Canyons as potential geotourism attractions of Serbia - comparative analysis of Lazar and Uvac canyons by using M-GAM model

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ABSTRACT
Serbia is a country with rich geodiversity including approximately 650 geological, paleontological, geomorphological, speleological and neotectonic sites. Among numerous geoheritage sites in Serbia there are several remarkable canyons with great scientific importance and immense geotourism potential such as the Lazar River Canyon and The Uvac River Canyon. The principal aim of this paper was to compare the current state and tourist potential of these two fluvial geosites. Moreover, of paramount importance was to indicate the major barriers of geotourism development as well as major fields for improvement. The M-GAM model provided the expert's assessment of both Main and Additional Values of the sites in accordance to the importance of each subindicator in the assessment model given by tourists. The final results indicated a moderate level of Main Values and a low level of Additional Values of both sites showing that these geosites have immense scientific and aesthetic value but there is plenty of room for improvement especially within the tourist values, management and planning, as well as tourism infrastructure as a basis for tourism development.

Key words: geotourism, geosite assessment, M-GAM, comparative analysis, Lazar Canyon, Uvac Canyon, Serbia

INTRODUCTION

Serbia is a country with very rich geodiversity existing in numerous forms. The fact that the Inventory of Serbian geoheritage sites includes approximately 650 geological, paleontological, geomorphological, speleological and neotectonic sites (Djurović & Mijović, 2006) clearly confirms the previous statement. Moreover, numerous geosites are especially characteristic for the Eastern and Western region of the country which has their highest concentration. The great value and importance of those geosites was also recognized by the Institute for Nature Conservation of Serbia which has so far protected approximately 80 geoheritage sites, mostly those of speleological character (Djurović & Mijović, 2006).

The concept of geoheritage is linked to the concept of geosites. Geosites are defined as portions of the geosphere that present a particular importance for the comprehension of Earth history, geological or geomorphological objects that have acquired a scientific, cultural/historical, aesthetic and/or social/economic value due to human perception or exploitation (Reynard, 2004, p. 440).

The type of tourism mainly focusing on geosites is defined as geotourism. This form of tourism falls within the category of special interest tourism and it is defined as: *"The provision of interpretative facilities and services to promote the value and societal benefit of geological and geomorphological sites and their materials, and to ensure their conservation, for the use of students, tourists, and other casual*

recreationalists." (Hose, 2003, 2008). This definition clearly shows that the main focus of geotourism is on interpretation, promotion and conservation, which are all key elements for the development of geotourism on any territory.

Among the 80 protected geoheritage sites in Serbia there are several remarkable canyons which possess great scientific importance and geotourism potential. Two canyons with the biggest potential for geotourism development are The Lazar River Canyon in Eastern Serbia and The Uvac River Canyon located in Western Serbia. Due to their irrefutable scientific and aesthetic qualities these two geosites are already under state protection as a Natural Monument (Lazar Canyon) and as a Special Nature Reserve (Uvac Canyon). Both canyons are one of the best representatives of fluvial erosion and other geomorphological processes in Serbia and both possess a wide variety of karst landforms. They are characterized by a unique combination of limestone canyon valleys of impressive dimensions and distinct morphological traits, numerous caves of great significance, interesting phenomena and processes of karst water flow and outstanding landscape variety and beauty. The entrenched meanders of the Uvac Canyon represent one of its most alluring and distinctive features. The number of these meanders (around 10) makes the Uvac River Canyon unique in the world. Additionally, both geosites represent important biodiversity hotspots as they are home to many endemic and relict plant species while the Uvac Canyon is also a natural habitat to a rare species of vulture eagle called griffon vulture. Even though both sites possess immense geotourism potential, unfortunately neither of them is currently engaged in major tourism flows.

The assessment of attractiveness of geotouristic objects would be one of the tools that could help a person to get interested in new environment – geotourism (Rybar, 2010). The main purpose of the research was to analyze and compare the two mentioned geosites by using the M-GAM model for geosite assessment. The analyzed sites are located in two different parts of the country which are economically unequally developed. The results of the assessment should give us a clear picture of the current state and tourist potential of these sites and also reveal if there are any major differences between the values and geotourism potential of these two geosites. The M-GAM model should also give us detailed assessment of analyzed geosites indicating the major barriers which thwarted tourism development up to now, as well as major fields for improvement focusing on the most important elements for tourists (expressed by the Importance factor) in order to attract major tourist flows in the future.

STUDY AREA

Serbia is a country located in Southeastern Europe. Numerous canyons and gorges are widespread throughout the country representing valuable fluvial geoheritage sites with great potential for future geotourism development. For the purpose of this paper, we selected two most representative canyons in Serbia (Fig. 1) which are described below.

The Lazar Canyon area is located in the region of Eastern Serbia, within 10 km from the town of Bor. This territory is very rich with numerous canyons, caves and pits that are located on a relatively small area. These geosites are excellent representatives of this area's geodiversity. Geoheritage sites usually include all geological, geomorphological, pedological and distinct archaeological values created during the formation of the Earth's crust (Djurović and Mijović, 2006). All of these values are present in the area of Lazar's Canyon which makes this territory excellent for the development of geotourism in the future. Also, the entire area around the investigated sites is surrounded by highly degraded zones of the Bor mining basin, which gives this

protected area even greater significance. The flora of this relatively small area (0.02% of the territory of Serbia) represents approximately 20% of the country's flora (Tomić, 2011).

The Lazar River Canyon was formed by fluvial erosion of the Lazar River and it is carved into the limestone of the Dubasnica Plateau. The canyon is joined by the smaller canyons of Mikulj, Demizlok and Vej rivers. It is notable for its vertical limestone cliffs with a flattened limestone plateau from which the carving of the valley began. It is also unique for its variety of surface and underground karst relief forms such as karst valleys, sinkholes, caves and caverns, the most significant being Lazar Cave and Vernjikica Cave.

The backbone of the Lazar Cave's channel system is the main channel with several larger morphological units: Prestona hall with the Cathedral of blocks in the nortwestern branch, and a Concert hall and the Hall of bats near the end of the north branch. Besides its length, there are several other indicators that show the significance of this cave: Its surface area is 9900 square meters and it's volume is around 70000 cubic meters of which the main channel takes about 52000 meters. The cave has very rich ornaments made from calcite and travertine that vary in shape, size and color (Lazarević, 1998). It also has paleontological remains of Ice Age animals as well as 5000 years old archaeological remains of tools and pottery (Vasiljević et al., 1998).

Vernjikica Cave is located in the left side of Lazar's Canyon, below the Kornjet elevation at 545.5 meters above sea level and over 150 meters above the canyon bottom. The total length of the cave is 1015 meters, its surface area is 13000 square meters and its volume is 260000 cubic meters, calculated for the average height of 20 meters. The Colosseum hall is the best proof of this cave's megalithic dimensions. The diameter of this rounded room is over 55 meters, and the maximum height of its dome ceiling is 50.7 meters, while the height difference between the lowest point on the floor and the highest point on the ceiling is 58.7 meters (Lazarević, 1998). This cave is also characterized by vast amounts of calcite and crystal accumulation, which form extremely diverse and imposing figures like the stalagmite Colossus, which is the symbol and logo of Vernjikica with a height of 11.5 meters.

The canyon is sheltered by rocky mountain reefs from all sides: to the south and southwest there is Malinik (1087 m), to the north Strnjak (720 m) and Kornjet (696 m) and to the west there are Pogara (883 m) and Mikulja (1022 m). Canyon sides are vertical and smooth, and in its narrowest part the canyon is less than seven meters wide. It is one of the deepest, most inhospitable and impassable canyons in Serbia with a length of 4400 meters and an average incline of the longitudinal profile of 44‰. The greatest depth of the canyon is at the Kovej site, where on the right side of the valley, the upper edge of vertical cliffs is at 375 m above the canyon bottom, and on the left side the depth is 330 m. The canyon bottom narrows in some places between three and four meters and throughout the canyon there is a great number of boulders, rocky towers and cascades that occasionally turn into waterfalls. The most prominent rock tower is located at the juncture of Mikulj River Canyon and Lazar's Canyon. The height of this tower is 150 m (Lazarević, 1998).

The Uvac River Canyon is a part of the "Uvac Special Nature Reserve" located in the region of Western Serbia. It is located on the north side of the Pešter plateau and it has an area of 600 square kilometers at the altitude of 1100 meters. The canyon begins at the point where the Uvac River merges with the Vapa River, at the end of the Sjenica valley, and from that point to the mouth of the Veljušnica River it has an east - west direction. The Uvac river waters deeply carved its bed eroding limestone rocks to form narrow canyon valleys with high, steep limestone cliffs.

The depth of the canyon on the left side is about 200 m, and around 250 - 300 m at the right side. The sides of the canyon are steep, almost vertical in some places, but the right side is higher by almost 100 m, which suggests the existence of anomalies in the cross section (Lješević, 1982). The special value of the canyon lies in the fact that it has entrenched meanders. Certain meanders have a meander angle greater than 270°. In the Lopiž zone the capes of meanders have a relative height of 80 - 100 m. The morphology of meanders within the partially submerged valley of the Uvac River represents a special aesthetic value of this area. By the number of its meanders (around 10) the Uvac River Canyon is unique in the world (Grubač et al, 2004).

This area is characterized by karst landforms with numerous karst formations: karst plains, karst depressions, karst sinkholes, caves and pits. Caves are numerous and vary in size, ranging from rock shelters to the Uvac Cave System, the largest known cave system in Serbia. The system consists of two caves and one pit with interconnected canals that are a total of 6185 meters in length. The largest part of the system is the Uvac Cave with two entrances, one in Gornje Lopiže village and the other in the Uvac valley. Ledena Cave is slightly shorter. The main canal of Ledena Cave stretches almost parallel with the main canal of Uvac Cave, at the distance of about 100 m. The smallest, but yet the most interesting part of the Uvac cave system is the Bezdan pit. The entrance into the pit is located at the end of a dead-end valley called Miletin Do. These caves are very rich in speleothem deposited by the action of dripping water to form stalactites, stalagmites, columns and other similar cave features.

Fig. 1 The location of the Lazar and Uvac Canyon

METHODOLOGY

The methodology of this study is based upon the 'modified geosite assessment model' (M-GAM), developed by the authors of this paper. The M-GAM represents modification of GAM model created by Vujičić et al., (2011). Previous geosite assessment models contain geosite assessment criteria adjusted towards two main segments of market demand – tourists (Pralong, 2005; Serrano & González-Trueba, 2005; Hose, 2007; Pereira et al., 2007; Zouros 2007; Reynard et al., 2007; Reynard, 2008) and experts (Hose, 1997; Bruschi & Cendrero, 2005; Coratza & Giusti, 2005; Hose, 2007; White & Wakelin-King, 2014; Bruno et al., in press). GAM consists of two key indicators: Main Values and Additional Values, which are further divided into 12 and 15 indicators respectively, each individually marked from 0 to 1. This division is made due to two general kinds of values: main - that are mostly generated by geosite's natural characteristics; and additional - that are mostly human-induced and generated by modifications for its use by visitors. The **Main Values** comprise three groups of indicators: scientific/educational, scenic/aesthetical values and protection while the **Additional Values** are divided into two groups of indicators, functional and touristic values. The Main and Additional Values are more detailed presented in table 1. In total sum, there are 12 subindicators of Main Values, and 15 subindicators of Additional Values which are graded from 0 to 1 that define GAM as a simple equation: GAM = Main Values (VSE+VSA+VPr) + Additional Values (VFn+VTr) (table 3). While in GAM all grades for each subindicator are given by experts M-GAM, focuses not only on the expert's opinion but also on the opinion of visitors and tourists regarding the importance of each indicator in the assessment process.

The importance of the subindicators in the model should be strongly related to the specific need of a specific segment of geotourists. The structure and size of tourist segments is changeable over time. It may be that in certain periods of time visitors of a geosite are mostly interested in the scientific value of a geosite, but later on, a large part of visitors can belong to a segment of tourists who are mostly interested in the socio-cultural meaning of a geosite. Hence, the market value of a geosite (estimated by the number of visitors) depends on many variables.

This is why the value of a geosite should be a product of both expert opinion and visitors' opinion also. One way of achieving this is to include the visitors/tourists in the assessment process. Visitors should play an important role in the assessment process and determine how important each subindicator is for them because, after all, they are the ones that will make the final decision to visit or not to visit a certain geosite (Tomić & Božić, in press).

For the purpose of this paper, we conducted a survey where each respondent was asked to rate the importance (*Im*) of all 27 subindicators (from 0.00 to 1.00) in GAM (Table 1). The importance factor (*Im*) gives visitors the opportunity to express their opinion about each subindicator in the model and how important it is for them when choosing and deciding between several geosites that they wish to visit. Afterwards, the value of the importance factor (*Im*) is multiplied with the value that was given by experts (also from 0.00 to 1.00) who evaluate the current state and value of subindicators (Table 1). This was done for each subindicator in the model after which the values were added up according to the already mentioned equation but this time with more objective and accurate final results due to the addition of the importance factor (*Im*). This parameter is determined by visitors who rate it in the same way as experts rate the subindicators for Main and Additional Values by giving them one of the following numerical values: 0.00, 0.25, 0.50, 0.75 and

Table 1. The structure of Geosite Assessment Model (GAM).

Indicators/Subindicators	Description
Main values (*MV*)	
Scientific/Educational value (*VSE*)	
1. Rarity	Number of closest identical sites
2. Representativeness	Didactic and exemplary characteristics of the site due to its own quality and general configuration
3. Knowledge on geoscientific issues	Number of written papers in acknowledged journals, thesis, presentations and other publications
4. Level of interpretation	Level of interpretive possibilities on geological and geomorphologic processes, phenomena and shapes and level of scientific knowledge
Scenic/Aesthetic (*VSA*)	
5. Viewpoints	Number of viewpoints accessible by a pedestrian pathway. Each must present a particular angle of view and be situated less than 1 km from the site.
6. Surface	Whole surface of the site. Each site is considered in quantitative relation to other sites
7. Surrounding landscape and nature	Panoramic view quality, presence of water and vegetation, absence of human-induced deterioration, vicinity of urban area, etc.
8. Environmental fitting of sites	Level of contrast to the nature, contrast of colors, appearance of shapes, etc.
Protection (*VPr*)	
9. Current condition	Current state of geosite
10. Protection level	Protection by local or regional groups, national government, international organizations, etc.
11. Vulnerability	Vulnerability level of geosite
12. Suitable number of visitors	Proposed number of visitors on the site at the same time, according to surface area, vulnerability and current state of geosite
Additional values (*AV*)	
Functional values (*VFn*)	
13. Accessibility	Possibilities of approaching to the site
14. Additional natural values	Number of additional natural values in the radius of 5 km (geosites also included)
15. Additional anthropogenic values	Number of additional anthropogenic values in the radius of 5 km
16. Vicinity of emissive centers	Closeness of emissive centers
17. Vicinity of important road network	Closeness of important road networks in the radius of 20 km
18. Additional functional values	Parking lots, gas stations, mechanics, etc.
Touristic values (*VTr*)	
19. Promotion	Level and number of promotional resources
20. Organized visits	Annual number of organized visits to the geosite
21. Vicinity of visitors centers	Closeness of visitor center to the geosite
22. Interpretative panels	Interpretative characteristics of text and graphics, material quality, size, fitting to surroundings, etc.
23. Number of visitors	Annual number of visitors
24. Tourism infrastructure	Level of additional infrastructure for tourist (pedestrian pathways, resting places, garbage cans, toilets etc.)
25. Tour guide service	If exists, expertise level, knowledge of foreign language(s), interpretative skills, etc.
26. Hostelry service	Hostelry service close to geosite
27. Restaurant service	Restaurant service close to geosite

Grades (0.00-1.00)				
0.00	0.25	0.50	0.75	1.00
1. Common	Regional	National	International	The only occurence
2. None	Low	Moderate	High	Utmost
3. None	Local publications	Regional publications	National publications	International publications
4. None	Moderate level of processes but hard to explain to non experts	Good example of processes but hard to explain to non experts	Moderate level of processes but easy to explain to common visitor	Good example of processes and easy to explain to

					common visitor
5.	None	1	2 to 3	4 to 6	More than 6
6.	Small	-	Medium	-	Large
7.	-	Low	Medium	High	Utmost
8.	Unfitting	-	Neutral	-	Fitting
9.	Totally damaged (as a result of human activities)	Highly damaged (as a result of natural processes)	Medium damaged (with essential geomorphologic features preserved)	Slightly damaged	No damage
10.	None	Local	Regional	National	International
11.	Irreversible (with possibility of total loss)	High (could be easily damaged)	Medium (could be damaged by natural processes or human activities)	Low (could be damaged only by human activities)	None
12.	0	0 to 10	10 to 20	20 to 50	More than 50
13.	Inaccessible	Low (on foot with special equipment and expert guide tours)	Medium (by bicycle and other means of man-powered transport)	High (by car)	Utmost (by bus)
14.	None	1	2 to 3	4 to 6	More than 6
15.	None	1	2 to 3	4 to 6	More than 6
16.	More than 100 km	100 to 50 km	50 to 25 km	25 to 5 km	Less than 5 km
17.	None	Local	Regional	National	International
18.	None	Low	Medium	High	Utmost
19.	None	Local	Regional	National	International
20.	None	Less than 12 per year	12 to 24 per year	24 to 48 per year	More than 48 per year
21.	More than 50 km	50 to 20 km	20 to 5 km	5 to 1 km	Less than 1 km
22.	None	Low quality	Medium quality	High quality	Utmost quality
23.	None	Low (less than 5000)	Medium (5001 to 10 000)	High (10 001 to 100 000)	Utmost (more than 100 000)
24.	None	Low	Medium	High	Utmost
25.	None	Low	Medium	High	Utmost
26.	More than 50 km	25–50 km	10–25 km	5–10 km	Less than 5km
27.	More than 25 km	10–25 km	10–5 km	1–5 km	Less than 1 km

Source: adapted from Vujičić et al. (2011)

1.00, marked as points. The importance factor (*Im*) is defined, as:

$$Im = \frac{\sum_{k=1}^{K} Iv_k}{K},$$

where Iv_k is the assessment/score of one visitor for each subindicator and *K* is the total number of visitors. Note that the *Im* parameter can have any value in the range from 0.00 to 1.00.

Finally, the modified GAM equation is defined and presented in the following form:

$$M - GAM = Im(GAM) = Im(MV + AV)$$

As it can be seen from the *M-GAM* equation, the value of the importance factor (*Im*) is multiplied with the value that was given by experts (*GAM*). This was done for each subindicator in the model. Therefore, the values of *M-GAM* sub-indicators are always equal or less than *GAM* values.

As it was said before, there have been many assessment methods over the years but this one seems to be one of the most objective ones as it considers not only the views and opinions of experts but also the views of visitors whose needs and interests have a significant impact in determining the value and potential of a geotourism destination. The assessment of some

subindicators (for example scenic value) can be very subjective and a survey among visitors is a good way to avoid such a problem (Tomić & Božić, in press).

In order to assess the geotourism potential of our study area more objectively, by using the previously explained model, a survey was conducted among visitors of the Lazar Canyon area in July and August of 2013. Also, some of the tourists that visited the area last year were also included in the survey. In addition, the survey also included visitors of the Uvac Canyon during 2013 and at the beginning of 2014. The questionnaire consisted of 27 questions/subindicators and each visitor was asked to rate the importance of every subindicator on a five-point Likert scale by rating it from zero to one in the same way as it was done by experts. A total of 156 visitors filled out the questionnaire. The fact that geosites are still not so popular tourist destinations in Serbia, and that the analyzed cayons are not visited by more than 300 visitors per year indicates that the sample size is adequate for making judgments and conclusions.

RESULTS AND DISCUSSION

For the purpose of this study, Lazar (GS_1) and Uvac (GS_2) canyons were assessed by using the above mentioned methodology (M-GAM) and tables 2 and 3 as well as figure 2 show us the final results of their assessment. From table 3 we can see that there is a significant difference between the Main values of these geosites. The Main values are pretty higher for Lazar Canyon (7.07) in comparison to (6.33) Uvac Canyon. Furthermore, the results show that the major difference between those sites' main values lies in much higher scientific values of Lazar Canyon (2.33), compared to (1.50) Uvac Canyon. When analyzing the values of different subindicators representing scientific value of the geosites we can see that Lazar Canyon is in advance in terms of rarity and representativeness of the sites. This can be explained by the fact that Lazar Canyon is the only place in Serbia where on a relatively small area (0.02% of the territory of Serbia) we can find approximately 20% of the country's flora, with many relict and endemic plant species (Tomić, 2011). Moreover, Lazar Canyon is considered to be one of the deepest, most inhospitable and impassable canyons in the country which makes it an excellent representative of Serbia's fluvial geodiversity. On the other hand, Uvac Canyon is unique in the world by the number of entrenched meanders it has (around 10) which makes it a very rare geosite with great natural values (Grubač et al, 2004). However, similar incised meanders also characterize some other sites in Western Serbia such as the Ovcar-Kablar Gorge.

It is interesting to note that within Main Values Uvac Canyon has slightly higher aesthetic value. The morphology of meanders within the partially submerged valley of the Uvac River represents a special aesthetic value of this area (Grubač et al., 2004) making it very attractive to tourists. In addition, it has a higher number of viewpoints with an amazing view on the curving meanders.

When considering protection, as an important subindicator within Main Values, we can see that it is at the same level for both geosites. This can be explained by the fact that both of the sites are under state protection. Uvac Canyon is a part of the "Uvac Special Nature Reserve" while Lazar Canyon is protected as a Natural monument. Their current condition is satisfactory which should be kept like this in the future by developing sustainable tourism forms and bearing in mind carrying capacities of those sites.

In terms of Additional values we can see that Uvac Canyon obtained a higher score (4.12) than Lazar Canyon (3.25). Functional values are quite similar for both geosites, noting that Lazar Canyon has more additional anthropogenic values in the vicinity (Monasteries Gornjak, Manasija

Tab. 2 Values given by experts and visitors for each subindicators in the GAM model

Main Indicators / Subindicators	Im	Total			
I Scientific/Educational values (VSE)	GS_1	GS_2	**Im**	GS_1	GS_2
1. Rarity	0.75	0.50	**0.89**	0.66	0.44
2. Representativeness	0.75	0.25	**0.79**	0.59	0.20
3. Knowledge on geo-scientific issues	1	0.50	**0.45**	0.45	0.23
4. Level of interpretation	0.75	0.75	**0.85**	0.63	0.63
II Scenic/Aesthetic values (VSA)					
5. Viewpoints (each must present a particular angle of view and be situated less than 1 km from the site)	0.75	1	**0.79**	0.59	0.79
6. Surface (each considered in quantitative relation to other)	0.50	0.75	**0.54**	0.27	0.40
7. Surrounding landscape and nature	1	0.75	**0.95**	0.95	0.71
8. Environmental fitting of sites	1	1	**0.68**	0.68	0.68
III Protection (VPr)					
9. Current condition	1	1	**0.83**	0.83	0.83
10. Protection level	0.75	0.75	**0.76**	0.57	0.57
11. Vulnerability	0.75	0.75	**0.58**	0.43	0.43
12. Suitable number of visitors	1	1	**0.42**	0.42	0.42
I Functional values (VFn)					
13. Accessibility	1	1	**0.75**	0.75	0.75
14. Additional natural values	1	1	**0.71**	0.71	0.71
15. Additional anthropogenic values	0.25	0.00	**0.70**	0.17	0.00
16. Vicinity of emissive centres	0.00	0.25	**0.48**	0.00	0.12
17. Vicinity of important road network	0.50	0.50	**0.62**	0.31	0.31
18. Additional functional values	0.25	0.25	**0.59**	0.14	0.14
II Touristic values (VTr)					
19. Promotion	0.00	0.50	**0.85**	0.00	0.42
20. Annual number of organised visits	0.25	0.25	**0.56**	0.14	0.14
21. Vicinity of visitors centre	0.00	0.00	**0.87**	0.00	0.00
22. Interpretative panels (characteristics of text and graphics, material quality, size, fitting to surroundings, etc.)	0.25	0.25	**0.81**	0.20	0.20
23. Annual number of visitors	0.25	0.50	**0.43**	0.10	0.21
24. Tourism infrastructure (pedestrian pathways, resting places, garbage cans, toilets, wellsprings etc.)	0.25	0.25	**0.73**	0.18	0.18
25. Tour guide service (expertise level, knowledge of foreign language(s), interpretative skills, etc)	0.00	0.25	**0.87**	0.00	0.21
26. Hostelry service	0.50	0.75	**0.73**	0.36	0.54
27. Restaurant service	0.25	0.25	**0.78**	0.19	0.19

Source: adapted from Tomić and Božić (in press)

and Ravanica, Lazar cave with paleontological remains of Ice Age animals as well as 5000 years old archaeological remains of tools and pottery (Vasiljević, et al., 1998) which contributes to the enrichment of the tourist offer of this area. On contrary, Uvac Canyon is mostly surrounded by natural values such as caves and mountains, while anthropogenic values are not so present in this area. Anthropogenic values in the vicinity are rated by tourists as quite important in the geosite assessment (0.70) which gives Lazar Canyon a favourable position.

The major difference between these geosites lies in their tourist value. Table 3 indicates that Uvac Canyon has much higher tourist value (2.09) than Lazar Canyon (1.17). Moreover, Uvac Canyon slightly stands out in terms of promotion, hostelry and tour guide service, all of them ranked by tourists as very important indicators (Im>0.80). Numerous natural values of Lazar Canyon are totally neglected by the media, resulting in the fact that even people in Serbia are not fully aware of its great significance and natural beauty.

Promotion of the Uvac Canyon is slightly higher, but still it doesn't attract enough public attention and its marketing activities are very low. In order to generate major tourist flows in the future the promotion should be intensified through regional and national media in order to increase the national awareness of their value. Moreover, even though Uvac Canyon is in advance in terms of tourist values, generally those values are not on an enviable level for either of the sites. Both geosites lack the basic requirements for tourism development referring especially to visitor's centres, interpretative panels and tour guide service. Neither of the analyzed geosites has a visitor's centre providing important tourist information, and both of them have only one information board signalizing the entrance to the protected area. Educative boards providing information about values of the sites still don't exist. In addition, Lazar Canyon doesn't have tour guide service at all, so tourists have only the opportunity of self-guided tours. The situation is slightly better in Uvac Canyon were there are tour guides available at request, so tourists need to contact them when they arrive to the site. However, there is no guided tour related to the canyon itself.

Moreover, the tourism infrastructure, restaurant and hostelry service are at a low level, representing a significant barrier for tourism development. All of this indicates the lack of adequate tourism management and planning at both sites which resulted in poor conditions for tourism development and quite small number of tourists (less than 5000 in Lazar Canyon and from 5000 to 10000 tourists for Uvac Canyon). The major reason why Uvac Canyon has slightly more visitors than Lazar Canyon is the fact that it is located in a more populated region of the country and it is closer to major emissive centres (Novi Pazar, Čačak, Užice).

By comparing the final results for both geosites we can clearly detect the mentioned difference in their Main and Additional Values, as well as their position in the M-GAM matrix (Figure 2).

The matrix consists of Main and Additional values, where these values are presented via X and Y axes respectively. The matrix is divided into nine fields (zones) that are indicated by Z(i,j) (i,j=1,2,3) based on the grade they received in the previous evaluation process. Major grid lines that create fields, for X axe have value of 4 and

Table 3. Overall ranking of the analyzed geosites by using M-GAM

Geosite Label	Values				
	Main		**Additional**		Field
	VSE+VSA+VPr	∑	VFn+VTr	∑	
Lazar Canyon – GS_1	2.33 + 2.49 + 2.25	7.07	2.08 + 1.17	3.25	Z_{21}
Uvac Canyon – GS_2	1.50 + 2.58 + 2.25	6.33	2.03 + 2.09	4.12	Z_{21}
Mean	-	6.70	-	3.68	-

Source: adapted from Vujičić et al. (2011)

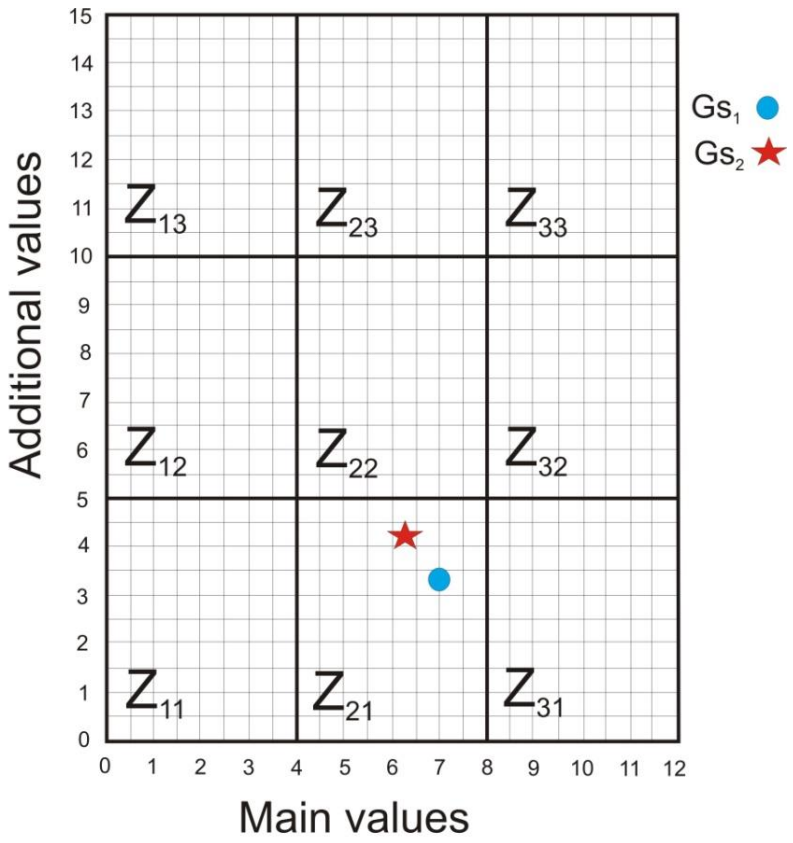

Fig. 2 Position of the assessed geosites in the M-GAM matrix

for Y axe of 5 units. This means that, for example, if the sum of main values is 7 and of additional values is 4, the geosite would be in the Z_{21} field of the GAM matrix which indicates a moderate level of main values and a low level of additional values (Vujičić et al., 2011).

From the matrix shown in figure 2 we can see that both geosites are in the same field (Z_{21}) indicating a moderate level of Main Values and a low level of Additional Values. However, we can clearly notice that Lazar Canyon has higher Main values, while Uvac Canyon has higher Additional Values. From this we can conclude that Lazar Canyon has a better opportunity to reach the higher position in the matrix by improving its Additional Values, especially tourist values, indicating the great potential for future tourism development. The Main Values are more static and cannot be easily influenced and improved, while this is not the case with Additional Values which can be improved with making bigger investments and community effort. On the other hand, by improving their Additional Values and with better management, both sites could be more attractive for tourists in the future.

CONCLUSION

The principal aim of this paper was to compare the current state and tourist potential of the two analyzed geosites in two different parts of the country. From all of the above mentioned we can conclude that both geosites have great tourist potential based on their significant natural beauty and value, but either of them still did not create adequate conditions for major tourist development. The M-GAM model provided the assessment of both Main and Additional Values of both sites in accordance to their importance for tourists and the final results showed us that there is plenty of room for improvement, especially within the tourist values. More precisely, this refers especially to the enhancement of

the management and planning, as well as investments in tourism infrastructure as a basis for tourism development. Furthermore, with all those improvements as well as organized promotional activities these geosites could attract more visitors every year thus benefitting the local community by generating new jobs and revenues for the local economy. However, principles of sustainable development should not be neglected bearing in mind that both geosites are under state protection and on the inventory list of the Institute for Nature Conservation of Serbia as sites of great significance. The sites could also contribute to the popularization of geotourism in Serbia by attracting the specific market niche interested in geology and geomorphology.

Is is important to mention that the M-GAM methodology with its subindicators is applicable to any geosite, although the Importance factor is susceptible to change, depending on visitors' preferences and needs.

Even though this research provides useful information about the importance of subindicators in the assessment of geosites, it has certain limitations. The research results are limited only to visitors of geosites in Serbia. By examining a larger sample including visitors of geosites in other countries throughout the world we could develop *Global Importance* of all subindicators applicable to any geosite of the similar type, which would be the subject of the authors further research.

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