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# Canyoning and Geotourism: Assessing Geosites for Canyoning Activities in Western Serbia

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## Abstract

*The aim of this research is to explore the current state and potential of Tribuća, Rača and Beli Rzav canyons for their further development as canyoning geotourism destinations in Western Serbia. This was done by applying the modified geosite assessment model (M-GAM) on the three analyzed canyons with special focus on values of importance for canyoning tourists. The results indicate that all three analyzed canyons possess significant natural values of great importance for the development of canyoning tourism, such as possibility for interpretation, representativeness, surrounding landscape and nature, protection level and current condition. The main issues are related to human induced elements such as promotional activities, interpretive tools and visitor centers. Given their importance for further tourism development, these activities should have priority in the future in order to attract a larger number of canyoning tourists to these geosites. Significant improvement of these elements along with improved promotional activities would bring more domestic as well as foreign tourists to these geosites which would benefit the local population and local economy through higher income and new jobs for the local community.*

***Keywords:*** *canyoning, geotourism, Modified Geosite Assessment Model (M-GAM), Western Serbia*

## Introduction

Nature-based tourism provides tourists with numerous activities and sightseeing experiences. Geotourism, a form of nature-based tourism (Newsome, Dowling, 2010), promotes and develops tourist sites with geological features (Newsome et al., 2012). Moreover, geotourism development generates benefits for geoconservation (Hose, 2000), appreciation of geosites and the economy (Dowling, Newsome, 2018). It is essential that geotourism affirmation and satisfaction of geotourists leads to environmental and economic sustainability of geosites (Escori-

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huela, Dowling, 2015; Began et al., 2017; Gordon, 2018; Rivero et al., 2019), while generating employment and new economic activities (Dowling, Newsome, 2010; Farsani et al., 2011).

Furthermore, given the diversity of sites that are in the focus of geotourism development, there are various forms of sports and recreational activities that can be carried out as part of geotourism. Due to their aesthetic uniqueness, geosites attract many tourists (Božić, Tomić, 2015), including those who strive for physical activity in the form of recreation and adventure. Several authors have defined adventure tourism in various terms (Buckley, 2000; Bentley, Page, 2001; Hudson, 2002; Swarbrooke et al., 2003; Page et al., 2005). According to them, this form of tourism is connected to guided tours where the main attraction is an outdoor activity related to the features of natural landscape and terrain. Specialised equipment is often required, and the experience brings excitement for tourists (Buckley, 2007). Such activities have led to an increase in visitors to protected areas, particularly areas that offer wilderness landscapes and settings (Hardiman, Burgin, 2011).

One of the forms of adventure recreation taking place in protected areas is the activity of 'canyoning' where participants follow the flow of the stream, climbing over waterfalls and across different natural obstacles. This activity can involve a combination of extreme sports such as hiking, abseiling, swimming, caving, and rock scrambling (Hardiman, Burgin, 2010). Various canyoning companies offer guided tours with different levels of difficulty. Beginnert ours start with hiking and swimming, while tours for more experienced canyoneers include bouldering, rappelling and diving from rocky cliffs and waterfalls (Internet 1). An essential element of canyoning is the use of specialised guides. These guides are normally qualified in different fields such as climbing, fastening, rappelling, diving, first aid and rescue techniques. Therefore, advanced skills and continuous guidance are necessary for successful, fun, and safe canyoning tours (Ernstbrunner et al., 2018). Canyoning is also a demanding venture when it comes to marking access routes, creating information spots and car parks and laying out moorings for going down vertical sections (Massiera et al., 2019).

As a special sports and recreational activity carried out in geological sites (canyons and gorges), canyoning can be easily integrated with geotourism and geological interpretation. According to Ruban and Ermolaev (2020) climbing as well as canyoning activities can enrich the experience of geotourists and contribute to geoheritage accessibility. Additionally, geotourism requires focus on sustainability issues and combined with canyoning activities it challenges sustainable development due to the anthropogenic impact on the environment. Furthermore, geotourism activities are strongly connected to Geoparks. Even though geoheritage presents the core element of a Geopark, its functioning cannot be limited to only pure geotourism (which includes only geosite and geoheritage sightseeing) and conservation activities. Other activities should also be allowed as long as they respect basic sustainability principles and exploit the environment and natural resources responsibly while satisfying visitors and supporting local communities. Canyoning is one such possible activity in many Geoparks and protected areas. It can contribute to sustainable development by creating jobs and generating income as well as by planning improvement.

Since there are numerous karst terrains in Serbia suitable for this type of activity there are many possibilities for this form of tourism. However, currently there are only three destinations in Serbia that offer organized canyoning activities: Tribuća Canyon (near the city of Valjevo), RačaCanyon (National park Tara) and Beli Rzav Canyon (National park Tara). These destinations are in the focus of canyoning geotourism adventures in Serbia and therefore have been explored as potential carriers of the future development of canyoning geotourism in Ser-

bia. This paper aims to explore the current state of the three mentioned canyons and their potential for further development as canyoning geotourism destinations in Serbia.

## Study area

The analyzed canyons are located in Western Serbia. They are representative destinations in which extreme sports are actively conducted at geosites. Western Serbia is an area that is largely covered by the Dinaric karst, and has exceptional geosites that include caves, karst waterfalls, gorges, and canyons. However, speleotouristic potentials are not as present as in Eastern Serbia (Tomić et al., 2019; Antić et al., 2019). In Western Serbia, there is an evident opportunity to develop new types of tourism on geosites that could significantly improve the position of geotourism on the tourism market (Vuković, Antić, 2019). Canyoning adventures certainly reflect the advanced type of geotourism that follows world trends and enables a diverse offer of geotourism in Serbia. For the purpose of this research, three canyons were selected and analyzed (Figure 1). Momentarily these are the only canyons in Serbia where guided canyoning tours are included in the official tourism offer through the Explore Serbia tourism organization. The analyzed canyons include:

1. TribućaCanyon(near the city of Valjevo);
2. Rača Canyon (Tara National Park) and
3. Beli Rzav Canyon (Tara National Park).

The **Tribuća Canyon** (Figure 2) is located near the village of Gornje Košlje, about 38 km from the city of Valjevo. A macadam road in the length of about 2.5 km from the village leads to Tribuća. The canyon is about 1 km long and it has 5 verticals, from 5 to 20 meters (Stojadinović, 2013). The best time to visit this canyon is in the summer after long dry days when the water level is quite low. In addition to walking, jumping into the pools and swimming through the water, passing through this canyon also requires rope descending. Expert guides and appropriate equipment are necessary, especially for beginners without previous experience and knowledge of equipment handling.

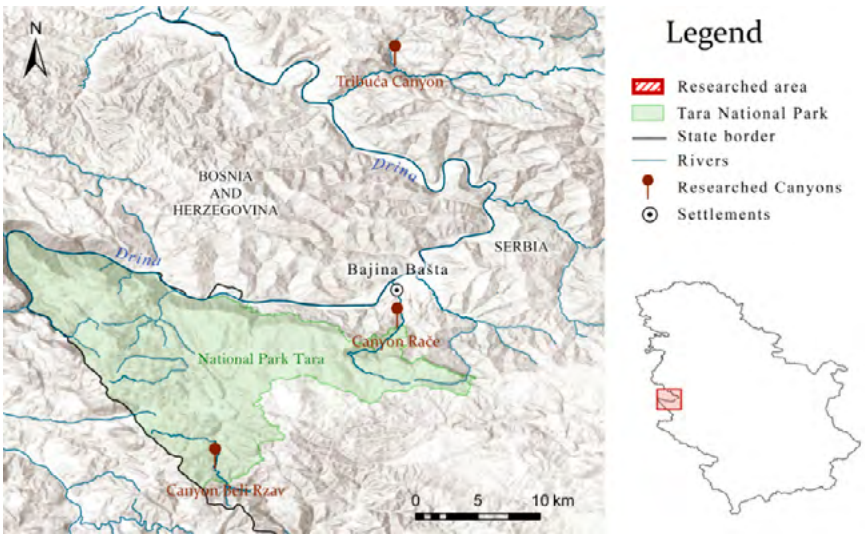


**Figure 1.** Location of analyzed canyons in Western Serbia

**Figure 2**. Tribuća River Canyon

**The Rača Canyon** (Figure 3) is located in the middle course of the Rača River which springs in the area of Kaluđerska Bara, in the northern part of the Tara mountain and flows into the Drina River near Bajina Bašta. The canyon depth is from 330–350 m. In the central part the canyon is very narrow, only a few meters wide, with rocky and completely vertical sides. On the right side of the canyon, at its exit, there is an alkaline-thermal karst spring Lađevac with a water temperature from 15–18°C (Stojadinović, 2013). The canyoning tour is 5.5 km long with interesting geological features and waterfalls.

**Figure 3**. The Rača River Canyon

**Figure 4.** The Beli Rzav River Canyon

**The Beli Rzav Canyon** (Figure 4) is located in the Tara National Park. The length of the river is 23 km, and the canyon itself is 2 km long. The river originates from Karaklijski Rzav and Baturski Rzav. It flows at the foot of Šargan, through Mokra Gora.The canyon is located 1.5km from the village of Đurići (Milanović, 2006).At the beginning of the canyon there is a vertical about 5m high. In several places it is necessary to swim through deep water with all the equipment that is being carried. Both alpine rope and belt with accompanying equipment is needed for safe descent.

## Methodology

The methods used for this research are based on the 'Modified Geosite Assessment Model' (M-GAM), developed by Tomić and Božić (2014). The M-GAM model is based on former geosite assessment methods created by different aurthors (Bruschi, Cendrero, 2005; Coratza, Giusti, 2005; Erhartič, 2010; Hose, 1997; Pereira et al., 2007; Pralong, 2005; Reynard, 2008; Reynard et al., 2007; Serrano, González-Trueba, 2005; Zouros, 2007) and the Importance factor (*Im*) first introduced by Tomić (2011). Its advantage is that it integrates the opinion of both tourists and experts so that noneof them are favored throughoutthe assessment process. This method has been successfully applied several times for the evaluation of different geosites in Serbia (Antić, Tomić, 2017; Boškov et al., 2015; Božić et al., 2014; Božić,Tomić, 2015; Tomić et al., 2019; Tomić et al., 2020; Vukoičić et al., 2018; Antić et al., 2019; Antić, Tomić, 2019; Vuković, Antić 2019; Antić et al., 2020a; Antić et al., 2020b; Bratić et al., 2020), USA (Tomić et al., 2015; Jonić, 2018), Slovenia (Tičar et al., 2018), Iran (Tomić et al., 2021) and Hungary (Pál, Albert, 2018).

The M-GAM evaluation method has two primary indicators: Main Values and Additional Values, which are divided into 12 and 15 subindicators, each one of them individually marked from 0 to 1. This division is done mainly because of two general types of values: Main Values

- mostly generated by the geosite's natural characteristics; and Additional Values which are mostly human-induced. The Main Values consist of three subindicat or groups: scientific/educational (VSE), scenic/aesthetical (VSA) and protection (VPr) values, while the Additional Values are split into two subindicat or groups entitled functional (VFn) and touristic values (VTr). These values are presented in more detail in Table 1.

**Table 1.** *The structure of Modified Geosite Assessment Model (M-GAM)*

| Indicators/Subindicators | Description |
|---|---|
| **Main values (*MV*)** | |
| Scientific/Educational value (*VSE*) | |
| Rarity | Number of closest identical sites |
| Representativeness | Didactic and exemplary characteristics of the site due to its own quality and general configuration |
| Knowledge on geoscientific issues | Number of written papers in acknowledged journals, thesis, presentations and other publications |
| Level of interpretation | Level of interpretive possibilities on geological and geomorphologic processes, phenomena and shapes and level of scientific knowledge |
| Scenic/Aesthetic (*VSA*) | |
| 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. |
| Surface | Whole surface of the site. Each site is considered in quantitative relation to other sites |
| Surrounding landscape and nature | Panoramic view quality, presence of water and vegetation, absence of human-induced deterioration, vicinity of urban area, etc. |
| Environmental fitting of sites | Level of contrast to the nature, contrast of colors, appearance of shapes, etc. |
| Protection (*VPr*) | |
| Current condition | Current state of geosite |
| Protection level | Protection by local or regional groups, national government, international organizations, etc. |
| Vulnerability | Vulnerability level of geosite |
| 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*) | |
| Accessibility | Possibilities of approaching to the site |
| Additional natural values | Number of additional natural values in the radius of 5 km (geosites also included) |
| Additional anthropogenic values | Number of additional anthropogenic values in the radius of 5 km |
| Vicinity of emissive centers | Closeness of emissive centers |
| Vicinity of important road network | Closeness of important road networks in the in radius of 20 km |
| Additional functional values | Parking lots, gas stations, mechanics, etc. |
| Touristic values (*VTr*) | |
| Promotion | Level and number of promotional resources |
| Organized visits | Annual number of organized visits to the geosite |
| Vicinity of visitors centers | Closeness of visitor center to the geosite |
| Interpretative panels | Interpretative characteristics of text and graphics, material quality, size, fitting to surroundings, etc. |
| Number of visitors | Annual number of visitors |

| | | | | | |
|---|---|---|---|---|---|
| Tourism infrastructure | | Level of additional infrastructure for tourist (pedestrian pathways, resting places, garbage cans, toilets etc.) | | | |
| Tour guide service | | If exists, expertise level, knowledge of foreign language(s), interpretative skills, etc. | | | |
| Hostelry service | | Hostelry service close to geosite | | | |
| 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 occurrence |
| 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 |

In total there are 12 subindicators for Main Values, and 15 subindicators for Additional Values that are rated from 0 to 1. These values define M-GAM as a simple equation:

$$M-GAM = MV + AV \tag{1}$$

where *MV* and *AV* represent symbols for Main and Additional Values. Givent the fact that Main Values consist of three and Additional Values of two groups of subindicators, we can derive the two following equations:

$$MV = VSE + VSA + VPr \tag{2}$$

$$AV = VFn + VTr \tag{3}$$

Since we know that each subindicator group consists of several other subindicators, equations (2) and (3) can be written in the following manner:

$$MV = VSE + VSA + VPr = \sum_{i=1}^{12} SIMV_i, \text{where } 0 \le SIMV_i \le 1 \tag{4}$$

$$AV = VFn + VTr = \sum_{i=1}^{15} SIAV_i, \text{where } 0 \le SIMV_j \le 1 \tag{5}$$

In these equations, $SIMV_i$ and $SIAV_j$ represent 12 subindicators of Main Values($i$ = 1,...,12) and 15 subindicators ($j$ = 1,...,15) of Additional Values.

The most important characteristic of M-GAM is the fact that this method does not focus primarily on the expert's opinion but it also takes into account the opinion of tourists regarding the importance of every subindicator in the evaluation process. The inclusion of visitors in this process is done by conducting a survey in which each of the respondents is asked to rate the importance (*Im*) of all 27 subindicators (from 0.00 to 1.00) in the M-GAM model (Table 2). The importance factor (*Im*) provides visitors with the opportunity to express their point of view regarding each subindicator and to show how each one of them it important for them when deciding and choosing which geosite they want to visit. After rating the importance of every subindicator by each of the respondents, the mean value of each subindicator is calculated thus giving usthe final Importance value for each subindicator. This value is the importance factor. Subsequently, the value of the importance factor (*Im*) is then multiplied with the values given by experts (also from 0.00 to 1.00) whose duty is to rate each of the subindicators (Table 2).

After this is done for every subindicator in the model, all of the subindicator values are added up according to the previously explained equations. However, this time with more accurate and objective results due to the addition of the Importance factor (*Im*) that is determined by survey respondents who rate it on the same scale as experts rate each of the subindicators for Main and Additional Values (by awarding them one of the numerical values: 0.00, 0.25, 0.50, 0.75 and 1.00). The importance factor (*Im*) is defined, as:

$$Im = \frac{\sum_{k=1}^{K} Iv_k}{K} \tag{6}$$

Where $Iv_k$ is the assessment/score of one visitor for each subindicator and $K$ is the total number of visitors. The *Im* value can be in the range from 0.00 to 1.00.

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

$$M-GAM = MV + AV \tag{7}$$

$$MV = \sum_{i=1}^{n} Im_i \cdot MV_i \tag{8}$$

$$AV = \sum_{i=1}^{n} Im_j \cdot AV_j \tag{9}$$

As it isseen from the previous equations, the value of the importance factor (*Im*) for each subindicator in the model is rated by visitors and afterwards multiplied with the values given by experts for each subindicator respectively.

The Importance factor can be considered as a universal feature as it has found its role and application not only in geotourism and palaeontological tourism (Antić et al., 2021) but also in the assessment of cultural heritage in the Cultural Route Evaluation Model (CREM) created by Božić and Tomić (2016) and for the assessment of spas in the Spa Assessment Model (SAM) published by Tomić and Košić (2020). Henceforth, its continuous application for different types of tourism in different countries and for different market segments is very appealing for future research as it can be very useful for managing and planning various tourism activities.

In the research by Božić & Tomić (2015) about different geotouristic market segments, the Importance factor (for each subindicator) for Serbian tourists was calculated through a survey. The resulting values of the Importance factor have been adopted from the mentioned research and used for the purpose of this paper.

According to the final assessment results, a matrix of Main (X axes) and Additional Values (Y axes) can bemade (Figure 5). The matrix is divided into nine sections marked with Z(i,j), (i,j=1,2,3). Depending upon the final score, each analyzed geosite will fall within a certain section of the matrix. For example, if the Main Values of a geositeare 7 and the Additional Values are 4, the geosite will belong to the $Z_{21}$ field of the M-GAM matrix.

## Results and discussion

For the purpose of this study we have selected three canyons in western Serbia and analyzed them by applying the M-GAM method for geosite assessment in order to establish their current state and potential for canyoning activities.The final results of the assessment are presented in Tables 2 and 3 as well as Figure 5.

**Table 2.** *Subindicator values given by experts for canyons in Western Serbia.*

| Main indicators/Subindicators | Geosites | | | Total value | | | |
|---|---|---|---|---|---|---|---|
| | $Gs_1$ | $Gs_2$ | $Gs_3$ | Im | $Gs_1$ | $Gs_2$ | $Gs_3$ |
| **I Scientific/Educational values (VSE)** | | | | | | | |
| Rarity ($SIMV_1$) | 0.25 | 0.25 | 0.25 | **0.89** | 0.22 | 0.22 | 0.22 |
| Representativeness ($SIMV_2$) | 1.00 | 1.00 | 1.00 | **0.79** | 0.79 | 0.79 | 0.79 |
| Knowledge on geo-scientific issues ($SIMV_3$) | 0.00 | 0.00 | 0.00 | **0.45** | 0.00 | 0.00 | 0.00 |
| Level of interpretation ($SIMV_4$) | 1.00 | 1.00 | 1.00 | **0.85** | 0.85 | 0.85 | 0.85 |
| **II Scenic/Aesthetic values (VSA)** | | | | | | | |
| Viewpoints (each must present a particular angle of view) ($SIMV_5$) | 0.00 | 0.25 | 0.00 | **0.79** | 0.00 | 0.19 | 0.00 |
| Surface (each considered in quantitative relation to other) ($SIMV_6$) | 0.00 | 1.00 | 0.50 | **0.54** | 0.00 | 0.54 | 0.27 |
| Surrounding landscape and nature ($SIMV_7$) | 1.00 | 1.00 | 1.00 | **0.95** | 0.95 | 0.95 | 0.95 |
| Environmental fitting of sites ($SIMV_8$) | 1.00 | 1.00 | 1.00 | **0.68** | 0.68 | 0.68 | 0.68 |
| **III Protection (VPr)** | | | | | | | |
| Current condition ($SIMV_9$) | 1.00 | 1.00 | 1.00 | **0.83** | 0.83 | 0.83 | 0.83 |
| Protection level ($SIMV_{10}$) | 0.75 | 0.75 | 0.75 | **0.76** | 0.57 | 0.57 | 0.57 |
| Vulnerability ($SIMV_{11}$) | 0.50 | 0.50 | 0.50 | **0.58** | 0.29 | 0.29 | 0.29 |
| Suitable number of visitors ($SIMV_{12}$) | 0.50 | 0.50 | 0.50 | **0.42** | 0.21 | 0.21 | 0.21 |
| **Additional indicators/Subindicators** | | | | | | | |
| **I Functional values (VFn)** | | | | | | | |
| Accessibility ($SIAV_1$) | 0.25 | 0.25 | 0.25 | **0.75** | 0.18 | 0.18 | 0.18 |
| Additional natural values ($SIAV_2$) | 1.00 | 1.00 | 1.00 | **0.71** | 0.71 | 0.71 | 0.71 |
| Additional anthropogenic values ($SIAV_3$) | 0.25 | 0.25 | 0.25 | **0.70** | 0.17 | 0.17 | 0.17 |
| Vicinity of emissive centres ($SIAV_4$) | 0.25 | 0.50 | 0.25 | **0.48** | 0.12 | 0.24 | 0.12 |
| Vicinity of important road network ($SIAV_5$) | 0.25 | 0.25 | 0.25 | **0.62** | 0.15 | 0.15 | 0.15 |
| Additional functional values ($SIAV_6$) | 0.00 | 0.00 | 0.00 | **0.59** | 0.00 | 0.00 | 0.00 |
| **II Tourist values (VTr)** | | | | | | | |
| Promotion ($SIAV_7$) | 0.00 | 0.00 | 0.00 | **0.85** | 0.00 | 0.00 | 0.00 |
| Annual number of organised visits ($SIAV_8$) | 0.25 | 0.25 | 0.25 | **0.56** | 0.14 | 0.14 | 0.14 |
| Vicinity of visitors centres ($SIAV_9$) | 0.00 | 0.00 | 0.00 | **0.87** | 0.00 | 0.00 | 0.00 |
| Interpretive panels ($SIAV_{10}$) | 0.00 | 0.00 | 0.00 | **0.81** | 0.00 | 0.00 | 0.00 |
| Annual number of visitors ($SIAV_{11}$) | 0.25 | 0.25 | 0.25 | **0.43** | 0.10 | 0.10 | 0.10 |
| Tourism infrastructure ($SIAV_{12}$) | 0.25 | 0.50 | 0.50 | **0.73** | 0.18 | 0.36 | 0.36 |
| Tour guide service ($SIAV_{13}$) | 0.75 | 0.75 | 0.75 | **0.87** | 0.65 | 0.65 | 0.65 |
| Hostelry service ($SIAV_{14}$) | 1.00 | 0.75 | 1.00 | **0.73** | 0.73 | 0.54 | 0.73 |
| Restaurant service ($SIAV_{15}$) | 1.00 | 1.00 | 1.00 | **0.78** | 0.78 | 0.78 | 0.78 |

*$Gs_1$—Tribuća Canyon; $Gs_2$—Rača Canyon; $Gs_3$—Beli Rzav Canyon.*

From Table 3, we can see that the Scientific and Protection values have the same score for all three analyzed canyons. When it comes to representativenes and the level of interpretation, all three canyons have the maximum score. However, the subindicators rarity and knowledge on geoscientific issues have rather low values. This is mainly due to the fact that these canyons are not very well known on a national or international level but only at a regional level. So far

there have not been any significant scientific publications related to these geosites. The high values for representativeness and level of interpretation means that these geosites possess great tourism potential that should be fully utilized in the future by appealing to those tourists who value these elements in a tourist destination. Tourists that visit canyons for canyoning activities are more likely to visit a canyon if it has a high level of interpretation and representativeness because it enhances their overall experience of the destination and their activities which is why these canyons are excellent locations for this type of tourist activities. According to Gorman (2007), there is a need for visitors to be involved in the experience. The more knowledge a visitor has aboutthe site, the more involved and interested he will become. Therefore a visitor will engage and show empathy towards the visited site. One of the ways to achieve this is through publications, but a much more efficient way is through good quality interpretation.

**Table 3.** *Overall ranking of the analyzed canyons by M-GAM*

| Canyons | Main Values | Σ | Additional Values | Σ | Field |
|---|---|---|---|---|---|
| | VSE + VSA + VPr | | VFn + VTr | | |
| $Gs_1$—Tribuća Canyon | 1.86 + 1.63 + 1.90 | 5.39 | 1.33 + 2.58 | 3.91 | $Z_{21}$ |
| $Gs_2$—Rača Canyon | 1.86 + 2.36 + 1.90 | 6.12 | 1.45 + 2.57 | 4.02 | $Z_{21}$ |
| $Gs_3$—Beli Rzav Canyon | 1.86 + 1.90 + 1.90 | 5.66 | 1.33 + 2.76 | 4.09 | $Z_{21}$ |

If we look at the aesthetic values, we can see that they are different for all three canyons, with the Rača Canyon having the highest values and the Tribuća Canyon having the lowest. A more detailed analysis shows that the subindicators related to the surrounding evironment, landscape and nature are rated with maximum score. Aesthetic values such as landcape and the environment are often one of the most important motives for visiting a nature based destination, whether its geotourism or some other nature based form of tourism. Most people visiting canyons are mainly interested in these values (Božić, Tomić, 2015). When it comes to canyoning this is also one of the most important motive for visit along with recreation and physical activity. Therefore it is essential that a canyoning destination posesses these values in order to attract visitors who will almost always chose a destination with higher aesthetical values over the one with lower aesthetical values, even if the destination lacks other values. The importance of aesthetical values for Serbian tourists is also supported by the high value of the importance factor for the subindicator surrounding landscape and nature in the M-GAM model. Given this fact and the maximum score for this subindicator in the case of the three analyzed canyons, we can conclude that these canyons are an excellent place for canyoning activites.

Furthermore, if we analyze the protection values we can see that all three canyons are protected on a national level and have the maximum value for the subindicator related to the current condition of a geosite. This subindicators is once again of great importance for Serbian tourists, meaning that they prefer visiting pristine environments. People who visit geosites for recreational purposes generally look for pristine destinations for their activities. High values of current condition make the three analyzed canyons perfect contenders for canyoning activities.

If we take a look at the Additional Values we can see that all of the sites have very similar results with the Beli Rzav Canyon having a slightly higher overall score than the other two canyons. In the case of Functional values, the only difference is the subindicator related to the vicinity of emissive centers. The Rača Canyon is a bit closer to an emissive center than the two

other canyons. One of the main issues for all three canyons is their accessibility and closeness to important road networks which can impact visitor choice when choosing their destination for canyoning activities.

Looking at Tourist Values we can once again see that the results for all three canyons are very similar. All three sites face the same problem related to promotional activites. The only promotional tool at the moment is a website (www.explore-serbia.rs) that offers canyoning at these three sites. However, the website offers many tourist activities in the entire country so there is little attention focused towards canyoning activities. Other problems include the lack of interpretation tools. As it was mentioned before, knowledge about geosites enhances the visitor experience and sparks interest among tourists leading to a development of empathy towards the visited site. Since all three canyons have great interpretive possibilities it is a shame that there are no visitor centers nearby or at least iterpretive panels which often have an important role in good quality interpretation. The subindicators with the highest score for Tourist values are related to hostelry, restaurant and tour guide service. Good quality tour guides are an essential element for canyoning and therefore these activities could not be done without proper tour guide service. Luckily, the Explore Serbia agency that organizes canyoning tours provides a good quality tour guide service. Additionally, one of the more important elements for Serbian tourists are also good quality and nearby hostelry and restaurant services which are necessarry for relaxing after finishing canyoning tours. As we can see from the results, all of these elements have been highly valued.

By looking at the final results forall three canyons, we can determine their position in the M-GAM matrix (Figure 5). From the displayed matrix we can see that the analyzed canyons fall within the $Z_{21}$ field with the Rača Canyon having the highest Main Values while the Beli

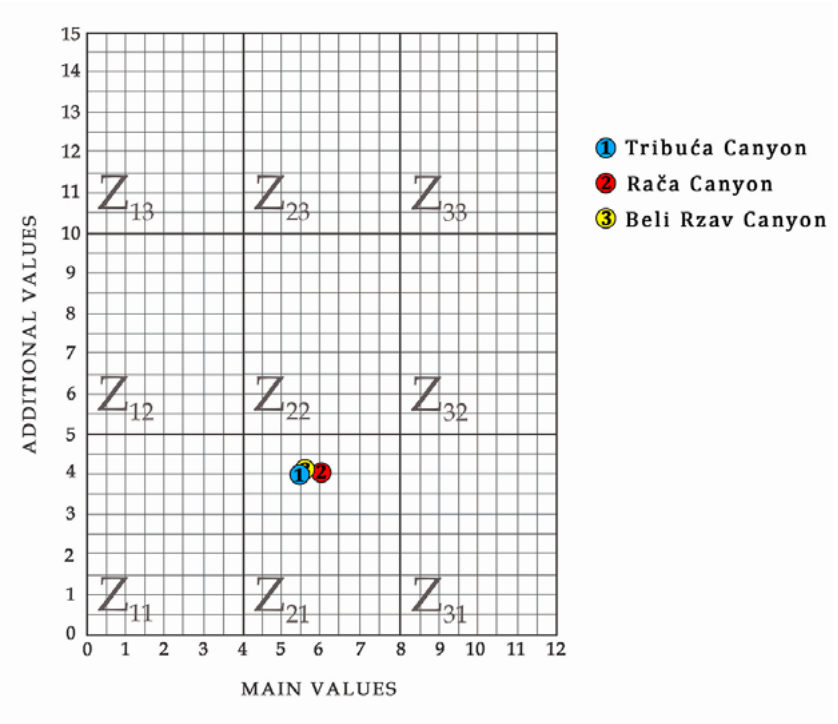


**Figure 5.** The position of the analyzed canyons in the M-GAM matrix

Rzav Canyon has the highest Additional Values. However, it is important to emphasize that the differences between Main and Additional Values among all three canyons are minimal meaning that all of them have similar advantages and problems when it comes to canyoning activities.

From the findings we can see that the success of a tourist service linking nature with physical activity largely depends on the quality and skill of tour guide service. Their task is to mediate and help tourists navigate at nature destinations such as canyons and therefore it is essential to improve the expertise and skills of such guides in the future. Considering that one of the most highly valued elements by tourists is related to tour guide service, this should be the primary focus for the future. Only expert guides with an appropriate set of skills can provide visitors with memorable experience while engaging in canyoning activities.

Furthermore, one of the most important elements is related to aesthetic values of the landscape and surrounding nature where canyoning activities take place. Therefore, it is essential to keep these natural spots as pristine as possible and limit the number of participants to a suitable number by determining the carrying capacity at these destinations. Regular observation and monitoring measures for visitors should be implemented in future. This is especially important during the present Covid-19 pandemic when foreign travel is very limited which has in turn led to a significant increase of domestic visitors at nature destinations throughout Serbia.

## Conclusion

The primary goal of this paper was to explore the current state and potential of the three analyzed canyons for their further development as canyoning geotourism destinations in Serbia. According to our results we can conclude that all three analyzed canyons possess most of the main elements required for the development of these sites as canyoning tourism destinations. When it comes to natural values and nature protection, each site possesses high scores for the subindcators that fall within this group (possibility for interpretation, representativeness, surrounding landscape and nature, protection level and current condition). This is especially important in the case of aesthetic values which are often among the most important motives when visiting such canyoning tourism destinations. Other elements, such as tour guide service, hostelry and restaurant service are also at a satisfying level at the moment. On the other hand, some subindicators related to human activities are a much bigger issue. Promotional activities are almost non existent as well as interpretive tools and visitors centers. Given their importance for further tourism development, these activities should have priority in the future in order to attract a larger number of canyoning tourists to these geosites. Interpretive panels do not require much money and effort to make while visitor centers are a bigger investment. A possible solution for the visitor center could be the use of the current visitor center of the Tara National Park (located in Bajina Bašta) in the initial stages of canyoning tourism development in this area. Succesful tourism development could lead to a construction of a smaller nearby visitor center in the future, focusing mainly on this area and the three canyons. Significant improvement of these elements together with better promotional activities would bring more domestic as well as foreign tourists to these geosites thus benefitting the local population and economy by opening new job opportunities and eventually higher income for the local community.

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