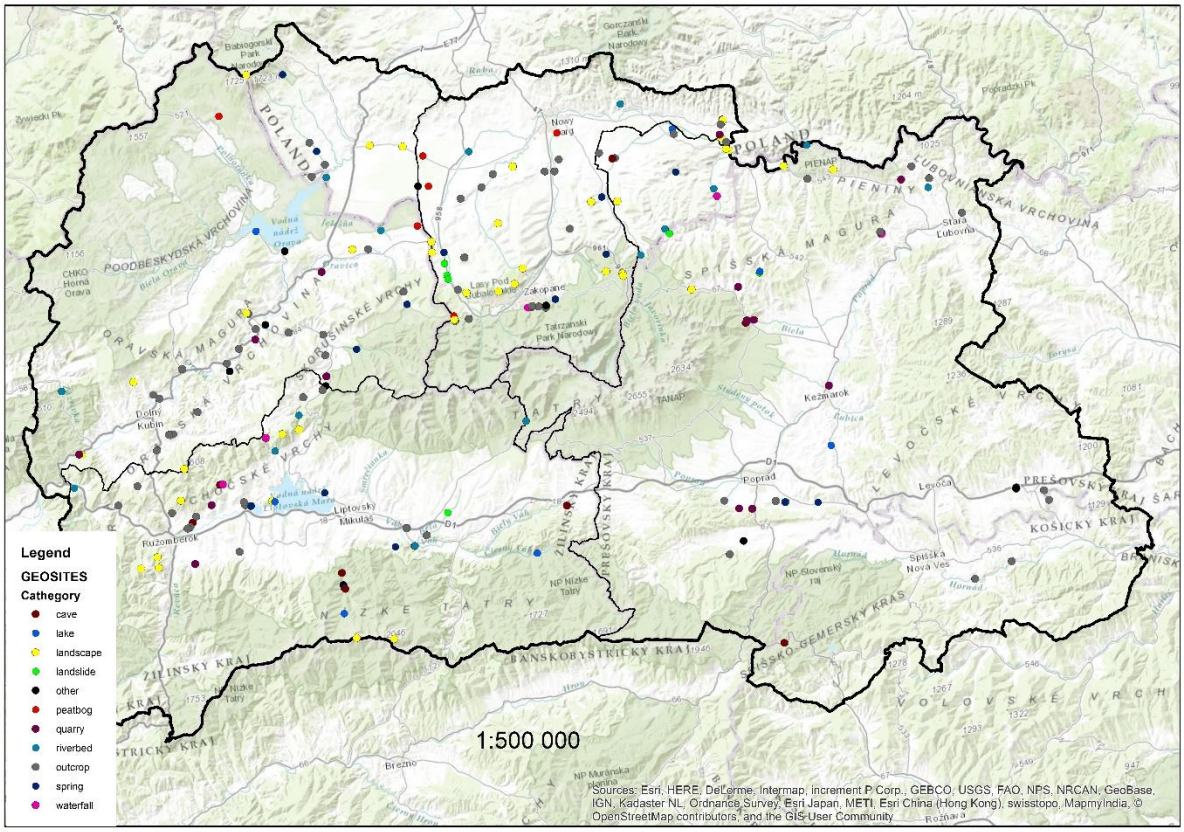


Fig. 9 The geotourist map of Podtatrze Region. Source: own research

Each geosite is precisely described in the information card (tab.1). There are informations about the name, location, belong to mesoregion, categorization, accessible and the physical-geographical description. There is also a location map and the picture of the geosite. The map was made in the ArcMap program and it can be still modified. For the purpose of this contribution only geosites with their categories are presented on the map with topographic background. Author will add more informations about tourist development in the future. From 203 geosites there are 59 in the Spiš Region, 53 in the Podhale Region, 46 in the Orava Region and 45 in the Liptov Region.

Taking to account the categories, the most numerous group, 73 geosites, are outcrops. There are single rocks, natural outcrops, stratotypes, etc. On the second place are landscapes – 40 geosites. These two categories represent more than a half of all geosites. On the third place there are riverbeds (gorges, canyons, river connections) and springs (thermal springs and mineral springs) – 16 geosites. Next there are quarries – 10 geosites, lakes and caves – 8 geosites, peat bogs and landslides – 6 geosites and waterfalls – 5 geosites. 10 geosites belong to group "other". There are old buildings, dams, etc.

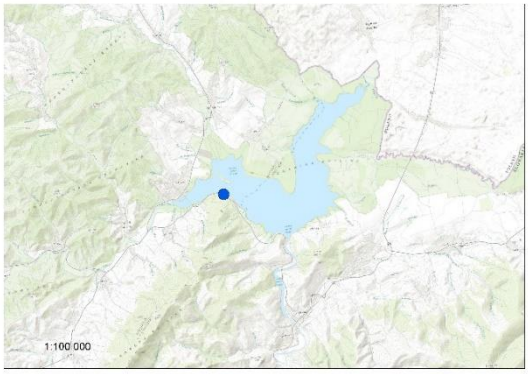
Some of the geosites (57) were described earlier and they are in the geodatabases belongs to: Polish Geological Institute (22 geosites), AGH Cataloge of the geosites (3 geosites), Polish Academy of Sciences (3 geosites), State Geological Institute of Dionýz Štúr (33 geosites).

DISCUSSION

Geotourism potencial in the Podtatrze Region depends of diverse geological structure and interesting relief. Presenting geosites is just the beginning to make there one of the most interesting geotourist places in the Central Europe.

Nowadays, the Podhale, Orava, Spiš and

Tab. 1 The example of information geosite card
GEOSITE CARD NO. 167

Name of the geosite	***ORAVA LAKE***
Longitude & Latitude	19°30'44,52"E 49°24'04,90"N
Location	Slanička Osada, Námestovo, Žilinsky kraj, Slovakia
Mesoregion	Oravská kotlina
Geological region	Neogene sediments of Orava Basin
Property	Slovak Republic
Region	ORAVA
Category	LAKES
	
CHARACTERISTICS Orava Reservoir is the bigggest lake in Slovakia (346 mln m³). It was established in the years 1941 - 1954. It has three mainly functions: retention, energy and recreation. The concrete dam was constructed at the junction to the Black and White Orava. It is long at 291 m and 46 m-high. The bedrock is carted by thick-bedded layers of sandstone with a carbonate binder and a gray shales of Magura Nappe. The sandstones and shales are forming an anticline where the dam was built. The anticline is interrupted by a few faults and the largest fault is in its nucleus. Flysch bedrock with sandstones domination has a very good load-bearing capacity, but also permeability, due to the high porosity of sandstone. Five villages: Usti nad Oravou, Slanica, Osada, Orava Hamre, Lawkov and lower parts of cities and Namestovo Bobrov were flooded. The only remnant of them are now the Slanicky Ostrov located in the middle of the lake. It was the highest hill above the village of Slanica. **COMMUNICATION** The Orava Lake is located at Orava Region, close to the Polish border with Poland, between two major routes: the E77 motorway connecting Crakow and Budapest and road no.78 from Żywiec through the Korbielów, Namestovo to Oravske Podhradze. The largest town located close to the lake is a district town Namestovo. On the south - western shore there are many small resorts offering lodging and attractions associated with water sports on the lake. **REFERENCES** Mišik M., 1976, Geologické exkurzie po Slovensku, Slovenské pedagogické nakladateľstvo, Bratislava Kollar D., 1999, Orawa, Dajama, Bratislava	

Source: own research

Liptov Regions are seen as a places where tourists can stay for a night, eat well, see the highlanders culture and go hiking to the Tatra Mountains. Many historical objects, especially in Orava and Spiš Regions are opened for tourists, like Oravsky Hrad or Spišsky Hrad, but there are not many information about the geographical

background why this castles are where they are. Liptov Region has a very good places for recreation: ski centers (Chopok) and thermal baths (Bešeňova, Liptovsky Ján, Tatralandia), but there are not any information about the hot water, why there is and what causes it is so hot and good for health. Around spa in Vyžne Ružbachy there are many interesting travertine formations, but the informations about travertines in Vyžne Ružbachy are sparse and do not relate directly to the geology. Geosites which are in the Polish and Slovak databases do not have an information panels, sometimes are hard to reach and an ordinary tourist cannot find it e.g. Rogoźnicka Skała Quarry or there are currently unavailable Lisková Mohylky Outcrop.

Geotourism development can expose and show the most interesting places for (geo)tourists. A lot of people who are coming to the Tatra Mountains are interesting in nature and the processes which shaped the landscape around them. They will go to the new places with good access and accompanying tourists base.

Tatra Mountains are famous from the centuries and the culture of traveling there will stay, but maybe people choose the opportunity in the geotourism in the Podtatrze Region, which already has a good accommodation base, many places with good food and many other tourists attractions. Of course the amazing highlanders culture are also very important.

Especially Polish part of Tatra Mountain is overpopulated during summer and winter holidays, Christmas and long weekends. Maybe the geoturism in the Podhale Region is the way to reduce the number of tourists in the most attractive places in Tatras during the high season (Chrobak, 2014).

CONCLUSION

Geotourism has been grooving for 20 years and it has a huge economic potential. Tourists want to see new places, learn about Earth and how the earth make us. Nowadays people who make a geotourism attractions has a big development opportunities which creation new products. Geotourism is not only a tourism to inanimate nature, it is also revitalization old mines and quarries.

Geology and relief at Podhale, Orava, Liptov and Spiš Regions is very diverse. The best proof of that sentence is the presenting map with over 200 geosites. Region around Tatra Mountains has various geotourist attractions, there are 11 categories describing different geoatractions on the map both natural and anthropogenic.

Geotourism on the Podtatrze Region is slowly developing (57 geosites belong to the national geotourist databases) but with the good cooperation scientist, economists, managers, government and local people it can the better. Podtatrze Region can be the most interesting Region from the geotourism and cultural point of view in Central Europe.

REFERENCES

Biely A., Bezák V., Bujnovský A., Vozárová A., Klinec A., Miko O., Halouzka R., Vozár J., Beňuška P., Hanzel V., Kubeš P., Liščák P., Lukáčik E., Maglay J., Molák B., Pulec M., Putiš M. and **Slavkay M.** (1997) Vysvetlivky ku geologickej mape Nízkych Tatier 1: 50 000, GÚDŠ, Bratislava.

Birkenmajer K. (1958) Przewodnik geologiczny po Pienińskim Pasie Skałkowym, cz. 1-4, Wydawnictwo Geologiczne, Warszawa.

Bizubova M. (2008) Prirodne krasy Slovenska. Kamene, Vyd. Dajama, Bratislava, 94-105.

Chrobak A. (2014) Geotourism in the Podhale region as an opportunity toreduce the tourist overpopulation in the Polish part of the Tatra Mountains, Geotour&Irse 2014 Conference Proceedings, Technical University of Kosice, 181-197.

Dowling R. and **Newsome D.** (2006) Geotourism, Elsevier/ Heineman, Oxford, UK

Geologická mapa Slovenska M 1:50 000 [online]. Bratislava: Štátny geologický ústav Dionýza Štúra, 2013. [03,12,2015]. Available at: http://mapserver.geology.sk/gm50js.

Gołąb J. (1954) Flisz Podhala na zachód od Białego Dunajca, Archiwum Oddział Karpacki

PIG–PIB, Kraków.

Goląb J. (1959) Zarys stosunków geologicznych fliszu zachodniego Podhala, Biuletyn IG,149 (5), 225–240.

Gross P. (2008) Litostratigrafia Západných Karpát: Paleogén-podtatranská skupina, GÚDŠ, Bratislava, 5–78.

Gross P., Köhler E. and **Samuel O.** (1984) Litostratigrafická klasifikácia vnútrokarpatského paleogénneho sedimentačného cyklu. Geologické Práce, Správy, Bratislava, 81, 103–117.

Gross P., Köhler E., Mello J., Haško J., Halouzka R., Nagy A., et al. (1993) Geológia južnej a východnej Oravy, GÚDŠ Bratislava, 1-319.

Gross P., Kähler E., et al. (1980) Geológia Liptovskej kotliny, GÚDŠ Bratislava, 1-242.

Hose, T.A. (1995) Selling the story of Britain's Stone'. Environmental Interpretation,10, 2, 16-17.

Hose T.A. (2000) European geotourism—geological interpretation and geoconservation promotion for tourists. In: Barretino D, Wimbledon WAP, Gallego E (eds) Geological heritage: its conservation and management. Instituto Tecnologico GeoMinero de Espana, Madrid, 127–146.

Janočko J. and **Jacko S.** (1999) Marginal and deep sea deposits of Central Carpathian Paleogene Basin, Spisska Magura Region, Slovakia: Implication for basin history, Slovak Gelogical Magazine, Dionyz Štur Publishers, Bratislava, 4, 281-292.

Janočko J., Gross P., Polák M., Potfaj M., Jacko S. ml., Rakús M., Halouzka R., Jetel J., Petro Ľ., Kubeš P., Buček S., Köhler E., Siráňová Z., Zlinská A., Halasová E., Hamršmíd B., Karol S., Žec B., Fejdiová O., Milička J., Boorová D. and **Žecová K.** (2000) Vysvetlivky ku geologickej mape Spišskej Magury 1: 50 000, ŠGÚDŠ, Bratislava, 1-202.

Joyce B. (2006) Geomorphological sites and the new geotourism in Australia. http://web.earthsci.unimelb.edu.au/Joyce/heritage/geotourosmReviewebj.html

Kondracki J. (2010) Geografia regionalna Polski, Wydawnictwo Naukowe PWN, Warszawa.

Liščál P. (ed.).: Významné geologické lokality [online]. Bratislava: Štátny geologický ústav Dionýza Štúra, 2012. [03.12.2015]. Available at: http://mapserver.geology.sk/g_vglg.

Łajczak A. (2009) Warunki rozwoju i rozmieszczenie torfowisk w Kotlinie Orawsko-Nowotarskiej, Przegląd Geologiczny, 57, 8, 694 – 702.

Mazúr E. and **Lukniš M.** (1986) Geomorfologické členenie SSR a ČSSR. Časť Slovensko. Slovenská kartografia, Bratislava

Nemčok J., Zakovič M., Gašpariková V., Ďurkovič T., Snopková P., Vrana K. and **Hanzel V.** (1990) Vysvetlivky ku geologickej mape Pienin, Čergova, Ľubovnianskej a Ondavskej vrchoviny 1: 50 000, GÚDŠ, Bratislava.

Newsome D. and **Dowling R.K.** (2010) Geotourism: The Tourism of Geology and Landsape, Oxford : Goodfellow Publishers

Obidowicz A. (1988) The Puścizna Rękowiańska raised bog. In: Starkel L., Rutkowski J., Ralska-Jasiewiczowa M., Late glacial and Holocene environmental changes Vistula basin, AGH, Kraków.

Passendorfer E. (1983) Jak powstały Tatry, Wydawnictwa Geologiczne, Warszawa.

Slomka T. (red.), (2012) Katalog obiektów geoturystycznych w obrębie pomników i rezerwatów przyrody nieożywionej, Ministerstwo Środowiska, Narodowy Fundusz Ochrony Środowiska i Gospodarki Wodnej, Akademia Górniczo-Hutnicza w Krakowie.

Słomka T. and **Kicińska-Świderska A.** (2004) Geoturystyka – podstawowe pojęcia, Geoturystyka 1, 5-7.

Vozár J. (1977) Tholeiitic magmatic rocks in the Permian of the Choč Nappe (Western Carpathians), Miner. Slovaca 9, 241—258

Watycha L. (1977) Objaśnienia do szczegółowej mapy geologicznej Polski 1:50 000, Arkusz Czarny Dunajec, Państwowy Instytut Geologiczny, Warszawa.

Watycha L. (1959) Uwagi o geologii fliszu podhalańskiego we wschodniej części Podhala, Przeglad Geologiczny, Warszawa, 8, 350-356.

http://geoportal.pgi.gov.pl/portal/page/portal/geostanowiska

https://www.google.com/fusiontables/data?docid=1WENLyFVa5Z-0qHu47-5opYbKBUtLtLrGGOIZH80&pli=1#card:id=22

http://www.iop.krakow.pl/geosites

Geotourism and sustainable development in Skrapar

MERITA DOLLMA
University of Tirana, Faculty of History and Philology, Department of Geography, Rruga e Elbasanit, office 102, Tirana, Albania
(E-mail: meritadollma@yahoo.com)

ABSTRACT
Skrapar region has a great number of geomonuments, such as canyons, caves, waterfalls, karstic landforms, valleys, etc. On the other side this region is one of the poorest of the country where the population has limited resources to live and the unemployment rate is high. These last years this almost forgotten region is developing geotourism thanks to the presence of a great number of geomonuments, especially the canyons. Geotourism development is encouraging local people to improve the services and the government to invest in the infrastructure. However, these geomonuments are not known enough yet due to the lack of information or poor promotion. Valorisation of the geomonuments and better promotion will stimulate geotourism development, what will have a significant impact on sustainable development of this region. The paper is aimed to describe the geotouristic values of the geomonuments, with the aim to promote geotourism in this area.

Key words: Geomonument, geotourism, vlorisation, promotion, sustainable development.

INTRODUCTION

Skrapar region lies almost totally in the Southern Mountainous Region of Albania, on the north east of this geo-physical region. It is bounded by the valley of Tomorrica (branch of Devoll River) on the northeast, valley of Osumi on the southeast and southwest and the northern mountain foot of Tomorr. Within this area it has numerous impressive geological and geomorphological features besides rich cultural heritage.

Although very rich in geomonuments, Skrapar was not known of any touristic attraction until 1990. The promotion of the great touristic values of these geomonuments and their declaration as protected sites increased the interest of tourists to visit them. Their scenery beauty and water sports have attracted many tourists, whose number is continuously increasing, and some travel agencies have included these geomonuments in their tours. Geotourism development in this region is resulting into the creation of the touristic infrastructure, promotion of the natural and cultural heritage of the area, increase of the employment in the tourism sector, increase of the land price, development of the local bio products, etc. However, there is still a great need to highlight geoheritage of Skrapar and include it in the touristic map of Albania and Skrapar. Rare geosites features of this region have scientific, educative and recreative values, which need to be valorised, protected, preserved and promoted.

GEOLOGY AND RELIEF

The lithology of the territory of Skrapar is represented by the limestones of cretak and paleogen and flysch of eocen-oligocen.The carbonatic structure belongs to Kruja techtonic zone (Akademia e Shkencave, 1990a), whose characteristic is the development of the karstic landforms.

Flysch deposits of Krasta-Cukal techtonic zone are characterised by degraded and smooth landforms. Current mountainous landform of Skrapar is attributed to the new alpine techtonic uplift, especially during the quaternary with 1500-2000 m amplitude (Aliaj, 2012). The mountainous relief of this territory is represented by the mountain range Tomorr-Kulmaka-Miçan, with predominant altitudes 1200-2000m, reaching up to 2416 m (Mountain of Tomorri) (Akademia e Shkencave, 1990b). The alpine shapes create morphological contrasts with the deep river valleys creating stunning landscapes.

Rivers have followed the continuous tectonic uplift of the limestone structure, deepening their valleys and creating impressive geomorfological shapes such as canyons. Tomorrica River flows on the synclinal structures, but Osum River cuts transversally the antycline of Miçan, in the sector between Nikolara and Malindi, creating the grand canyon of Miçan of about 6 km long and 120-150m deep. The other Canyon of Osum River is created along the axis of the limestone anticline of paleogen, having almost the same length and width with this structure (about 12 km long, 30-50 m deep and 20-35 m wide). The canyon of Gradec is formed by Çorovoda stream cutting transversally the limestone antycline of Kulmak-Miçan following also a techtonic fault close to the periclinal closure of this structure.

The tectodynamic conditions have stimulated the regressive river erosion especially on the flysch deposits, creating degraded lands which are situated mainly in the upstream of Tomorrica and along Osum River, such as the bad land "Bokërrimat e Tomorricës".

On the mountain of Tomorri, karstic landforms are the evidence of the process of karst on the limestone of cretac and glacial cirques and moraines are the testimony of the glacial of quaternary on this territory. In the mountain range Tomorr-Kulmak-Miçan the development of the underground karstic processes are evidenced by the presence of numerous water springs such as Springs of Bogova, Ujaniku, Guaku, Sotira, which flow in the periphery of this mountain block along the lithological contact of limestone and flysch.

VALORISATION OF THE GEOMO-NUMENTS OF SKRAPAR

Geomonuments are natural monuments with particular aesthetic, ecological and touristic values, which are protected by law being classified in the third category of monuments of nature of the International Union for Conservation of Nature (IUCN). Thanks to the efforts of geologists, geographers, ProGeo members, etc., 291 geosites of Albania, or 41% of the monuments of nature, are listed on the list of the protected areas, in the third category, so called geomonuments. Some of the most important geomonuments of Albania are located in Skrapar region such as the Canyon of Osum (the longest canyon of Albania), Canyon of Gradeci (significant for its depth), Cave of Pirrogoshi (the longest cave in Albania), glacial cirques of Tomorri, moraines of Ujanik, etc. The canyons and the cave are the main touristic attractions in the region due to many reasons, but mainly due to their accessibility. The valorisation of the geosites of Skrapar for their geotourism potential is made based on the criteria according to Knapik, et al, modified by Anna Solarska and Zdzisław Jary (Solarska & Jary, 2010).

The fixed criteria allows making a statement of every object significance for scientific research and study of their geotouristic and educational functions (Solarska & Jary, 2010). The results of valorization proved the existence of a significant geotouristic potential of geomonuments of Skrapar. Three of 16 evaluated geosites resulted with highest potential for geotourism.

Two of the geomonuments have average to high scientific value (canyon of Osum and canyon of Gradeci). One of them is

Tab. 1 Criteria of assessment for inventoried geomonuments (according to Knapik, et al., 2009, modified)

Criteria	Traits	Points
Acessibility	Site clearly visible, located directly on the touristic trail or nature's path	5
	Site clearly visible, located on the road or path	4
	Site barely visible, located more than 250 m away from the path or road	3
	Site difficult to access for tourist (ex. significantly overgrown or difficult to access)	2
	Site unavailable for tourists	1
State of preservation	Well preserved site with no visible signs of degradation	5
	Site in slight violation of its structure	4
	Partially destroyed	3
	Site heavily modified by human	2
	Site destroyed - loss character of geosites	1
Scientific worth	Very high: one site in the region, unique in a wider scale	10
	High: very important for regional studies	8
	Average: significant for regional research	6
	Low: common site with average values	4
	Very low: no particular distinctive features	2
Education	Very high: number of represented issues: 5 and more	10
	High: number of represented issues: 4	8
	Average: number of represented issues: 3	6
	Low: number of represented issues: 2	4
	Very low: number of represented issues: 1	2

clearly visive and is located directly on the road trail (Canyon of Osum). Two of them are well preserved with no visible signs of degradation, especially Canyon of Gradec, which is naturally protected (difficult terrain). Cave of Pirrogoshi is barely visible and located more than 250 m away from the road. However it is in slight violation of its structure due to iresponsible visitors who prefer to cut stalagmites and stalagtites from the walls of the cave. All three of them have high education values, although people are not aware of their values. People visit these sites mainly for water sports or esthetic values. Other geosites have also high scientific value such as the glacial cirques of Tomorri, Moraines of Ujaniku, Neck of Kulmaku, Bokërrimat e Tomorricës (bad lands of Tomorrica), but these sites are difficult to be accessed by tourists, for they are located in difficult terrain and high altitudes.

Canyons of Osum River

Osum River has formed two big canyons, that of Miçan and that of Osum. This river has deeply cut the carbonatic anticline structure of Qeshibeshi forming the great canyon of Miçan, which lies in the borderline of Skrapar municipality, belonging to Përmet Municipality. But the longest canyon of Osum is situated in the sector Çorovodë-Hambull of the valley. This canyon is 12 km long, 4-35m wide and 70-80 m deep. The canyon has deep vertical slopes and is formed in the limestone rocks of Paleogene, which are covered by the flysch rocks of Oligocene. Along the canyons some waterfalls of multi step type fall from high altitudes creating rainbows such as the waterfalls of Çerenisht, Zogas, Kalanjas, Dhores, Pigas and Blezënckë. On the vertical walls of the canyon there are

Tab. 2 Valorisation of geosites of Skrapar

Nr.	Geomonument	Criteria				
		Acessibility	State of preservation	Scientific values	Education	Summarised value
1	Canyon of Osum	5	5	6	8	24
2	Canyon of Gradec	3	5	6	8	22
3	Cave of Pirrogoshi	3	4	4	8	19

small caves and other karstic forms. One of them is "Vrima e nuses" which is a small karstic cave in a gallery shape of 7-8m long and about 2m diameter. The picturesque view of the canyons can be clearly seen from the bridge close to Blezënckë village, where the canyon has the narrowest width. Along the valley and the road nearby there are a lot of cold water springs.

The canyon is also an interesting ecosystem with rich biodiversity. On the slopes of the canyon grow oak and herbal vegetation and many birds like wild pigeon, merlin and sparrow have their nests. Osum River is also the habitat for some species of fish, reptiles and amfibes.

Canyon of Gradec

Canyon of Gradec is situated three km on the north east of Corovoda town. It is formed by the stream of Corovoda in the southeast edge of the karbonatic anticline of Kulmaka. The transversal throut of Gradec is formed by Corovoda stream terthor the limestone antycline Kulmak-Miçan following also a techtonic fault close to the periclinal closure of this structure. Canyon of Gradec is very deep and narrow. Its vertical slopes of up to 300 m altitude are very close to each other in a distance from 2-3 m and 10-15m. The canyon can be clearly seen in the middle level of the structure, on the road to the Neck of Devrije. From the road it is about 250 m walking distance in a relatively difficult terrain.

Pirrogoshi cave

Pirrogoshi cave is one of the most interesting geomonuments of Skrapar. It is situated on the right slope of the Canyon of Gradec, on the limestones of Cretac. This cave has been a water spring, but the tectonic uplift of the structure and the riverbed deeping have exposed the entrance of the cave on the surface. This cave is a testimony of the tectonic uplift of the structure and the evolution of the underground karstic processes. Currently this cave has temporary water flow, only in wet season. From the cave the view is breathtaking with the waterfall of Radesh stream on the background, rich vegetation on the slopes, and the ruins of the citadel of Skrapar on the west. The explored length of the cave up to now is 1853m. The cave has stalagmites, stalagtites and bats.

Glacial cirques of Tomorri

On the mountain of Tomorri the glacial of quaternary (Vyrm) have shaped the karstic preglacial relief forming glacial cirques along its northern and eastern slope on the 1800-2200m altitudes. On the footstep of these glacial cirques, the moraine deposits of Ujaniku (25-80m thick) are situated over the flysch, in the altitude 1200-1800m. Currently the glacial landforms are shaped by the nivokarstic and periglacial processes. Glacial cirques are simple and have typical shape of an amphitheater.

Neck of Kulmaka

Neck of Kulmaka separates Mountain of Tomorri from that of Kulmaka. It is 2 km long, 1 km wide and 1460-1500m high. The sizes of this neck are among the biggest in Albania of its type. It is situated on the deposits of flysch of Oligocen, which lay in transgresiv position to the limestone of Cretak of Mountain of Tomorri on the west and Mountain of Kulmaka on the east. This neck separates the meridional direction of Mountain of Tomorri from the NW-SE direction of Kulmaka.

GEOTOURISM AND SUSTAINABLE DEVELOPMENT

According to National Geographic Society (2015), geotourism is defined as a tourism that sustains or enhances the geographical character of a place, its environment, culture, aesthetics, heritage, and the well-being of its residents. This means that geotourism is a multifaceted sustainable tourism centered on the conservation of geoheritage, appreciating its geological creation through learning and

enrichment of the economy (Swarna et al., 2013). Skrapar region in a way has initiated geotourism in Albania, mainly for the scenic landscape and rafting. Albania Rafting Group is the first tourism and sport organization in Albania which has helped in developing sustainable outdoor tourism attracting an icreasing number of tourists in remote areas and extending the time of their stay in Albania. They are contributing in generating revenue for local tourism, while maintaining the authentic values of the area, creating new jobs and opportunities for young people in the tourism and recreation industry.

The majority of visitors are foreigners (Italian and French) who come for water sports mainly. The analyses of a questionnaire realized with visitors of Canyon of Osum in May-July 2015, shows that 65 % of visitors visit the canyon for rafting, 24 % for its esthetic value and 11% for both of them. According to the statistics native tourists have still insignificant impact to the economy of tourism of Skrapar. The main income is generated by the foreigners, for the price for a rafting trip (provision of the equipments and specialised staff) is too high for the domestic visitors. According to the Albania Rafting Group, the cost of the water sports in Osum is 50 euro/person (Albania Rafting Group, 2015). However, the promotion of the values of these geosites and the activity of water sports is bringing an increased number of visitors in Skrapar. This has stimulated local investors to build small hotels and restorants in Çorovoda and improve their services. On the other side the improvement of the roads has made accessible some of the main geosites, resulting with the increased number of visitors. About 78% of the 100 local people that were interviewed in Skrapar answered that they do not want to leave the area. This is a positive sign for a remote area which has been facing migration since 1990. Geotourism perspective of the area has increased also the value of the land and people feel motivated to grow local products to support tourism.

People feel optimistic that geotourism development will stimulate employment. According to the program of the major, geotourism development is a priority for Skrapar municiplity that will generate employment and income. To achieve this goal local people need to be trained as tour guides or water sports instructors and services need to be improved. Also traditional handcrafts like potery, carpet makers, raki makers, besides handmade souvenirs using geomonuments images and local materials such as wood or stone etc., need to be encouraged. This will create job opportunities for local people and motivate them not to migrate. So far there is no entrance fee to the geomonuments and no information documents such as guide books, maps, postcards, etc., but in the future the revenues gathered from these items can be used for better management of the geomonuments.

Promotion of the geomonuments

The list of the monuments of nature of Albania is the main publicly accessible database of natural heritage sites which has some very basic information. There are no guidebooks for geomonuments in Albania besides some publications by Albanian geologists, geographers and ProGeo Albania. Public eduction is contributing to educate the young generation with the complex values of the nature and the human impact in the landscape. In the programs of the elementary schools, high schools and some bachelor and master programs are included syllabuses about natural heritage and human ecology. This is raising the awareness of the people about the values of the protected areas in general and geomonuments in particular resulting with ans increased desire to visit them. On the other side, as Joyce and Brohl (2008) state, tourism of geological and geomorphological sites can be used to harness the public's growing interest in environment and ecology, and educate them in the story behind the landscape.

Unfortunately, so far there is no guide book for Skrapar and any maps or informative tables for each geosite. Databases with up to date information about geological heritage is missing and this was the reason why a project about geoinformation of the protected areas in Albania is being held by the Department of Geography, in the scope of natural heritage program. So far we have done some progress concerning geoinformation of the Albanian caves, canyons, waterfalls, glacial landforms, etc., and currently we are working for the geoinformation of the geomonuments of 61 municipalities*. Skrapar is the first region we worked about where the valorisation of the geomonuments for geotourism is done and geoinformation of geosites is created.

The geoinformation of geosites of Skrapar (Fig. 1) created with the help of ArcGIS10, is a digital database about each geosite of this region, where data about geographical position, geology, geomorphology, hydrology, biodiversity, etc., are provided. For example the database of a waterfall besides esthetic, hydrologic and biological values includes also important data for the visitors like geographical coordinates, distance, altitude, accessibility, itineraries, scale of difficulty, etc. The database completion is an ongoing process, for in many cases there is no updated data or total lack of information. Hopefully this will be improved in the future with continuous monitoring of the state of the geosites from the experts in the field of geology, geomorphology, hydrology, biology, etc. The website "Heritage of Skrapar" is being set up, where the public will be informed for the geoheritage of this region besides the cultural heritage. Ministry of Tourism and travel agencies need to promote and include in their itineraries the geomonuments of Skrapar. In this way better promotion of geomonuments can help within the geotourism development, what will have a significant impact on sustainable

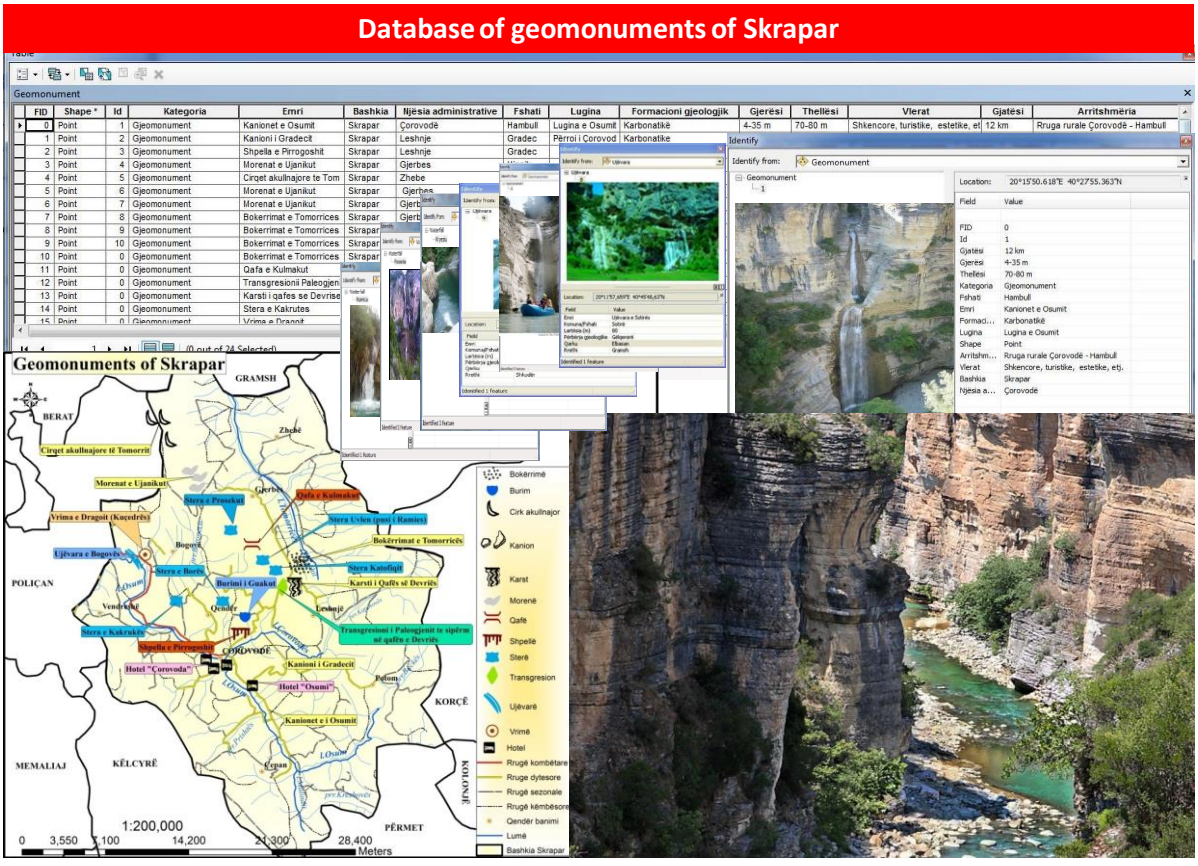


Fig. 1 Database of geomonuments of Skarpar

development of this region.

CONCLUSION

Based on the valorisation of the geosites, Skrapar has a considerable potential for geotourism development. State and local authority of Skrapar are yet unaware of this rich geoheritage and its economic potential in terms of geotourism development. Concerning protection and conservation it is done almost nothing, but their declaration as monuments of nature. Proper management of the geosites should consider providing basic facilities to the visitors, recreational activities and geotours need to provide geological, geomorphological and biological knowledge to the visitors. Geoheritage of Skrapar can also be used to create images for the country and in the context of the sustainable development, geoheritage can be a significant contributor to the achievement of economic development, social development and environmental protection. The contribution of geographers should not be limited to the identification and protection of heritage values, but also extend the application of new technologies GIS/RS for cataloguing the geoheritage to turn it an accessible tourism product with economic benefits.

REFERENCES

Akademia e Shkencave (1990a) Gjeografia fizike e Shqipërisë, vol. 1, 43. (Techtonic zones of Albanides: Korabi, Alpet, Vermoshi, Sazani, Mirdita, Gashi, Krasta-Cukali, Jonike, Kruja).

Akademia e Shkencave (1990b) Gjeografia Fizike e Shqipërisë, vol. 2, 298.

Albania Rafting Group (2015), available at: www.albrafting.com

Aliaj S. (2012) Neotectonic of Albania, Klean.

Joyce B. and **Brohl M.** (2008) Geological and geomorphological features of Australia: how our geosites can be used in geoparks and geotourism to promote better understanding of our geological heritage and as a tool for public education, Global Geotourism Conference "Discover the Earth beneath our feet".

Swarna K., Biswas, S.K. and **Harinarayana T.** (2013) Development of Geotourism in Kutch Region, Gujarat, India: An Innovative Approach, Journal of Environmental Protection, 4, 1360-1372.

Solarska A. and **Jary Z.** (2010) Geoheritage and Geotourism Potential of the Strzelin Hills, Geographica Pannonica, Vol.14, Issue 4, 118-125.

National Geographic (2015) About geotourism, available at: http://travel.nationalgeographic.com/travel/sustainable/about_geotourism.html

Geosite Boží hora at Žulová – a classic mineral deposit

JIŘÍ MALIŠ*, JAN JELÍNEK, LENKA PETRUŠKOVÁ and MARTIN KLEMPA

Institute of Geological Engineering, Faculty of Mining and Geology, VSB – Technical University of Ostrava, 17. listopadu 15/2172, 708 33, Ostrava-Poruba, Czech Republic
*(*Corresponding author e-mail: jiri.malis@vsb.cz)*

ABSTRACT
The town of Žulová is a historic centre of stone quarrying and processing of granite, in particular. The town is located in the north-western part of Czech Silesia, Czech Republic. Still, this area is little known due to its location near the borders. The absence of infrastructure, insufficient funds of the local municipalities and high unemployment prevent the town and its surroundings from exploiting the tourist potential in a wider scale. However, this town and its neighbouring villages certainly have a tourist potential, especially thanks to their preserved and beautiful landscape, interesting history and remoteness from big cities. In addition, in Žulová and the surrounding villages there are several localities interesting from the geological point of view. For geoscience tourism the geosites are valuable as deposits of various minerals of contact metamorphism and as deposits of silica or pegmatite veins. Furthermore, there are sites of historic or existing quarries related to stone processing or sites with remarkable geomorphology. This article describes the geological position and genesis of Boží hora geosite, along with its mineralogical and geotourist attractiveness.

Key words: tourism, contact metamorphism, Žulová Pluton, Žulová, Silesia

INTRODUCTION

The town of Žulová lies 15 km to the north-west from the town of Jeseník, 56 km to the north from the town of Šumperk and about 16 km to the south-east from the Czech-Polish border crossing of Bílý Potok/Paczków. It adjoins the village of Kobylá nad Vidnavkou in the north, Vlčice and Skorošice in the west, Vápenná in the south and Černá Voda in the east. The town's acreage is 12.96 km^2 according to the cadastre register office data. Žulová is situated 12 km from the county town of Jeseník and 112 km from the regional city of Olomouc. The town has about 1,300 inhabitants (or 1,327 inhabitants according to the data of 2007). Žulová is a member of several regional unions. It is a member of Žulovsko Microregion which is a union of the surrounding villages created in 2003. Since 1993, the town has been a member of the Union of Jeseníky Towns and Villages (SMOJ) that was created by municipalities of the Jeseník County. Since 1997 it has been also a member of Praděd Euroregion (see Fig. 1 – map of the region).

The name of Žulová town is related to the main line of business that dominated there from the 1850s till the end of the 20th century, i.e. granite extraction, stone-cutting industry and stone-industry. There used to be a technical stone-cutting school there too. At the times of the top industrial prosperity as many as 5,000 workers were employed in the quarries and workshops of the Silesian granite industry. The history of granite quarrying has been described in detail in the work by T. Kruťa (1973). However, the name of Žulová has been used since 1948, after World War II. It has replaced the original German name of

Fig. 1 Location of the Žulovsko Microregion. (adjusted according www.1)

Frýdberk is a result of the post-war evacuation of the majority of the German inhabitants. There were also other villages in the county, such as Písečná, Vápenná or Uhelná, that gained their names in a similar way. There are not many attractive sights in the town itself from a tourist point of view although it has a long history. Still, the exception is, for example, the Church of St. Josef with its church tower being the remainder of Frýdberk gothic castle, already mentioned as early as 1296. Apart from the cylindrical tower, there are also the remnants of the castle fortifications. The St. Mary Square in the town centre is bordered by several old craftsmen houses. Next, there is a column with a statue of St. Mary and a stone bridge, both from the 19th century. Another historical sight is the neo-gothic Church of Grieving Virgin Mary on top of Boží hora (sometimes referred to as a chapel). This church was built between 1878 and 1880 and replaced the former wooden building from 1712 to 1713 (Kuča, 2011). The geosite of Boží hora (God's Hill) lies to the west from Žulová. With its altitude of 527 m, it represents the highest summit of the hilly country called Žulovská pahorkatina. Apart from the Church of Grieving Virgin Mary on the hill top and the Way of the Cross that leads from Žulová to the top of Boží hora, visitors are offered a beautiful view of the countryside from its top (see Fig. 2). In addition, those interested in geotourism may find at least three very interesting places where minerals may be gathered. These places differ in their origin and composition, and the fact that they have been clustered at such a relatively small area makes them unique. However, it must be pointed out that Boží hora has been a well-known site for mineralogists who have paid numerous visits to it for several decades. As a result, this has mirrored in the present state of the geosites with the occurrences of minerals. Currently, the sites with the major occurrences of the best known and most beautiful samples of the different minerals are rich in excavation pits, small waste dumps and debris after activities of people who explored for minerals and collected them. Still, samples of the characteristic minerals may be found even at such

Fig. 2 The Church of Grieving Virgin Mary on the hill top of Boží hora. (photo by authors)

devastated sites and everybody who visits them may enjoy their great variety and appeal.

TOURISM IN ŽULOVÁ AND ITS SURROUNDINGS

As regards the tourist industry, the town of Žulová may be considered a starting point for hiking and cycling in the surrounding countryside. The hiking and cycling trails destine for nature attractive sights with deep woods, hilly countryside and various natural formations. The town of Žulová lies at the boundary of the Žulovská pahorkatina Hills and Rychlebské Hory Mts. Considering the relief of the two mountain ridges, it appears to be an interesting and physically less demanding alternative for hiking and cycling trips when compared with the nearby Hrubý Jeseník Mountains.

Traffic accessibility of the town Žulová and its surroundings, with regard to its position at the edge of the Czech Republic, is relatively good. A regional railway passes through Žulová (it is the railway from the spa of Lipová Lázně to the town of Javorník in Silesia). Žulová has its own railway station with a relatively high traffic. About 11 pairs of trains pass through Žulová every day.

As regards the automobile transport, the town is connected by a 1st class road, number 60, which leads through Žulová from the spa of Jeseník (the county town) and Vápenná to Uhelná and Javorník and further to the state border with Poland. From there, it continues as the road number 382 to Polish Paczków. Next, a 2nd class road number 456 starts from Žulová to Černá Voda and Stará Červená Voda towards Velké Kunětice. Near Velké Kunětice it joins the 2nd class road number 457. There are also several 3rd class roads in the area, for example the road to Nýznerov and Skorošice and a road from Skorošice through Tomíkovice towards Kobylá nad Vidnavkou with a turning to Buková.

Accessibility of this area is also ensured by bus transport. Local bus lines Jeseník -

Bílá Voda, Jeseník - Javorník , Jeseník - Vidnava and Jeseník – Žulová cross the town. The bus service to the county town of Jeseník is ensured by about 25 pairs of bus lines every day (see Fig. 1 and Fig. 3 – Map of railway network).

The social potential of tourism in Žulová has been adversely affected especially by high unemployment (up to 18 %). The majority of people are employed in industry and the building industry. Furthermore, it has an insufficient accommodation potential. As regards accommodation facilities, there are only smaller boarding houses or accommodation in private houses available in the town. The closest hotel is in the village of Černá Voda. Catering and refreshment facilities in the town are absolutely insufficient. The character of other facilities corresponds to the town size and to its financial possibilities. There are a local library, a health centre, a grocery and several smaller shops with consumable goods available in the town.

Regarding hiking trails, red and blue tourist paths go through the town. The red path leads from Javorník to Jeseník and the blue one from Horní Lipová through Nýznerov Waterfalls to Žulová and Černá Voda.

The natural resources of Žulová surroundings are rather high. The town may be regarded as a starting point for trips to the Rychlebské hory Mountains, Nýznerov Waterfalls, to the cave 'Na Pomezí' in Lipová, to the spa of Jeseník or to Vidnava. Numerous abandoned quarries in the town surroundings may be listed among the natural objects of interest in this area. Many of the quarries have been flooded and offer swimming possibilities. Geomorphologic objects of interest include, for example, Venušiny misky (Venus Bowls) (see Fig. 4) on the top of Smolný vrch Hill. The hill is

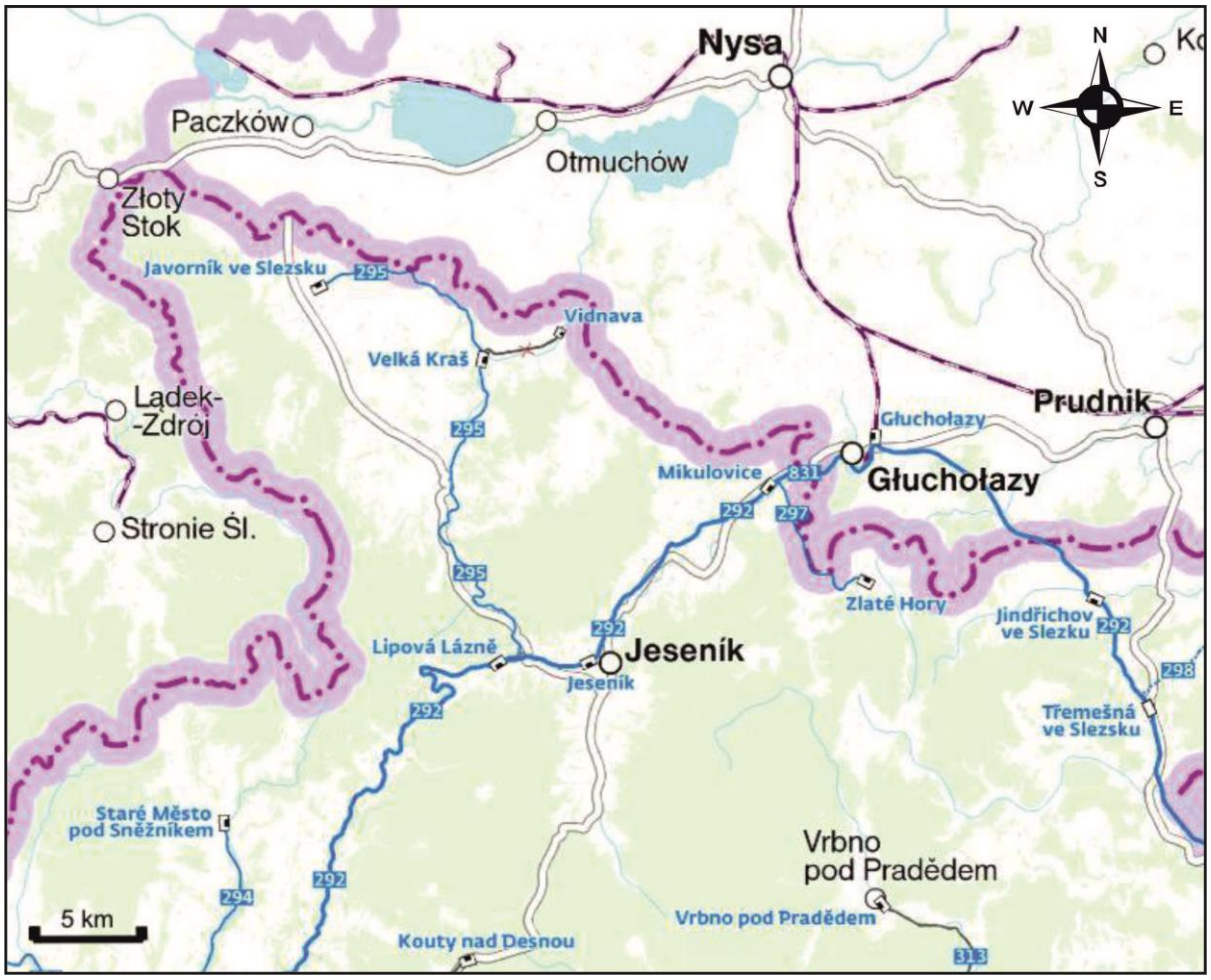


Fig. 3 Map of railway network – blue lines. (adjusted according www.2)

Fig. 4 Geomorphologic objects venušiny misky. (www.3, photo by Pavla Gürtlerová, 2011; photoarchive of Czech geological survey)

the so-called inselberg formed in the tropic Tertiary climate. An inselberg is a unique geomorphic formation with granite orbicular structure; many remarkable shapes developed in the rocky formations, for example, rock-basins, benches, cavities which formed by erosive activities of rain water and the orbicular structure of granite mentioned above. Also Borový vrch Hill that is 1 km to the north from Žulová has a similar character. It is also an inselberg with a rocky town on its top, which was declared a protected natural formation in 1987.

It is important that even the latest trends within the tourist industry and adrenaline lifestyle can be found in this area, represented by the project of mountain bike trails in Rychlebské hory Mountains. A group of enthusiastic mountain bikers and mountain bike lovers rebuilt a former unused farm-house in the village Černá Voda that became a base for mountain biking in the surrounding hills. Furthermore, a network of closed trails intended for mountain bikes exclusively was built. At present, the network is already 60 kilometres long and it consists of several trails with various levels of difficulty. It holds true for the greater part of the trails that they remarkably copy old hunting paths. That way, the trails blend with the landscape and they hardly disturb it. This project is very popular among active mountain bikers within the whole Moravian-Silesian Region and the trails have hundreds of visitors not only at weekends but also during holiday weekdays over the whole season. At the same time, this project represents an excellent model of modern tourist and leisure time activities. It was well-thought-out from the very beginning, it means from the information campaign by means of a website and social networks including shared video clips and photographs where the visitors are also asked to donate further for the centre development and building of new trails by a small voluntary donation (for potential visitors are a very good source of information about the current state trails websites http://www.rychlebskestezky.cz /cs/).

GEOLOGIC DEVELOPMENT OF THE REGION

The described geosite of Boží hora is located in the so-called Žulová Pluton. It makes part of Silesicum in the Moravian-Silesian area of the Bohemian Massif. This formation was intensively deformed and regionally metamorphosed during the Variscan orogeny period. These processes resulted in melting of the lower sections of the crust and extrusion of the Variscan granitic rocks that might be as old as 340 Ma.

The Žulová Pluton extrudes in the northern part of Silesicum, and in the Czech Republic it takes up an area of about 80 km^2. In the south, it is divided from the group of Branná by a peripheral Sudeten fault. Towards the north, it continues to the Polish dominion where it plunges under the Tertiary and Quaternary deposits (Chlupáč et al., 2002). The eastern edge at the contact with the Devonian system of Velké Vrbno Group is intrusive. According to Cháb and Žáček (1994), it is the top part of a huge body that continues further deep towards southeast. The main body of the Pluton is mostly created by biotite granodiorites, granites up to quartz diorites and granitoids rich in accidental xenoliths (Chlupáč et al., 2002). (See Fig. 5 – Geological map of the region)

The postorogenic origin of the massif is documented by a minimum gneissic banding, perfect cleavage of granitoids and absence of mylonitic zones (Zachovalová et al., 2002). The rocks of the Žulová Pluton mantle are markedly affected by the contact of Pluton and the surrounding basements rocks, especially large accidental xenoliths of crystalline limestones that are perceivable at many places and even in the middle of the Pluton. Characteristic Pluton mantle rocks are the following: sillimanite-biotite gneisses (migmatizated in places), feldspathic quartzites, amphibolites, crystalline limestones, erlans and skarns (called tektites by some authors).

The boundary lines between the individual types of mantle metamorphites are not sharp (Rozkošný and Souček, 1989). The rocks come from Staré Město Group, Branná Group and from core parts of Desná Dome and Keprník Dome. Various authors state the temperature and pressure of the mantle metamorphosis activated by impacts of intruding Žulová Pluton ranging from 560 °C to 800 °C and from 300 MPa to 500 MPa (Losos and Hladíková, 1988; Žáček, 2003).

Pegmatites are rather frequent in granites and granodiorites. They most frequently appear as sheet bodies. They fill up variously oriented failure cracks in deep-seated rocks. Their thickness ranges from 4 cm to 25 cm. Pegmatites structure is simple with a narrow medium grained peripheral zone consisting of feldspars and silica with a centre of pegmatite veins filled up with coarse-grained potash feldspar and silica.

From the mineralogical point of view, the most interesting rocks of the Žulová Pluton are skarns which have been called tektites by some authors. They form in the contact zones of granitoids and the mantle rocks. These rocks have a very variable composition due to the diverse composition of xenoliths that reacted with granitoids (Mísař et al., 1983). The most typical minerals from the zones are the following: hessonite, vesuvianite, epidote, diopside, wollastonite and scheelite (see Fig. 6). The contact zones have been described in numerous geosites in Žulová and its close surroundings, for example, Vycpálek quarry, Staré Podhradí, Boží hora near Žulová, settlement near Bergov, Borový vrch Hill and Huttung quarry, Nietsche quarry, Nová Červená Voda, Stará Červená Voda, Starost quarry, Zelený vrch, Žulový vrch, etc. (Rybák, 1972).

MINERAL PROSPECT OF BOŽÍ HORA – GEOSITE DESCRIPTION

Andělské domky

The first described geosite lies at the

Fig. 5 Geological map of the region. The main part of the map (red colours) represent granitoid rocks of Žulová pluton. From neighboring units (the left side of the map) are separated by faults NNW-SSE direction. (www.4)

south-eastern foothill of Boží hora in a small forest about 150 m to the left from the road that leads from Žulová to Černá voda (see Fig. 7). Literature refers to it as Andělské domky (Angel Houses) or 'Coral Holes' (Pauliš, 2001). This geosite consists of holes and small piles of material. They were created during exploration and digging of primary quartz dikes. Rock crystals from the veins were processed as decorative objects and souvenirs already in the 18th century (Pauliš, 2001). The local digging did not have an industrial character or was not intense. It had a form of primitive digging of colourless crystals in shallow pits from the surface. An exploratory examination of the geosite found two silica veins 0.5-metre thick under a layer of waste pile in 1996. The veins occasionally contained cavities filled up with fragments of quartz aggregates and colourless crystals 6-7 cm in length, exceptionally as long as 10 cm. The veins may represent a core of pegmatite body. Despite the fact that only small crystals and fragments of quartz crystals and rock crystals may be found at the geosite at present, it still belongs among the most frequently visited geosites. (See Fig. 8 Quartz crystal and Present state).

Fig. 6 Typical mineraks from contact zones – wollastonite, hessonite, epidote. (photo by authors)

Abandoned shelf quarry at south-eastern slope of Boží hora

Another geosite is an abandoned quarry situated about 300 m to the south-east from the top of Boží hora. The easiest access to this geosite is by means of a forest path that turns to the left from the road leading from Žulová to Černá Voda. The forest path leads up directly to the quarry (it passes the geosite of Angel Houses) (see Fig. 7).

The single-bench shelf quarry with the face length of about 30 m and height of about 15 m was built in the granodiorites of Žulová Pluton. Quarrying was terminated in the 1970's. The mined biotite granodiorites have a light grey colour. The rock is characterized by regular separation, which means that it is an excellent material for stonework. In practice, it was given a trade name of 'Silesian Granite'.

Biotite granites of Žulová Pluton used to be quarried there, in places with veins of aplites and pegmatites. A bimetasomatic zone between the primary limestone and paragneiss in adjacent proximity of the granitoid intrusion can be found at the entrance to the quarry. The maximum thickness of the bimetasomatic zone is 20 cm. (see Fig. 9)

In the centre of the quarry face visitors may observe a pegmatite vein from 0.5 m to 1 m thick and 4 m long. The vein has a light colour. The pegmatite blocks originating in this vein can be found on the quarry bottom too.

Contact mineral occurrences on the south-eastern slope of Boží hora

There are remnants of excavation pits related to garnet digging in the full-grown beech forest on the top of Boží hora. They lie about 100 m to the south-east below the Church of Grieving Virgin Mary (see Fig. 7). Searching for garnets at this place

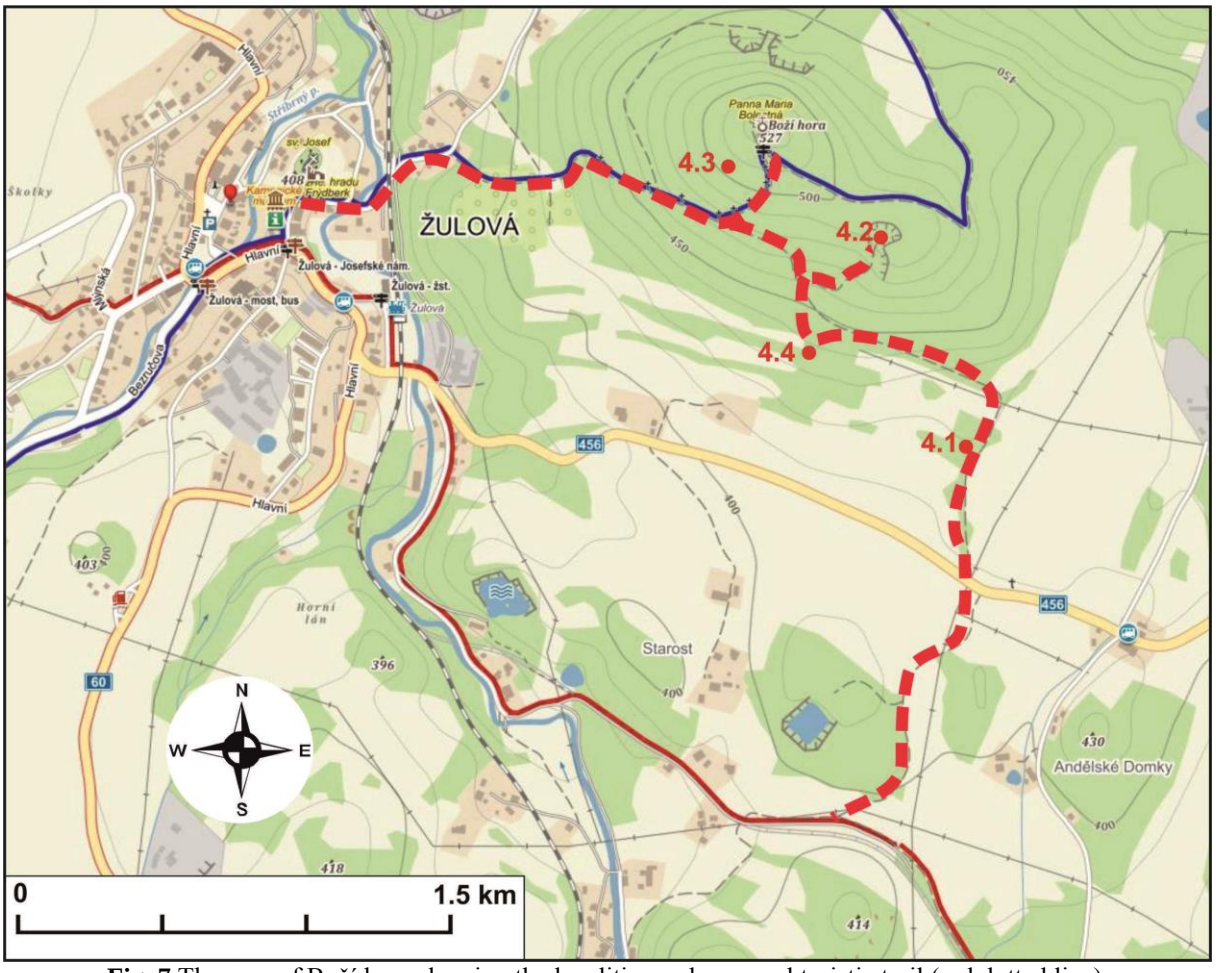


Fig. 7 The map of Boží hora showing the localities and proposal turistic trail (red dotted line).

Fig. 8 The quartz crystal founded in locality Andělské domky and present state of this place. (photo by authors)

Fig. 9 A contact zone between limestone and paragneiss on abandoned shelf quarry. (photo by authors)

started in the 19th century when they were used for production of souvenirs. The garnets come from tektites and their composition corresponds to hessonite. They occur in the form of separate crystals up to the size of 5 cm ingrown in quartz, or coarse-grained crystallic aggregates in tektite. Apart from the garnets, the excavation pits and debris also contain crystals and aggregates of dark green epidote with characteristic grooves in the crystallic surfaces and brown crystals of vesuvianite that are often ingrown in hessonite. Although this geosite is topped with debris material at the present, you may still find nice specimens of minerals of the contact metamorphic zone. (see Fig. 10)

Abandoned marble quarry on the southern slope of Boží hora

A small pit quarry lies on the southern foothill of Boží hora, below the forest path leading to the shelf quarry described above. The pit quarry, founded in marbles of Žulová Pluton mantle, has been abandoned and overgrown by vegetation (see Fig. 7). Its approximate dimensions are 40 x 20 m. Apart from crystallic limestone also veins

of pyroxenite pegmatite extrude. These veins extrude in lenticular bodies of medium grained crystallic limestone from which they are incised. They are predominantly represented by white plagioclase with marked insets of clinopyroxene (diopside – Fe diopside) that are several centimetres long and by small crystals of titanite. However, in the past crystals of titanite found there were up to 2 cm big. The titanite is of a light brown colour and its crystals form characteristic rectangular 'envelopes'.

PROPOSAL OF A GEOTOURIST NATURE TRAIL

This chapter proposes a nature trail to experience Boží hora geosites, which starts from and returns to the centre of Žulová. The Church of St. Josef in Žulová has been chosen as the starting point. Visitors may explore the remnants of the Frýdberk Castle fortifications and its cylindrical tower at the very beginning of the tour. A blue tourist path leads from St. Josef Church to the top of Boží hora. The path follows the pilgrimage stops along the Way of the Cross up to the Church of Grieving Virgin Mary on the top. On this route there is also the geosite with occurrences of contact minerals on the south-eastern slope of Boží hora (see Fig. 7). From there, the proposed trail continues up to the Church of Grieving Virgin Mary as mentioned above. There are beautiful views of the Žulovská pahorkatina Hills and Rychlebské hory Mountains' panoramas from the top. Further on, the blue tourist path continues from the Church of Grieving Virgin Mary along the old forest path that follows a contour line. Next, the nature trail leaves the blue tourist path and continues along the forest path to the south-east towards the abandoned shelf quarry. There is another stop at the second geosite where visitors may observe a contact zone between limestone marble and paragneiss at the quarry entrance. The Žulová Pluton rocks that extrude in the form of granodiorite with pegmatite vein are visible on the face in the quarry centre.

Fig. 10 A typical material that can be found in contact zones – hessonite. (photo by authors)

The nature trail continues along the forest path for about 300 m. On the right, below the forest path, there is another mineralogical stop, the abandoned marble pit quarry. Small crystals of titanite may be found in pegmatite veins material lying on the quarry bottom. The last mineralogical stop of this nature trail is at Andělské domky (Angel Houses or Coral Holes) geosite that lies in a small forest to which the mentioned forest path leads. Quartz crystals and fragments of rock crystals may be found there. From there on, the nature trail returns to Žulová. Firstly, it is advisable to cross the road leading from Žulová to Černá voda and continue along the field path, which connects to the red tourist path after 800 m. This tourist path passes flooded quarries and leads back to the square in Žulová. The proposed nature trail is about 4.5 km long and, with the exception of the uphill gradient towards the top of Boží hora, it is a physically undemanding trip.

CONCLUSION

The article aims to inform readers about a very geotourist attractive region of Žulová and its surroundings. Analogously to works by Štrba and Kurtová (2013), Teplická et al. (2011), Velázquez et al. (2013), a geotourist nature trail was proposed herein. The example of Boží hora shows that several diverse geological phenomena may be found at a very small area. The nature trail recommended here is just one from several possible routes visitors to Žulová and its surrounding may take and experience. This nature trail offers visitors traces of former human activities that markedly have formed this area in the past centuries and evidence of geological activities that had shaped this landscape much earlier. The tourist potential of Žulová and of its surrounding has not been fully utilised, which is attributed to the economic possibilities of the town and of the whole region. This is also affected by the proximity of the Hrubý Jeseník Mountains that attract a huge part of tourists and also by the region's position at the edge of the Czech Republic, in former Sudetenland. However, in spite of this 'handicap', viable tourist projects found their place there. The example of Rychleby Trails project shows that also an area on the edge of tourism industry interest, which lacks necessary infrastructure, may attract prospective visitors and upraise tourism with improvements to local economy. Better knowledge of the geological attractiveness of the described locality may positively contribute to this situation.

REFERENCES

Cháb, J. and **Žáček, V.** (1994) Geology of the Žulová pluton mantle (Bohemian Massif, Central Europe). Věstník Česk. geol. úst, Vol. 69, 1-12.

Chlupáč, I., Brzobohatý, R., Kovanda, J. and **Stráník, Z.** (2002) Geologická minulost české republiky. Academia, Praha, 370 p.

Kuča, K. (2011) Města a městečka v Čechách, na Moravě a ve Slezsku / 8. díl V-Ž. Libri, Praha, 896 p.

Kruťa, T. (1973) Slezské nerosty a jejich literatura. Moravské zemské muzeum, Brno, 414 p.

Losos, Z. and **Hladíková, J.** (1988) Izotopické složení grafitů a karbonátů z pláště žulovského masívu a jeho využití pro výpočet teplot metamorfozy. Scr. Univ. Purkyn. brun., Geol., Vol. 18, No. 7, 261-272.

Mísař, Z., Dudek, A., Havlena, V. and **Weiss, J.** (1983) Geologie ČSSR I Český masív. SPN, Praha.

Pauliš, P. (2001) Nejzajímavější mineralogická naleziště Moravy a Slezska. Kuttna, Kutná Hora.

Rozkošný, I. and **Souček, J.** (1989) Contribution to the petrology of the Žulová massif mantle. Acta Universitatis Carolinae, Geologica, Vol. 15, No. 2, 165-197.

Rybák, J. (1972) Asociace minerálů z kontaktních výskytů v okolí Žulové. Diplomová práce PŘF MU, Brno.

Štrba, Ľ. and **Kurtová, M.** (2013) Attractive geotourism sites in the area of the Ždiar village (Tatra Mts. region, Slovakia). Acta Geoturistica, Vol. 4, No. 1, 47-57.

Teplická, K., Čulková, K. and **Sőkeová. E.** (2011) Mine workings in area of Gemer as a tool for development of tourist traffic. Acta Geoturistica, Vol. 2, No. 1, 16-22.

Velázquez, V.F., Azevedo Sobrinho, J.M.,

Pletsch, M.A.S.J., Guedes, A.C.M. and **Zobel, G.** (2013) Geotourism in the Salesópolis-Caraguatatuba Trail, São Paulo, Brazil: A Possibility to Utilize Geological Elements for Sustainable Development. Journal of Environmental Protection, Vol. 4, 1044-1053.

Zachovalová, K., Leichmann, J. and **Čvančara, J.** (2002) Žulová Batholith: a post-orogenic, fractionated ilmenite-allanite I-type granite. Journal of the Czech Geological Society, Vol. 47, No. 1-2, 35-45.

Žáček, V. (2003) Thermal effects of the Žulová Granite Pluton, Silesicum, eastern Variscan front. Polskie Towarzystwo Mineralogiczne Prace Specjalne, Vol. 23, No. 1, 185–188.

Internet sources

www.1: **Location of the Žulovsko Microregion**, available at: http://ww.mapy.cz (accessed 13. 07. 2015)

www.2: **Map of railway network**, available at:http://www.cd.cz/mapa/# (accessed 13. 07. 2015)

www.3: **Venušiny misky**, Gürtlerová,P. (2011) Fotoarchív České geologické služby, available at: http://www.geology.cz/aplikace/fotoarchiv/fotoarchiv.php?foto=20372 (accessed 15. 07. 2015)

www.4: **Geological map of the region,** Česká geologická služba, available at: http://mapy.geology.cz/geocr_50/ (accessed 12. 07. 2015)

Impact of geopark establishment on regional tourism development; case study from Slovak part of the Novohrad-Nógrád Geopark

BRANISLAV KRŠÁK*, ĽUBOMÍR ŠTRBA, MARIÁN LUKÁČ, CSABA SIDOR and MÁRIO MOLOKÁČ

Department of Geo and Mining Tourism, Institute of Earth Resources, Technical University of Košice, Letná 9, 042 00 Košice, Slovakia

*(*Corresponding author e-mail: branislav.krsak@tuke.sk)*

ABSTRACT

In last decades, several new and "non-traditional" forms of tourism has been developed as a result of specific needs of particular groups of tourists. Geotourism offers via geoparks several opportunities of regional tourism development. The aim of this study is focused on two major points: 1 – to introduce geotourism as an innovative approach within the tourism and 2 – based on the case study from the area of Slovak park of the Novohrad-Nógrád Geopark, to point out how geopark can positively affect regional tourism development as underprinted by the case study results and conclusions presented in this paper.

Key words: geopark, tourism, innovation, sustainable development

INTRODUCTION

As still much more people look for new, non-traditional and/or innovative forms/approaches within different areas of human activities, new forms of tourism reflecting the demand of particular groups of people has been defined also.

From ancient times, people tend to visit attractive and impressive natural places including e. g. caves, mountains, canyons, volcanoes, etc. But just in last decades, a real challenge has emerged in the tourism sector by creating completely new market with very specific and unusual requirements arising from researcher's definitions, needs of nature heritage preservation, appropriate way of tourists' education and tourists' demands. "Nature-friendly" or "geo-friendly" approach of many professionals and laics within different branches of science assisted and helped to definition of specific form of tourism – geotourism.

This article, based on case study data from the Slovak part of the Novohrad-Nograd Geopark, is devoted to the introduction and characterization of geotourism and geoparks as relatively innovative approach within tourism respecting principles of sustainable development and to study of their impact on regional tourism development.

GEOTOURISM AND GEOPARKS

As e.g. popularity of eco-foods significantly grows in last years, geotourism and geoparks, with their non-traditional Earth-resources tourism offer, become popular in the world nowadays.

There are several different ways of geotourism understandings. First real definition of geotourism comes from Hose (1995). He defines geotourism as "the provision of interpretive and service facilities to enable tourists to acquire knowledge and understanding of the geology and geomorphology of a site

(including its contribution to the development of the Earth sciences) beyond the level of mere aesthetic appreciation". This definition was subsequently modified by many authors (e. g. Hose, 1996, 2000; Joyce, 2006; Dowling & Newsome, 2006; Sadry, 2009). Nowadays, well-accepted definition was published by Newsome and Dowling (2010), which says that geotourism is "A form of natural area tourism that specifically focuses on landscape and geology. It promotes tourism to geosites and the conservation of geo-diversity and an understanding of Earth sciences through appreciation and learning. This is achieved through independent visits to geological features, use of geo-trails and viewpoints, guided tours, geo-activities and patronage of geosite visitor centers". From wider aspects, geotourism is a special form of tourism which is based on learning about geological objects and processes (geosites) with special emphasis on their aesthetical and historical value, and exploring technical monuments connected to mining activity (abandoned mines and/or quarries, mining museums, trade routes of goods of mining origin) and technical and historical monuments connected to mining history (Rybár, et al., 2010). An alternative view on geotourism is given by National Geographic (2014). They define geotourism as "tourism that sustains or enhances the geographical character of a place - its environment, culture, aesthetics, heritage and the well-being of its residents".

In general, it can be assumed that geotourism covers a variety of aspects (educational, scientific, environmental, social, cultural, economic, promotional, technical, service), on which the development of geotourism depends (Slomka & Mayer, 2011). After the year 2000, establishment of geoparks and definition of the European Geoparks Network (EGN) and Global Geoparks Network (GGN) accelerated geotourism development worldwide.

According to recent UNESCO definition, geopark can be characterized as follows: "A Global Geopark is a unified area with geological heritage of international significance. Geoparks use that heritage to promote awareness of key issues facing society in the context of the dynamic planet we all live on. Many Geoparks promote awareness of geological hazards, including volcanoes, earthquakes and tsunamis and many help prepare disaster mitigation strategies among local communities. Geoparks hold records of past climate change and are educators on current climate change as well as adopting a best practice approach to utilizing renewable energy and employing the best standards of 'green tourism'. " (UNESCO, 2014)

Every social activity works on the principle of some organization as purposefully created system accomplishing objectives for which it was created. Geopark should fulfill following tasks (Rokovanie vlády SR, 2010):

- care for the local environment and protection of geopark localities (geosites);
- education;
- research and scientific activity, cooperation with scientific institutions;
- region presentation, care for tourists, monitoring and evaluation of tourism services, awareness ensuring (guide, animators);
- cultural and sport activities, workshops;
- local production and development.

The history of geoparks at international level has begun in 1991. In this year, an International Declaration of the Rights of the Memories of the Earth had been adopted. This international initiative had been sign-up by International Union of Geological Sciences (IUGS), International

Geoscience Programme, ProGeo, Malvern Group, UNESCO's Division of Earth Sciences and European Council (Rokovanie vlády SR, 2010).

Multidisciplinary nature of geopark and its role within tourism support clearly differ geoparks from any other models of tourism sustainable development. From this point of view, geoparks with its geotourism offer can be considered as innovation within tourism bringing several benefits (including employment increase, economic benefits, etc.), especially to the region of geopark.

METHODOLOGY

To testify if geopark and geotourism activities contribute to the development of the area and its prosperity, a comparative study was chosen. Selected indicators including the number of night stays of visitors in accommodation facilities, the number of visitors in accommodation facilities, the number of accommodation facilities were compared before and after the geopark establishment. Visible increase within individual studied indicators will clearly confirm that geotourism activities as relative innovative approach within the tourism influence the tourism development of the geopark area. Also, financial investments were assessed. As the data needed for this study were available only from Slovak part of the geopark, this study discusses impact of geotourism only on this area.

NOVOHRAD-NÓGRÁD GEOPARK OVERVIEW

Novohrad-Nógrád Geopark as a cross-border (Slovakia-Hungary) includes 28 municipalities in its Slovak part and 63 municipalities in Hungary (Fig. 1). In the area of geopark, two protected areas are located – Cerová Vrchovina Protected Landscape Area andd Karancs Medves Protected Area. Both areas were established to protect and preserve the youngest Neogene volcanics within the region in 1990. Thanks to relative young age of the geological structures they can be used not only for research but for educational and tourism purposes for general public.

The project of the geopark was initiated by the idea plan in 2003. This plan was processed into complex spatial and development study of geopark in the area of both states during 2006 and 2007.

In 2008, the geopark was officially established and its management started to prepare for all the requirements to become a member of European Geoparks Network (EGN) and Global Geoparks Network (GGN). In 2010, Novohrad-Nógŕad Geopark became the 37th EGN member and 66th member of GGN (Geoparky na Slovensku, 2014).

General characteristics of the geopark are given in the table 1. As summarized by EGN, "within a relatively small area a wide spectrum of volcanic activity can be investigated. Devastating pumice flows, andesitic stratovolcanoes formed under the sea and on land, long dyke networks, a basalt plateau which is noted amongst the largest uninterrupted examples in Europe, deeply eroded vents of andesite and basalt volcanoes, diatremes and a real speciality, the bundles of regularly shaped, arcuated rock columns derived from the slow cooling of the basalt and andesite lavas." (European Geoparks Network, 2014)

DISCUSSION ON THE IMPACT OF GEOPARK ESTABLISHMENT ON REGIONAL TOURISM

One of the best way how to express the impact of geopark establishment on regional tourism development is via the total number of visitors.

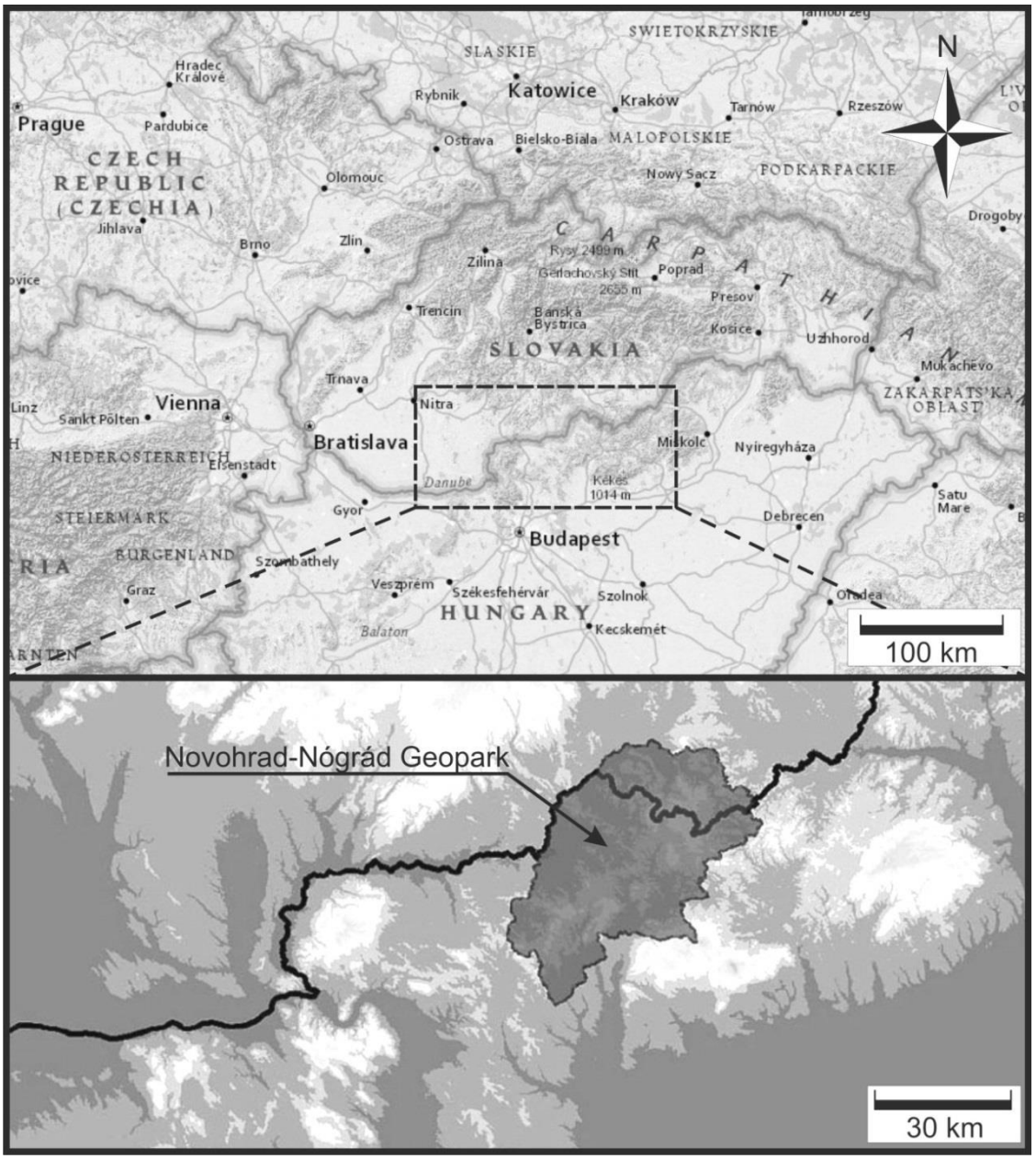


Fig. 1 Location of the Novohrad-Nógrád Geopark (source: arcgis.com, European Geoparks Network, 2014; modified)

As there is no regular and/or official evidence of geopark visitors in the study area, the only way how to assess the impact of the innovation within the tourism offer in the region is to compare the number of visitors and their night stays before and after the geopark establishment.

Despite many publications dealing with geotourism and/or geoparks, there is lack of research devoted to direct impact of geopark establishment and geotourism on regional development. According to Elder and Patzak (2004), with respect to sustainable development, numerous areas in the world offer immediate potential for substantial economic development because of the presence of a diverse range of geological phenomena including, amongst many others, structures, minerals and fossils. Geological heritage sites, properly managed, can generate employment and new economic activities, especially in regions in need of new or additional sources of income. But their conclusions are not supported by any research numbers.

Härtling and Meier (2010) concluded that it is not possible to prove direct relationship between the geopark and the tourist expenses. They assumed that (geo)tourist spend relatively little money on lodging, but on the other hand notable amount of money on meals and additional services.

Farsani, Coelho and Costa (2012) assumed that a new vision of geotourism and geoparks, through innovation and some strategies, attempt to develop the local economy via direct incomes Data obtained from the Statistical Office of the Slovak Republic and the Slovak Tourist Board give interesting results (Figs. 2 - 4). There is not very visible increase of visitor number and their night stays after the geopark establishment (years 2008, 2009). And, other clearly visible fact is decreasing trend of studied variables in general. That means that neither such innovation like establishment of geopark does not assure sustainable development and increase of visitor numbers.

On the other hand, to be objective, it is necessary to say here that world financial crisis from 2007-2008 influenced the tourism sector also. Therefore a comparison of ratio of studied variables from geopark area to the whole self-governing region area was made (Figs. 5, 6).

As it can be seen from graphs above (Figs. 2 – 6), it is very hard to find a relationship between geopark establishment and the number of visitors and their night stays in accommodation facilities in the area. The only clear conclusion is, that after geopark establishment several new accommodation facilities were open and in connection with it, local economy was

Tab. 1 General characteristics of the Novohrad-Nógrád Geopark (source: Geoparky na Slovensku, 2014)

Geopark area	1578 km^2 (336 km^2 in Slovakia and 1251 km^2 in Hungary)
Number of geosites	76 (32 in Slovakia, 44 in Hungary)
Presented topics	geology, nature protection, history, culture
Geological characteristics	Neovolcanics

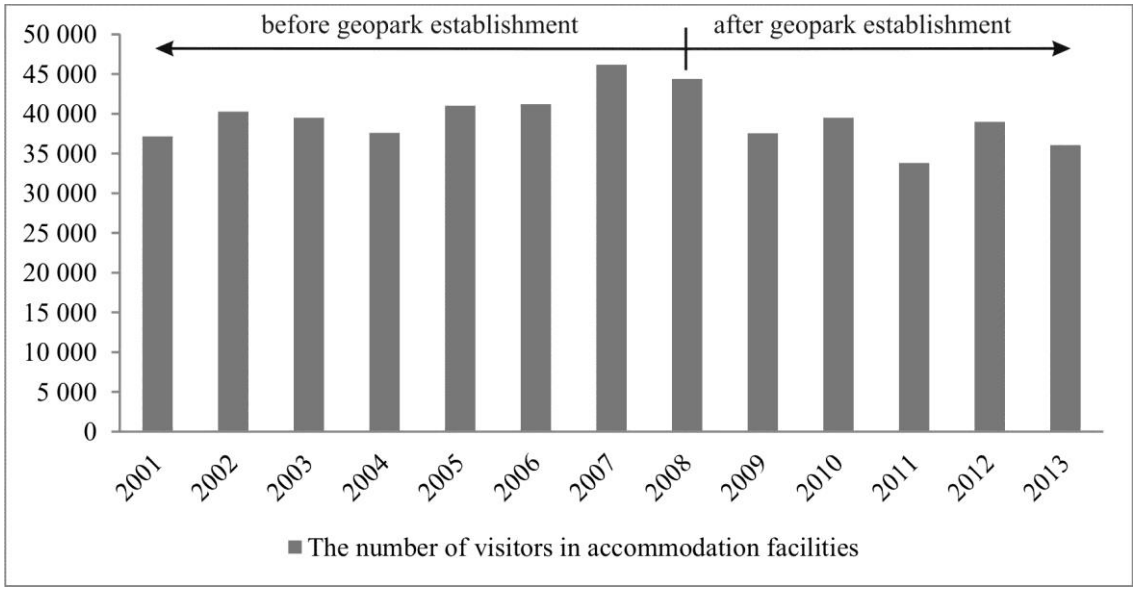


Fig. 2 The trend of the number of visitors in accommodation facilities in the Slovak part of the Novohrad-Nógrád Geopark (source: Statistical Office of the Slovak Republic, 2014; own compilation)

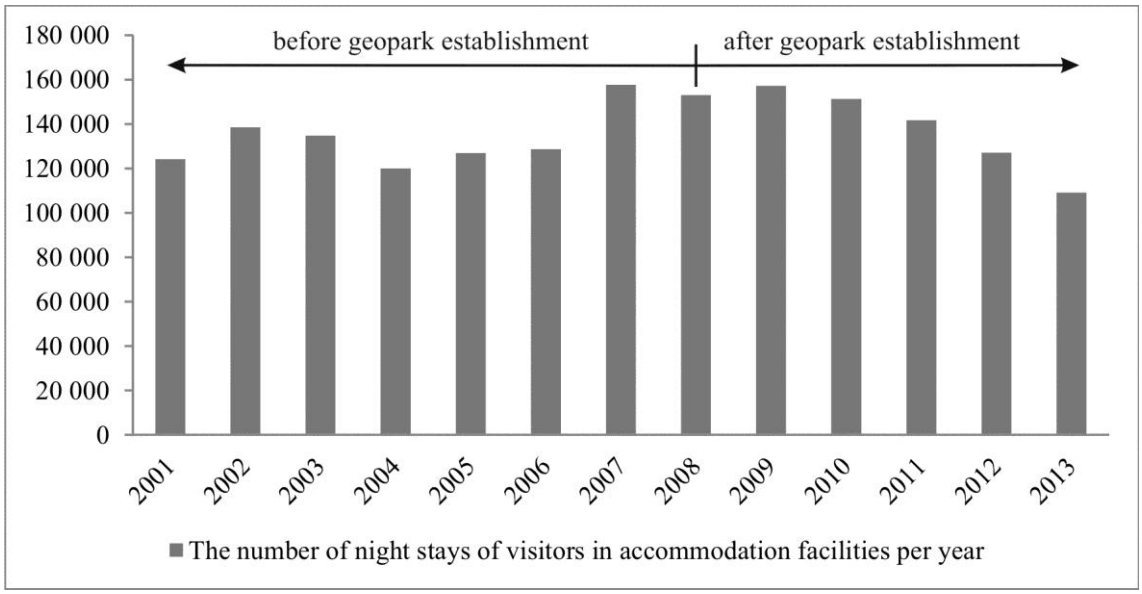


Fig. 3 The trend of the number of night stays of visitors in accommodation facilities in the Slovak part of the Novohrad-Nógrád Geopark (source: Statistical Office of the Slovak Republic, 2014; own compilation)

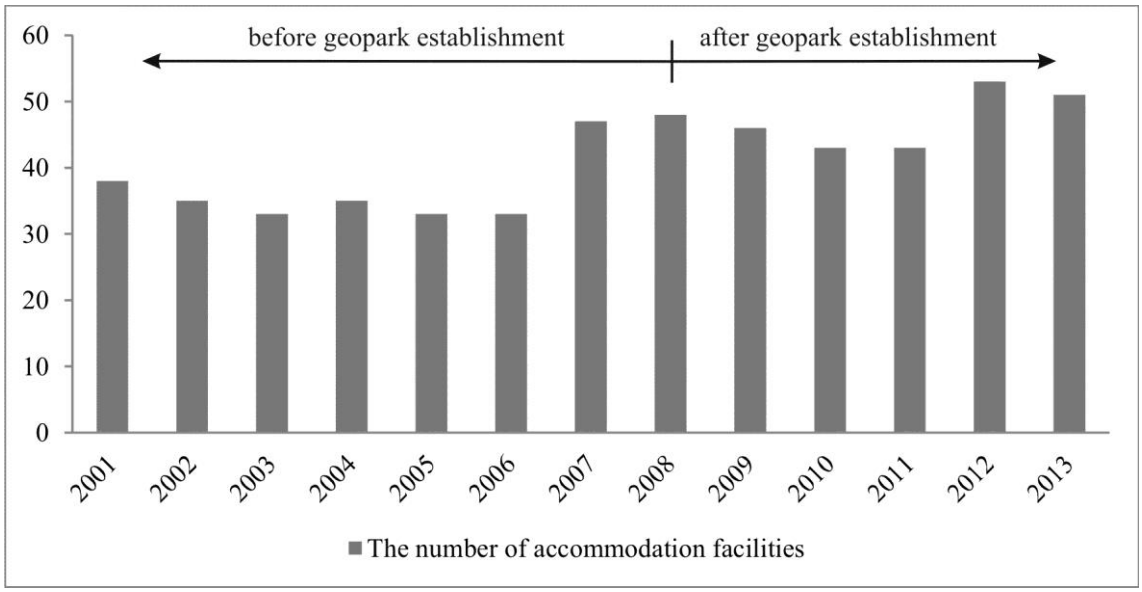


Fig. 4 The trend of the number of accommodation facilities in the Slovak part of the Novohrad-Nógrád Geopark (source: Statistical Office of the Slovak Republic, 2014; own compilation)

more supported. Because geotourists do not spend a lot of money on accommodation (Härtling and Meier, 2010), or they do not stay in the area of geopark during the night in general, another way how to quantify the impact of geopark establishment on the regional development is to analyze the data from direct financial support connected with the geopark activities. Establishment of the Novohrad-Nógrád Geopark requires inevitable and continuously coordinated activities aimed on the geopark vision fulfillment, development of the geopark area and management, and constantly improve this practice to reach balanced development throughout the whole area of the geopark.As a result of successful cooperation several projects, devoted to the development on primary and

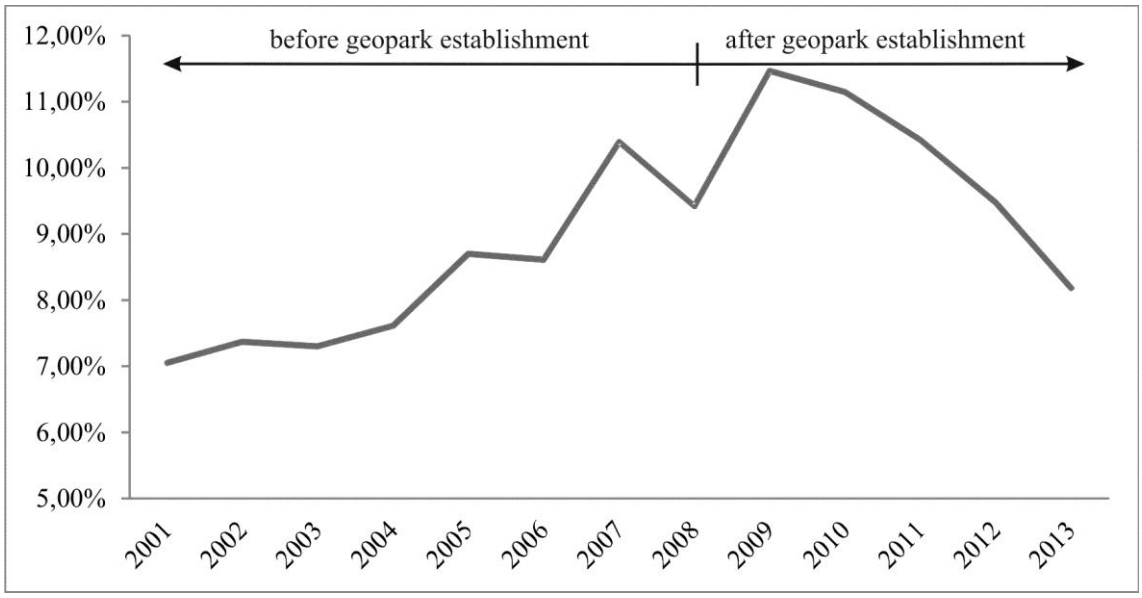


Fig. 5 Percentage of the number of visitors' night stays in accommodation facilities in the Slovak part of the Novohrad-Nógrád Geopark within the total number of visitors' night stays in whole area of the Banská Bystrica Self-governing Region (source: Statistical Office of the Slovak Republic, 2014; own compilation)

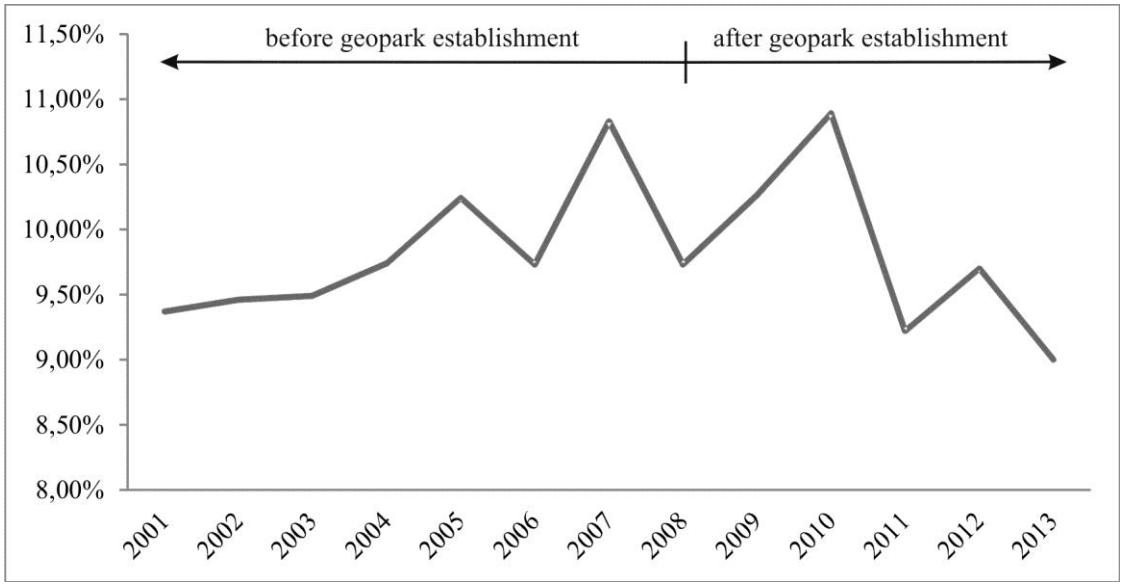


Fig. 6 Percentage of the number of visitors' night stays in accommodation facilities in the Slovak part of the Novohrad-Nógrád Geopark within the total number of visitors' night stays in whole area of the Banská Bystrica Self-governing Region (source: Statistical Office of the Slovak Republic, 2014; own compilation)

secondary tourism offer, have been proposed and realized in the area of the geopark, e.g. Palóc Route supported by EU funds by 806 206 €, Development of the Novohrad-Nógrád Geopark infrastructure with budget of 494 984 €, Development of tourism destination of Novohrad-Nógrád Geopark (339 966 €), or the project of Development of tourism products and information system of Euroregion Neogradiensis and Novohrad-Nógrád Geopark with budget 21 965 € (19 205 € supported by EU funds). In total, more than 3 000 000 € were invested in different activities connected to the geopark (Mesto Fiľakovo, 2014). So, it can be assumed that establishment of the geopark has contributed by plumbless amount of financial support to the regional

development of tourism in general.

CONCLUSION

Geotourism as relative new form of tourism brings several innovations into the tourism sector. Here, geopark establishments and their active running can be considered as one of the most significant contributions which can positively affect whole area of geopark and its vicinity. Therefore, appropriate attention should be paid on the impact of geoparks and geotourism on regional (tourism) development.

According to the study results presented in this paper, it is not clearly visible that establishment of the Novohrad-Nógrád Geopark has resulted into increase of numbers of visitors using services of accommodation facilities. Taking into account that economic crisis affected the tourism customer behavior, we can assume that on one hand the geopark itself maybe did not resulted into increase of visitor numbers but on the other hand it is necessary to mention that without this type of innovation within tourism offer in the study area the numbers of visitor would be much lower. As these numbers are the only available official statistical data which can be analyzed in such kind of study, it would be useful to develop effective form data collection for further analysis and research as presented in this paper. Also, the study results show that geopark establishment can significantly help to obtain financial support for regional tourism development, so the area of geopark is more competitive in comparison to other regions.

REFERENCES

Dowling, R.K. and **Newsome, D.,** eds. (2006) Geotourism. Elsevier, Oxford, 260 p.

Eder W. and **Patzak M.** (2004) Geoparks - geological attractions: a tool for public education, recreation and sustainable economic development. Episodes, 27(3), pp. 162–164

European Geoparks Network (2014) Novohrad-Nograd Geopark – HUNGARY – SLOVAKIA [online] Available at: <http://www.europeangeoparks.org/?page_id=548> [Accessed 12 September 2014].

Farsani, N.T., Coelho, C.O.A. and **Costa, C.M.M.** (2012) Tourism Crisis Management in Geoparks through Geotourism Development. Revista Turismo & Desenvolvimento, 17/18, pp. 1627-1638.

Geoparky na Slovensku (2014) Novohrad - Nógrád geopark. [online] Available at: <http://www.geopark.sk/Slovensko/Novohrad-Nograd%20geopark> [Accessed 13 September 2014].

Härtling, J.W. and **Meier, I.** (2010) Economic Effects of Geotoruism in Geopark TERRA.vita, Northern Germany. The George Wright Forum: The GWS journal of parks, protected areas & cultural sites, 27 (1), pp. 29-39.

Hose, T.A. (1995) Selling the story of Britain's stone. Environ Interpret, 10 (2), pp. 16-17.

Hose, T.A. (1996) Geotourism, or can tourists become casual rock hounds? In: M.R. Bennett, P. Doyle, J.G. Larwood, C.D. Prosser, eds. 1996. Geology on your Doorstep. Geological Society, pp. 207-228.

Hose, T.A. (2000) European geotourism — geological interpretation and geoconservationpromotion for tourists. In: D. Barretino, W.A.P. Wimbledon and E. Gallego, eds. 2000. Geological heritage: its conservation and management. Instituto Tecnologico GeoMinero de Espana, Madrid, pp. 127-146.

Joyce, B. (2006) Geomorphological sites and the new geotourism in Australia. [online] Available at: <http://earthsci.unimelb.edu.au/Joyce/heritage/GeotourismReviewebj.htm> [Accessed 12 August 2014].

Mesto Fiľakovo (2014) Informácie o projektoch [online] Available at: <http://www.filakovo.sk/index.php/sk/mesto/informacie-o-projektoch> [Accessed 10 October 2014].

National Geographic (2014) The Geotourism Charter SR [online] Available at: <http://travel.nationalgeographic.com/travel/sustainable/pdf/geotourism_charter_template.pdf> [Accessed 12 August 2014].

Rokovanie vlády SR (2010) Návrh Koncepcie geoparkov v SR [online] Available at: <http://www.rokovanie.sk/File.aspx/ViewD

ocumentHtml/Mater-Dokum-32203?prefixFile=m_> [Accessed 12 September 2014].

Rybár, P., Baláž, B. and **Štrba, Ľ.** (2010) Identifikácia objektov geotourizmu. Edičné stredisko TU FBERG, Košice, 101 p.

Sadry, B.N. (2009) Fundamentals of Geotourism: with a special emphasis on Iran, Samt Organization publishers, Tehran. 220 p. (English Summary available Online at: http://physio-geo.revues.org/3159?file=1).

Slomka, T. and **Mayer, W.** (2011) Geotourism – an interdisciplinary educational specialization. Przeglad Geologiczny, 59, pp. 329-334.

UNESCO (2014) What is the Global Geoparks Network? [online] Available at: <http://www.unesco.org/new/en/natural-sciences/environment/earth-sciences/global-geoparks/some-questions-about-geoparks/what-is-a-global-geopark/> [Accessed 10 September 2014]