

GEOMORPHOSITES AS A VALUABLE RESOURCE FOR TOURISM DEVELOPMENT IN A DEPRIVED AREA. THE CASE STUDY OF ANINA KARSTIC REGION (BANAT MOUNTAINS, ROMANIA)

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Abstract: Geomorphosites are those landforms that in time, have acquired, a certain value, naming here scientific, cultural, aesthetic, ecological and/or economic. In many papers geomorphosites were associated with natural, relief-related tourist attractions. Those two notions, geomorphosite and natural tourist attraction are not synonymous, because a geomorphosite presents many features that give value to that landform. A geomorphosite is more than just topographic feature and that is the reason for which not all natural attractions are considered geomorphosite. Anina karstic region is synonymous with Anina Mining Area. This area was defined by Vasile Sencu (1977) as the area that is surrounded Anina town and it may be exploited by mining activities. The studied area presents many landforms specific for karst terrains. These features belong to the exokarst (sinkholes, poljies, karrens, gorges, karstic springs), but also to the endokarst (caves, shafts). The area is located in the largest and most compact area of carbonate rocks in Romania, in a typical structural area, Reșița-Moldova Nouă Synclinorium. Anina karstic region is an area with many socio-economical problems: poverty, unemployment and depopulation. Many landforms belonging to karst topography may be considered as geomorphosites due to their value (natural, economic, cultural). We believe that if some of these geomorphosites will be included in the touristic objectives, those landforms may generate a social-economic progress in this region, which nowadays is a deprived area. The aim of this paper is to point out that karstic geomorphosites in a deprived area may be a valuable resource.

Key words: karst, geomorphosite, tourism, Anina, Romania

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INTRODUCTION

Anina karstic region is synonymous with Anina Mining Area. This area was defined by Vasile Sencu (1977) as the area that is surrounded Anina town and it may be exploited by mining activities. The studied area presents many landforms specific for karst terrains. These features belong to the exokarst (sinkholes, poljies, karrens, gorges, karstic springs), but also to the endokarst (caves, shafts) (Sencu, 1963, 1964).

The area is situated in Banat Mountains, in the centre of Anina Mountains, in the largest and most compact area of carbonate rocks in Romania, in a typical structural area, Reșița-Moldova Nouă Synclinorium (Orășeanu & Iurkiewicz, 2010).

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This paper represents the first step in the study of geomorphosites of the Anina karstic region, the identification step (Gavrilă & Anghel, 2013) when we only mention the most representative landforms of the study area. The next steps, that will be presented in further works, has to come with an inventory stage (Gavrilă & Anghel, 2013) meaning that we have to obtain a database regarding geomorphosites. Besides, to implement a new type of tourism in the area, geotourism, the geomorphosites should receive a score based on an evaluation method, and finally, when these geomorphosites will receive an educational value, we will be able to come with a model approach to the interpretation of the scientific value of these karstic geomorphosites (Neches, 2013).

There are many localities where natural resources may represent the main source of revitalization, but scientists have to bring to public attention this opportunity. One paper that points out the valuable natural resources is regarded Vașcău town, a town that is facing almost the same problems as Anina town, meaning here increasingly poor quality of urban life and youth emigration (Prašca, 2012).

Nowadays, the interest in geomorphological heritage or geomorphosites is increasing. There are certain concepts that are defining a geomorphosite, meaning that this feature must be a landform which we can attribute a certain value and must be a geomorphological resource which can be used by the society (Panizza, 2001). Comănescu & Nedelea (2010), quoting Panizza & Piacente (1993) mention that geomorphosites are represented by those landforms that in time, have acquired, a certain value, naming here scientific, cultural, aesthetic, ecological and/or economic.

Many of these values may be very subjective when we consider the importance of such a geomorphosite. The scientific, cultural and ecological values may be easier to evaluate due to the state of the art that it is in the literature. On the other hand, the aesthetic is a very subjective value, given only by the personal perception, by the individual consideration and feelings (Panizza, 2001). Also, the economic value is very subjective, because some economic factors may want to exploit a certain geomorphosite quick and get incomes rapidly, being in this under the risk of being destroyed, or the reverse, to get incomes for longer periods, but with the main aim of preserving that landform.

In the analysis of the geomorphosites there will always be the problem of subjectivity because the knowledge and the experience of the observer are defining the study regarding such geomorphological heritage (Panizza, 2001).

A tool that may be very useful for tourism in areas with many geomorphosites may be the geotouristic map, representing a cartographic tool that combines information of geological and geomorphologic nature, but also basic touristic information as belvedere points, information posters, etc. The aim of this new type of map is to help the tourist to understand better landforms that are belonging to the geomorphologic and geological heritage of a territory (Comănescu et al., 2013).

The geotouristics maps may have as potential customers people from different domains: tourists, young people, local residents, old people, scientists, etc. This type of maps are able to provide the landscape's observers more information on the geological and geomorphological processes, including their spatial and temporal scale (Miccadei et al., 2014).

SITE GEOLOGY AND GEOMORPHOLOGY

The Reșița - Moldova Nouă Zone is the classic area in Romania where the sedimentary aspect is developed, even if sediments that covered a significant part of the field were largely removed by erosion. Reșița - Moldova Nouă worked as a depression in which succession and erosion of sedimentary cover were complete (Mutihac & Ionesi, 1974).

In Anina karstic area we may find different types of limestone: Anina Valley's limestone, Brădet limestone, Marila limestone, Gumpina limestone, Miniș limestone and also different types of marl. Should be mentioned the presence of clays, and also noncarbonated materials that are occupying smaller areas, such as granite, gravel and sandstones.

Lithologic and tectonic factors that influenced the development of landscape region are promoting or slowing the erosion action of exogenous agents, the most important are: the hardness of the rocks, their plasticity, their alternation, but also the character crease or the thickness of the various deposits and the depth to which they are (Mateescu, 1961).

From the structural point of view the study area is a folded region, with a Jurassic relief, being characterised by the presence of anticlines and synclines. The folds are Creases generally have a regular appearance, and are parallel to NNE-SSW orientation (Mateescu, 1961).

From the geomorphological point of view, the Anina karstic area presents a variety relief due to the high diversity of lithology, but also due to their structural aspect (figure 1) (Răileanu et al., 1964).

The entire area dominant geomorphological characteristic, which is conditioned by its geological structure, is represented by the existence of long parallel ridges, separated by valleys and karst plateaus (Bucur, 1997).

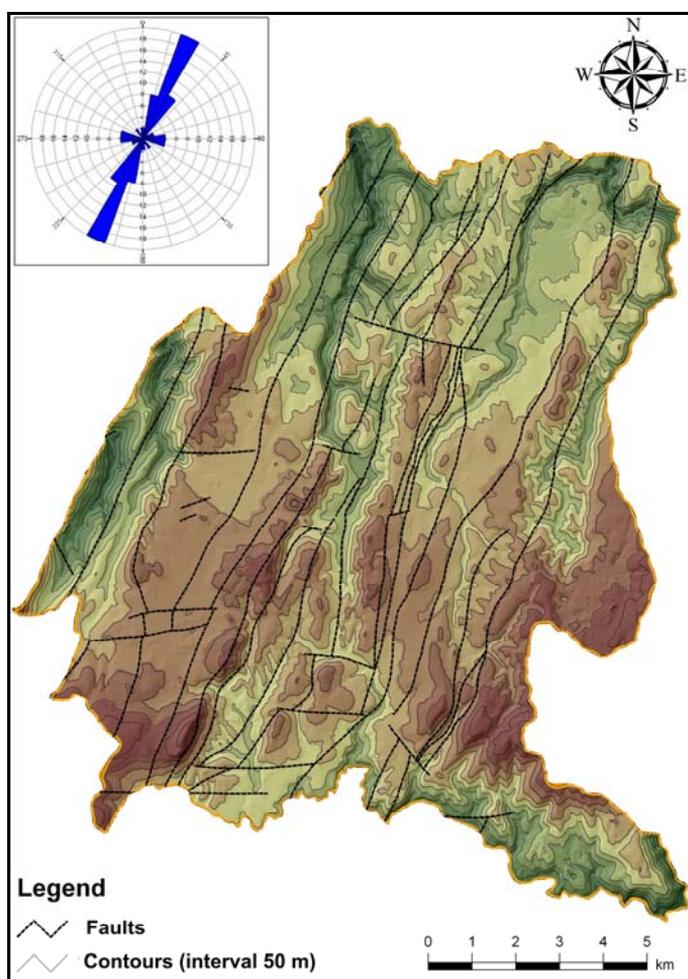


Figure 1. Main faults in the study area and their influence on the morphology
(Source: the faults were extracted from the geological map L-34-104-D-121d Anina 1:50000)

Also, there are a series of limestone ridges and plateaus which are separated by deep valleys; they succeed from west to east in the direction of the geological structure, NNE-SSW. The development of large areas of karst landscape fragmentation has as consequences peaks and disorganized valleys. The sequence of karst plateaus separated by deep valleys, give to this karst region the representativeness of suspended karst plateaus, areas with a high degree of karstification (Onac, 2000). From the entire surface which means approximately 172,4 km², carbonate rocks are occupying 144,3 km². On the other side, the non-carbonate rocks are occupying 28,1 km². In our study area there are present both exokarstic and endokarstic landforms. From the exokarstic point of view we may mention: karrens, karrens fields, sinkholes, sinkholes valleys, uvalas, poljes, blind valleys, dry valleys, gorges. Endokarstic landforms are represented by the presence of many caves and vertical shafts.

GEOMORPHOSITES AS A VALUABLE RESOURCE

Geomorphosites may be analysed from at least two perspectives, naming here the scientific perspective and the social approach. From the scientific approach, only „*geomorphologists*” may make considerations regarding such landforms and their values from the point of view of their evolution, their rarity in a certain landscape and their importance in the study area (Panizza, 2001). During last years, the creation of geoparks and the development of geotourism implies also geomorphosites as main features in these fields of tourism, and also the need to create new approaches regarding these geomorphological landforms, besides their geomorphological importance (e.g. cultural, ecological) (Reynard et al., 2007). Geomorphological features are immediately recognizable and represent most attractive non-living natural elements of the landscape. These landforms aroused people by their memorable shapes and unusual aspect. By the value given by people these forms become heritage, or a value. This value is given by its attributes and allows the landform to be declared a geomorphological natural value (Erhartič & Zorn, 2012). From the other perspective, the social perspective may be addressed from many points of views as economic, cultural, and ecological. As „*tourism specialists*” we may also deal with this second perspective regarding our study area. There are opinions that consider more important in protecting and conserving the geomorphosites, than employing this geomorphological heritage in a touristic direction, this opinion being made regarding Bucegi Natural Park (Comănescu & Nedelea, 2010). One geomorphosite in Anina karstic area is Zânei Hill (in local speaking called Tâlva) where were found different plant fossils belonging to Jurassic period. This site may be included in a geopark, but for achieve these aim there should be found a method to evaluate the importance of this site. One example is the evaluation of two sites, one in Croatia - Papuk Mountain Geopark, and one in Serbia, Fruska Gora Mountain, that are proposed for geoparks using a method for evaluate the importance of these sites (Petrovic et al., 2013). But, we believe that, as „*geomorphologists*” and as „*tourism specialists*” may promote Anina karstic area as an important touristic area based most of the tourist potential on the geomorphological heritage. Anina karstic area is surrounding Anina town, which in the past was an important economic point in the area due to the mining activities. After the socialism collapsed, Anina started the regression, both economic and social. Since 2006, when the mining activities have been stopped, Anina area is considered as a deprived area because there are many unemployed people and also depopulation is an active process. Besides, the mining infrastructure may cause many ecological problems because there are no management plans regarding waste dumps and mining galleries. All these problems give us the motivation to bring the public attention that tourism may be the best solution for this area, and geomorphosites may represent the high points of interests in Anina region.

GEOMORPHOSITES IN THE STUDY AREA

The most important geomorphosites in the area are represented by caves. In the study area there are more than 600 caves, most of them having small extensions, but there are also some large caves which are important tourist attractions. We may mention here Buhui Cave, the largest and

the most important of them, Plopa Cave, another important cave. Other large caves are The Cave with Water from Gârliște Gorges and The Vertical Shaft under Black Ridge. Then smaller caves are Cuptoare, Isvarnița, Blue Vertical Shaft, Cârneală, Ponor, Mărghitaș, and Cave of Caraș Spring, Anina Cave, and Girl's Cave. Most of these caves are located in accessible sites, but most of them are not marked with touristic indicators or are not included in the touristic trails. The reasons for this situation are different. From the environmental protection, the NGOs and environmental agencies are trying to protect these vulnerable sites by not including them in the touristic resources. But, there are many unorganised touristic activities that imply visits in many of those sites, and, in this way there is neither a benefit. On the other hand, there are the local authorities that are trying to promote this karstic area as a touristic destination and they are including these geomorphosites in their promotional materials. And in this way there is a fight between keeping these features intact from the human influence and the aim to develop tourism in this area by using these speleological features as the main attraction of this region.

Buhui Cave (figure 2)

The largest cave in the study area is situated in the central part of the Plateau Colonovăț, downstream of Lake Buhui. Access to the cave Buhui can be done through four entrances. They are listed from upstream to downstream, namely: Entry Certej entry through the pit entry through sinkholes and Buhui Grotto entrance. Is an active cave which drains the waters of the two springs, Buhui and Certej. To be mentioned that Buhui Cave has several levels, namely the asset, where the cave is crossed by the creek waters Buhui, the semi-active, which is active only at high water and the fossil (Sencu Basil Hall, Bears Hall) that was once active but now it is not crossed by any water course, being nice concretions.

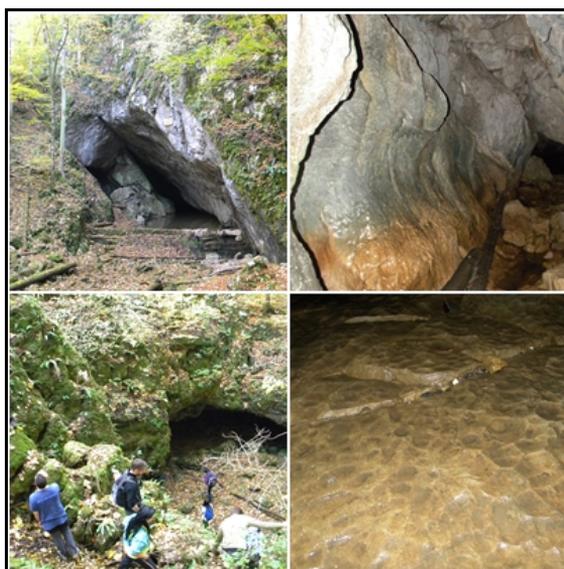


Figure 2. Two of the entrances in Buhui Cave and pictures from the interior of the cave

Ponor Cave (figure 3)

This cave is located in the South-West of the Ponor Plateau, close to the former Thermal Power Crivina, upstream of the Plopa Cave. Gallery floor is covered with clay and limestone blocks detached from the ceiling. The ends of the gallery floor of the cave are covered with a crust of stalagmite origin that were formed many domes. The walls of the manifold and forms the ceiling of the concretion, which are disposed on the side. Terrace erosion found in the cave and in

some places, like wall morphology shows that this was the course of a river, which subsequently found deeper flow paths through the cave that is in the vicinity Ponor Cave and at a lower level. Today, the cave is one type of fossil. As she began clogging the concretion, and the entry area, ceiling threatened to collapse (Sencu, 1964).



Figure 3. Pictures of Ponor Cave
(Source: Alina Satmari, 2005)

The Cave with Water from Gârliște Gorges (figure 4)

The cave has a big opening, facing South, South-West, which leads to a large gallery and up to 9 m high, lit up the first side (47 m) first gallery is oriented north, then East, and terminal side splits and both subgalerii become impenetrable by clogging with sand and gravel (Bleahu et al., 1976). Traces of water are visible everywhere in the cave erosion terraces, marmite with water and sharp blades on the floor, spoons, ditches, and vermiculații hieroglyphics on the walls, septa and domed ceiling and also as a result of water erosion, flint nodules and policies black or white. In some places the floor, ceiling and walls are well concretion.

Cârneală Cave (figure 5)

It is a cave downward, with a grand entrance. The floor of the cave is covered with large blocks of stone, and the ceiling shows small speleothems in the early stage of training. Towards the end of the cave ceiling is getting closer to the floor. In the first half of the gallery concretion formations do not occur. They begin to be seen in the final part of the cave, but are small and prevailing formations ceiling. Configurations are also downward in accordance with the development of the cave.

Cave from Caraș Spring (figure 6)

It is a cave downward, with a large opening. During dry periods the entrance hall and the next room are dry, but then the creek that flows through the cave galleries makes its presence felt. The cave is beautiful concretion, especially forms of wall and ceiling. The cave is located at the bottom of a valley, at the base of a steep wall on the front valley upstream of Caraș Spring; here come the name of the cave. Access to the cave is difficult due to the difference of level trail leads to Caraș Gorges and because of the stone blocks on the valley.

Mărghitaș Cave (figure 7)

It is located on the right side of the Buhui Valley, downstream Buhui Cave. It is carved in limestone Barremian-Aptian age. The cave is formed downward from a gallery, with several flues, which has at the end a reservoir and has a length of 115 m. Gallery floor consists of living rock alternating with calcareous crust. Concretion forms appear on the ceiling and on the walls of the gallery.

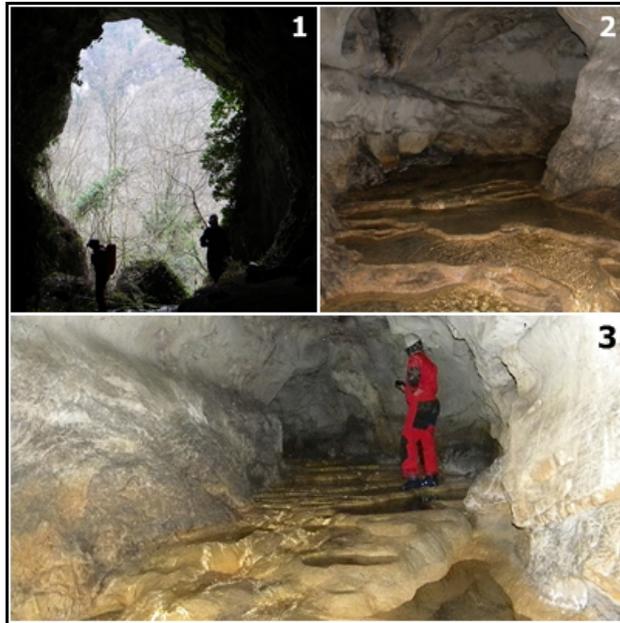


Figure 4. The Cave with Water from Gârliște Gorges



Figure 5. The entrance in Cârneală Cave and aspects of the interior of this cave



Figure 6. The entrance of the Cave from Caraș Spring and aspects from inside



Figure 7. The entrance of Mărghitaș Cave and speleothems inside the cave

Cuptoare Cave (figure 8)

It is carved into the limestone of the upper Aptian age on diacalse tectonic and has a length of 135 m cave is a former Cave Buhui upper gallery, and links between these two caves is blocked by a pit by the collapse of rocks, a pit which past made junction with Cave Buhui (Sencu, 1963).

Cuptoare Cave consists of a short corridor leading to two rooms that are succeeding with the floor covered by a calcareous crust. The walls and ceiling are various speleothems. In the last room concretions appear spectacular. Much of our cave speleothems are damaged, and that cave over there is a forestry road.

The Vertical Shaft under Black Peak (figure 9)

This vertical cavity is located in the northern part Anina Mountains, in Jitin basin, in a small plateau about 1 km² in the eastern slope of the valley suspended of Jitin, downstream Jitin Spring, being framed by Polom Peak and Black Peak.



Figure 8. Spelethems in Cuptoare Cave

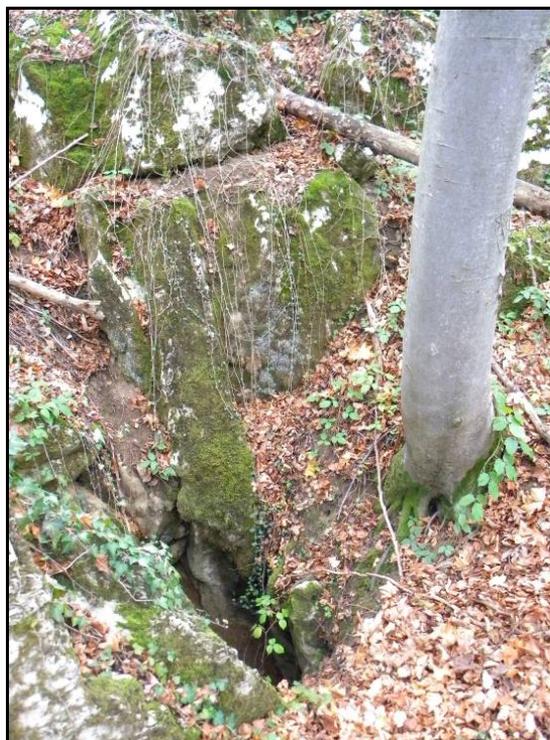


Figure 9. The entrance in The Vertical Shaft under Black Peak

Other geomorphosites in this area is Bigăr Water Fall, Buhui Gorges (figure 10a), Gârliște Gorges (figure 10b), Miniș Gorges, Caraș Spring (figure 11a), Certej Spring (figure 11b), and a Zânei Hill Geopark. All these landforms and karstic features represent, besides speleological features, many points of interests that could be considered as geomorphosites.

But, there are also specific karstic landforms that may be considered as geomorphosites, and here we may mention large karren fields (figure 12a), large sinkholes (figure 12b) and sinkholes valleys. All these landforms, specific to a karstic region may be included in the touristic materials with the aim to promote this area by the importance of these geomorphosites.

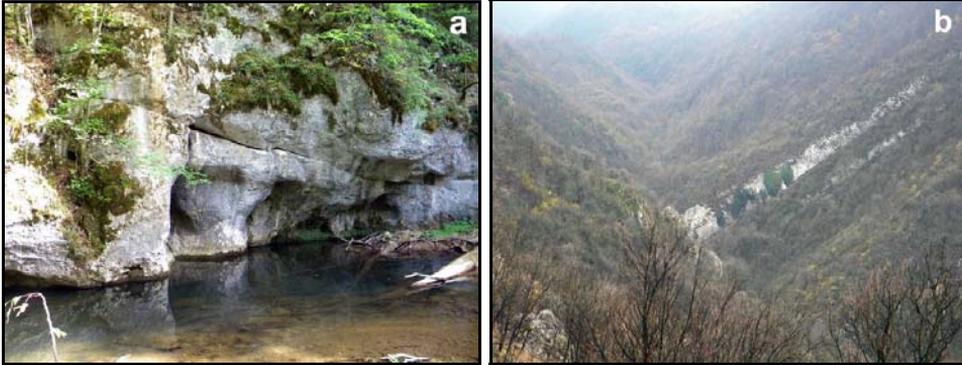


Figure 10. Buhui Gorges (a) and Gârliște Gorges (b)



Figure 11. Caraș Spring (a) and Certej Spring (b)

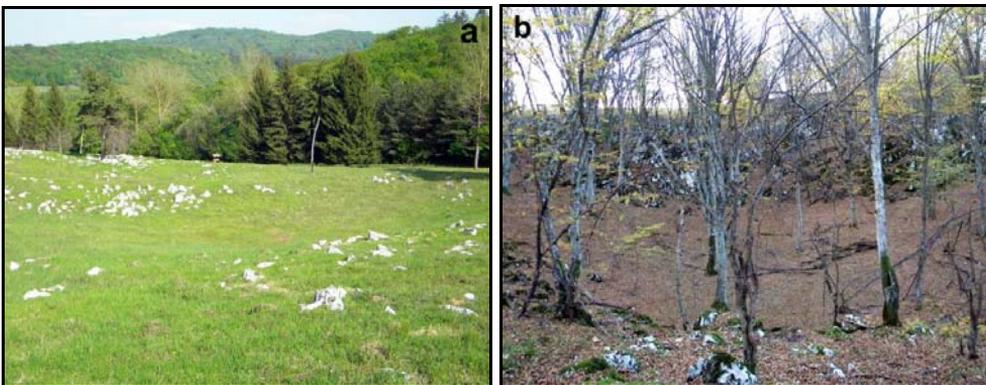


Figure 12. Karren fields (a) and a large sinkhole (b)

Tâlva Zânei geopark

In the vicinity of Anina it is situated the highest peak, Tâlva Zânei (Hill) with an altitude of 935 meters. There in the past was a quarry, and there have been found plant fossils. But there is nothing arranged for four touristic purposes, even if the site has large value from scientific point of view. These paleontological resources are very important because the collection of plant fossils present in Zânei Hill has a high diversity of species belonging to the Jurassic flora (Popa et al., 2009). There are different proposals and ideas that are trying to protect the geological and paleontological heritage of Zânei Hill. For researchers the heritage of this hill deserves to be protected and in their opinion this thing is possible only by creating an organized geopark, under a law. This potential geopark is seen as an opportunity to increase the environmental preservation, but also a chance to increase the economic potential of Anina town by obtaining incomes from touristic activities (Popa et al., 2010).

CONCLUSIONS AND PROPOSALS

This paper presents briefly a karstic area with many geomorphosites that could be exploited in the tourism activities with the aim to reborn from economic and social perspectives a deprived area. We consider that geotourism or ecotourism may be the forms of exploitation of this area to have equilibrium between exploitation and preservation. Based on many field trips and many references regarding the study area, we consider that we are able to present certain proposals regarding the idea of exploiting geomorphosites in the Anina karstic area.

The first proposal would be to map and quantify the entire area and all these geomorphosites that are belonging to the karstic category.

Second, evaluate the impact of tourist activities which may affect these vulnerable geomorphological landforms and define a strategy for a rational exploitation of these areas.

The third proposal is to develop a number of educational and touristic trails that should be strictly respected by visitors.

The fourth proposal is to involve local communities in these tourist activities. Here we speak about guides and persons who should ensure the security for visitors.

And the last proposal is to adopt taxes that would be afforded by locals and also by those who are coming from different other regions.

To conclude this paper, we point out that tourism and the auxiliary economic activities may be the best option for the deprived Anina region, because, besides the geomorphosites in this area there are some other touristic attractions that may be included in touristic activities, as 2 artificial lakes (Buhui and Mărghitaș), some cultural heritage (the first mountain railway in Romania, Anina-Oravița), some buildings, the mining infrastructure (which need serious rehabilitation). All these elements may represent a plus brought to the geomorphosites as tourist attractions.

In the near future we intend to realise a work regarding these karstic geomorphosites from the quantitative perspective. Also, we intend to offer our scientific results to those organizations that are managing this area for a place in the management of this area.

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