Original Research

Assessment of the Attractiveness of Natural Resources and Landscapes of the Kopaonik National Park (Serbia): Framework and Importance for Tourism Development

Danijela Vukoičić[1]*, Dušan Ristić[1], Uroš Milinčić[2], Dragan Petrović[3], Ljiljana Mihajlović[3], Sanja Božović[1], Branko Protić[3]

[1]University in Priština in Kosovska Mitrovica, Faculty of Sciences and Mathematics,
Lole Ribara 29, 38220 Kosovska Mitrovica, Serbia
[2]Republic Geodetic Authority, Bulevar Vojvode Mišića 39, 11000 Belgrade, Serbia
[3]University of Belgrade - Faculty of Geography, Studentski trg 3/III,11000 Belgrade, Serbia

Abstract

This research presents a methodological framework for assessing the attractiveness of natural resources and landscapes and their importance for tourism development. The research is conducted in the area of Kopaonik Mountain in Serbia, which is partly, due to its natural values, declared a natural heritage of exceptional importance Protection Category I, i.e. the National Park. The goal of this paper is to identify and assess the tourist attractiveness of the natural resources (relief, hydrological and climatological characteristics, and vegetation) and landscapes in the National Park (NP) Kopaonik area. There are two independent methods used to assess the tourist attractiveness of natural resources and landscapes in this study. The first method is based on numerical and statistical analysis and quantitatively expresses the attractiveness of natural resources/elements (relief, climate, hydrology and vegetation) separately and all together, indicating the overall attractiveness of natural resources for tourism development. The second method envisages 8 criteria according to which natural landscapes are scored on a scale from 0 to 3. Based on a clearly defined model for assessing the attractiveness of natural resources and landscapes, we conclude that the area of Kopaonik National Park has a high level of tourist attractiveness.

Keywords: assessment, natural resources, landscape, tourism, National Park (NP) Kopaonik

*e-mail: danijela.vukoicic@pr.ac.rs

Introduction

Tourism is a significant sector for the development of the economy of any country [1]. A natural and socio-cultural resource is the capital in developing tourism in a region. The intensity of mass tourist movements in the middle and end of the 20th century exceeded the carrying capacity of the environment, which led to the destruction of the ecological environment, i.e. the obstruction of the sustainable development of the tourist economy [2]. Nature-based tourism is an important and growing economic sector in different regions in Europe [3]. Therefore, nature-based tourism resources assessment is important in order to determine the appropriate region in the planning of a sustainable tourism destination [4]. The conservation of natural resources are the most important objectives among the protected area management authorities [5].

Research on landscapes is very important when it comes to the relationship between man and nature. There are different definitions of landscape [6-7]. Alltogether they represent a complex combination of all geo-factors in a certain area. Thus, the notion of "natural resources" usually goes hand in hand with the notion of "natural conditions" [8]. Therefore, the natural landscape is a combination of the same genetic works of one topographic area [9]. The properties of the landscape are reflected directly through the surroundings of the destination, and one of them is aesthetic attractiveness [10]. Geographical research on landscapes seeks to address the choice of sites that are most suitable for recreational content [11]. Thus, tourist destination planning must be based on evolution that takes into account all aspects of landscape quality.

Natural landscape aesthetic is the natural resource that is essential for maintaining mental and physical health of humans [12]. Landscapes are integral to human welfare and support many human activities, including scientific, educational, heritage-based, aesthetic, symbolic, sacred or for entertainment purposes [13]. The author Lee-Xsuex [14] states that aesthetics is the result of the interaction between people and the landscape". Tourists appreciate and aspire to see the picturesque landscapes and a good environment in which positive emotions reign. Ecological and aesthetic quality of the landscape can overlap in some aspects, i. e. the visual diversity of the landscape and the generated natural design associated with the emergence of biological productive effects [15]. In this paper, the focus is on the assessment of the aesthetics of the natural landscape of the Kopaonik National Park.

Protected natural areas have a special ecological, scientific, cultural, aesthetic and recreational value that are especially attractive to modern tourists [16]. While emphasizing the importance of the tourist potential of resources contributes to the development and marketing of destinations [17]. The impact of tourism and the economy in the areas of national parks or their immediate vicinity has been the subject of many studies [18]. This impact depends on external factors over which local authorities and parks have no influence, as well as on internal ones - which are mostly related to the attractiveness of the national park itself [19].

The sustainability of the mountain is important for the landscape and the environment. Sustainable tourism can be an effective management tool for natural resources. It guarantees benefits not only for the current generation but also for the future ones, and at the same time ensures high levels of quality of the landscape which is the main protagonist of tourism [20]. Areas with growing tourism and recreational use are facing demands to modify forest management to maintain and enhance the landscape, recreational and biodiversity values [21]. Mountain landscapes are highly valued, because in addition to recreational activities, tourists like to enjoy the beauties of nature [22-24]. It can be said that aesthetic values are one of the most important aspects that people associate with the mountain landscape and that contribute to the human sense of well-being [25].

A downhill skier on a mountainside may enjoy scenery located farther away than a hiker within a forest [26]. Several studies assessed the changes in aesthetics over time, with a focus on mountain aesthetic value [27-29]. Some studies have addressed changes in landscape function, attractiveness, identity, and sustainability in rural mountainous areas [30-33]. This research as well as some others are evidence that tourism has emerged as a powerful force that is fundamentally restructuring areas, consequently making tourism policy naturally linked to landscape management.

The attractiveness of an area in a tourist sense cannot be abstract, but arises from the attractive attributes of the tourist area (how recreational, interesting, aesthetic and famous it is). The concept of tourism attractiveness of an area is one of the most frequent issues studied in the theory of tourism and its adjacent disciplines in recent decades [34,35]. Several studies have dealt with the way tourist attractions affect the development of tourism within the area [36-38]. Taking into consideration the attractiveness in the context of natural potentials, individual studies deal with the attractiveness of the landscape [39,40], hydrological values [41], the impact of climate on tourism development [42-44]. Landscape and tourism are, therefore, two closely related terms. The landscape is revealed as a factor of attraction and development for tourism, which in turn generates an impact on the landscape from very different perspectives [45]. The transformation of a "natural" landscape into a tourist landscape implies a fundamental symbolic and physical reordering of the characteristics of the former landscape [46].

The goal of this paper is to identify and assess tourist attractiveness of the natural resources (relief,

hydrological and climatological characteristics, vegetation) and landscapes in the NP Kopaonik area. There are two independent methods used to assess the tourist attractiveness of natural resources and landscapes in this study. The first method is based on numerical and statistical analysis was used, which was previously applied in the assessment of natural potentials of Lukovska Banja, the highest spa settlement in Serbia, located in the foothills of Kopaonik [47]. In the current method, the shortcomings in the part of biocenosis assessment have been eliminated in numerical expressions, so the expected results are more precise. The second method refers to the assessment of the attractiveness of natural landscapes when it comes to tourism with special reference to vegetation, which was used in the Case Study: Otwock Commune, Central Poland [48]. Recognition of natural advantages and their evaluation should contribute to the economic development of the region. The greatest significance of this research would be the resulting ascent of NP Kopaonik as a tourist product and its better positioning on the tourist maps of Serbia and Europe. This would have a direct influence on the future development strategies concerning the tourism in NP Kopaonik and increasing tourist visits to the same mountain.

Study Area and Data

NP Kopaonik is located on the mountain Kopaonik, within the Kopaonik Tourist Region, in the southwestern part of Serbia in the relative vicinity of the towns of Kruševac and Kraljevo. It is 279 km south from the capital of Belgrade, and 130 km west from Niš. Kopaonik is one of the largest mountain massifs in Serbia, which extends from the north-west to the southeast, about 75 km in length, about 40 km wide in the middle. The mountain Kopaonik belongs to the Dinaric mountain range. The highest peak is the Pančić peak with its height calculated to be 2017 m [49, 50], above sea level (Fig. 1). One of its parts is a protected zone called "Kopaonik National Park" [49, 50].

Relief in general, as well as special forms of relief (mountains, gorges, canyons, caves) are attractive tourist motives, providing a certain types of tourist activities with their characteristics. For different sports and recreational activities, different relief surfaces are necessary. Thus, for golf or Nordic skiing, flat surfaces are required, while alpine skiing or alpinism requires steep or vertical terrain. Slightly stricken terrains are suitable for hiking tours or trim trails. It is characteristic that the largest part of the mountain Kopaonik has an altitude of 500-1000 m,
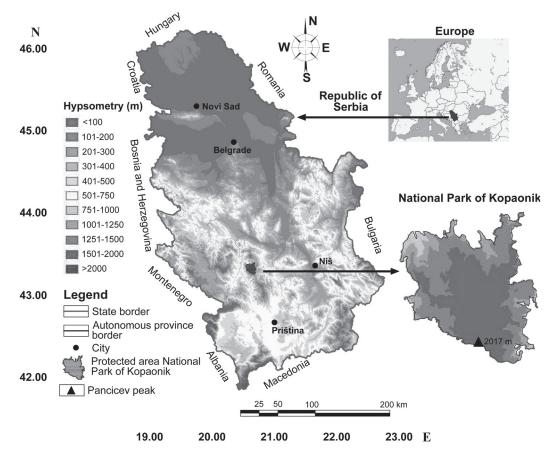

Fig. 1. Location map of the NP Kopaonik
Source: Authors; Source of hypsometry: CGIAR Consortium for Spatial Information. SRTM 90m Digital Elevation Data. 2017. Available at: http://srtm.csi.cgiar.org/ (accessed: 22 February 2017)
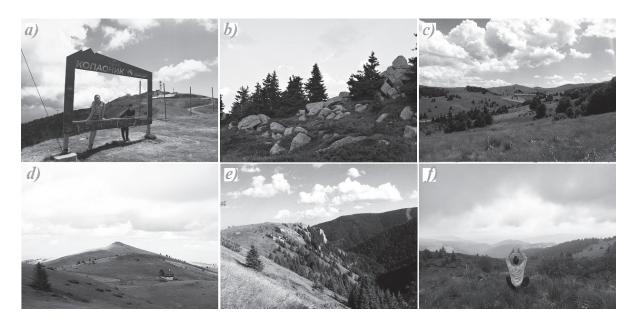
Fig. 2. Peaks Kopaonika: Pančićev peak a); Peak Vučak b); Rendara c); Gobelja d); Peak Bele stene e); View from Jelica f).

as well as that a significant area is located between 1000-1500 m. These are heights which allow several types of tourist movements, both in summer and winter. These surfaces are accessible and suitable for the construction of receptive facilities. Kopaonik, since it occupies the central part of Serbia, with its altitude, represents a true climate modifier. Its lowest point is at the confluence of Suvi Dol and Toplica, about 290 m above sea level, and the highest point is the Pančić peak with 2017 m. The altitude difference is 1727 m [50].

Kopaonik is characterized by high mountain relief, which is manifested by high peaks (seven peaks are higher than 1700 m above sea level, Fig. 2), high rocky cut-offs and large vertical dissection of the relief (height difference between valleys and peaks greater than 1000 m). These peaks offer a view of other parts of Serbia and the mountains of the surrounding countries (Montenegro, Albania and Bulgaria). This morphometry of the mountain and its high landscape values influenced it to become a tourist destination.

Kopaonik is one of the sunniest areas in Serbia in December and January. On average, sunshine hours in the highest part of Kopaonik amount to about 1900 per year. The sunshine is a very important climate element for tourism valorization. The average number of sunshine hours in Kopaonik is almost the same as the number of sunshine hours in the famous winter tourism center of Davos; little higher than the number of sunshine hours in Hallstatt and more than an hour a day higher than at the ski center in Piktal. Sunshine has great health significance, and apart from that, it has the greatest impact on the tourists movement, giving one of the main features to the tourist climate attraction [42].

Of all climate elements for winter tourism, sport and recreation in Kopaonik, the snow cover is the most important. In January, February, March, April and December, the snow cover in Kopaonik on average lasts over 25 days and in November it lasts 11 days. In October, May and September, the snow cover lasts for less than 5 days. Kopaonik has an average of 155 days under the snow cover, although this feature is not represented throughout the mountain, but it changes mainly with altitude and exposure. Skiing and other winter sports are possible on this mountain for at least four months a year. Usually, ski season lasts from late November till the end of March [42, 51].

NP Kopaonik is an attractive tourist destination in the summer. The first dry ski slope, 900 m long, was opened on Kopaonik in 2018. The construction of this slope completes an entire summer complex, which, in addition to the dry ski slope, consists of an adventure park, bobsleigh, tubing, zip line, outdoor gym and outdoor and bicycle and kart trails. In the summer period, panoramic rides are offered using the "Pančićev Peak" cable car (Fig. 3) [52, 53].

Hydrographic facilities allow the development of bathing and recreational tourism and in this context, water temperature, water purity and coastal area play an important role, water movement and transparency. The relatively dense river network in the area of NP Kopaonik consists of small streams, smaller rivers and three lakes. Numerous springs are scattered throughout the area (cold and radioactive, hot and healing, abundant and concentrated in the foothills of the mountain) [54, 55].

Flora and fauna are also significant when it comes to tourist movements. Vegetation is an air filter with its hygienic-health role, i.e. recreational properties and as such it has the greatest importance for tourism. Also, vegetation contributes to aesthetic values of the area and enables tourism activities. Staying in nature, collecting medicinal herbs, forest fruits and mushrooms becomes a center for recreation and relaxation of tourists. The Kopaonik Mountain is a forest-pasture zone of

Fig. 3. Sightseeing from the cable car "Pančićev Peak" in the winter and summer tourist season.

central Serbia, and one of the most important centers of biodiversity of the Serbian endemic flora. Forests that have various recreation opportunities, including picnicking, trekking, cycling, ecological tours, fishing, and so on, have psychological and physical benefits for people.

Landscapes represent an attractive factor for the development of tourism in the area of Kopaonik National Park. Large area with rich flora and fauna, many springs, streams and rivers, rocky and affordable peaks hidden in coniferous forests, mild ridges and slopes with passes and valleys, canyons, spacious coniferous forests with countless trails and roads for short and long hiking paths (hiking) make Kopaonik an ideal place for an active vacation and recreation with attractive landscapes.

Kopaonik is characterized by high mountain relief, which is manifested by high peaks (seven peaks are higher than 1700 m above sea level), high rocky cut-offs and vertical relief dissection (height difference between valleys and peaks higher than 1000 m). These peaks offer a view of other parts of Serbia and the mountains of the surrounding countries (Montenegro, Albania and Bulgaria). This morphometry of the mountain and its
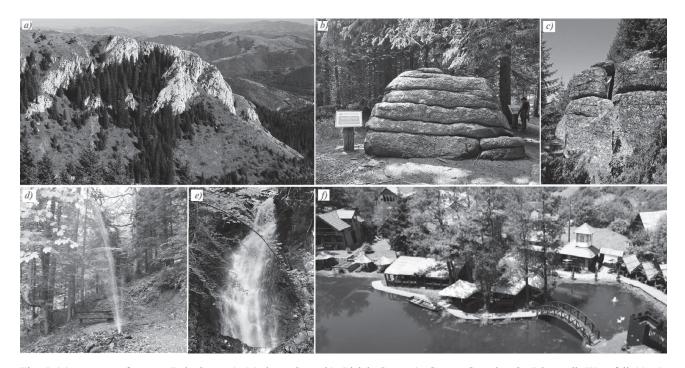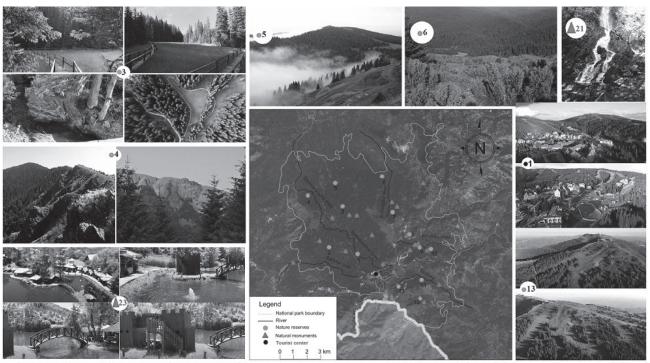

Fig. 4. Monuments of nature: Bele Stene a); Markova Stena b); Lisičja Stena c); Geyser Gvozdac d); Jelovarnik Waterfall (s); e); Semeteško Lake f).

Tourist center Kopaonik (1). **Nature reserves:** Samokovska reka (1); Barska reka (2); Jankova bara (3); Kozje stene (4); Vučak (5); Mrkonja (6); Gobelja (7); Bele stene (8); Metođe (9); Jelak (10); Duboka (11); Jelovarnik (12); Suvo Rudište (13). **Natural monuments:** Lisičja stena (1), Pajin grob (2), Suvi vrh (3), Jankov breg (4), Babin grob (5), Visoki deo (6), Karaman-Vučak (7), Cirk Krčmar (8), Cirk Široki do (9), Cirk V. Gobelja (10), Velika stena (11), Velika Šiljača (12), Jelica (13), Žljeb (14), Gvozdac (15), Oštri krš (16), Vrelo Duboka (17), "Gejzir" Gvozdac (18), Izvor Marina voda (19), Izvor Krčmar (20), "Jelovarnik" (21), Vodopad Barska reka (22), Semeteško jezero (23).

Fig. 5. Nature reserves in the area of the Kopaonik National Park.

high landscape values influenced it to become a tourist destination [56].

The landscape in the Kopaonik National Park consists of numerous natural monuments (Fig. 4), where 10 geomorphological ones have been recorded (stone granite figures: Lisičja Stena, Pajin Grob, Suvi Peak, Jankov Breg, Babin Grob, Visoki Deo, Karaman-Vučak; traces of Pleistocene glaciation: Cirk Krčmar, Cirk Široki Do, Cirk Velika Gobelja), six geological ones (Velika Stena, Velika Siljača, Jelica, Žljeb, Gvozdac, Oštri Krš) and 12 hydrological ones (springs and hot springs: Duboko Hot Spring, Gvozdac Geyser, Marina Water, Krčmar Spring, Jelovarnik, Barska River Waterfall, Semeteško Lake, strictly protected watercourses of the basins: Samokovska River, Gobeljska River, Barska River, Brzećka River, Duboka River) [56].

Among the most important natural values in the area of Kopaonik National Park are nature reserves. In this area, 13 sites that belong to the first category of protection were singled out (Fig. 5), as well as 12 botanical monuments of nature [56].

Research Methodology

Model for Assessing the Attractiveness of Natural Tourist Values

The most commonly used models for the assessment of natural tourist values refer to geo-heritage [47,50]),

and a smaller number of studies deal with the complex assessment of natural values with the aim of a functional tourist typology of the area. On the example of NP Kopaonik, we have improved the model used in previous studies [47]. Based on the quantifications, individual qualifications were derived taking into consideration the relief, hydrological and climatological characteristics and vegetation. On the obtained results, the attractiveness of the area for tourism development was calculated.

Tourist Attractiveness of the Relief

Special forms of relief (mountains, canyons, gorges, caves) represent attractive tourist values, and the characteristics of the relief are determined by the types of tourist activities. If we start from the general relation that $y = x^z$, where: y – the coefficient of the tourist attractiveness of the relief; x – general parameter relationship, z – the set of all other parameters, developing the function we get that $x = \frac{Hi}{Hm}$ where Hi – maximum height of the tourist place, a Hm – maximum height in the observed region. The lowest altitudes in the tourist place and region also play an important role in determining the attractiveness coefficient, so z is obtained by the following parameters: Hw – maximum or minimum difference between the highest and lowest point in the observed region, Hwi – maximum or minimum difference between the highest

and lowest point of the observed tourist place, and h the intensity of the relief jaggedness. Parameter h is equal:

$h = a * (\frac{n*\Delta H}{d}) + b$, where a and b – constants on

which jaggedness depends, n – number of possible positions where tourist places can be developed in the region, H – the difference between individual positions of tourist places, and d – the length of the observed space. Based on everything above, the coefficient of tourist attraction of the relief is defined by the formula (1) [47]:

$$log\, K_h = \frac{H_{max}}{H_m\, log\frac{1\, Hw - H_{wi}}{h\quad H_w}} \qquad (1)$$

Where:

H_{max} – maximum height of the tourist location,
H_m – maximum height of the tourist region,
H_w – the difference between the highest and the lowest point in the region,
H_{wi} – the difference between the highest and lowest point of the observed tourist location,
h – the intensity of the ruggedness.

The intensity of the relief ruggedness determines whether the area is suitable for excursions ($h = 1$) or for air-conditioning and sports-recreational terrains ($h = 5$). Depending on the slope of the terrain, the following types of terrain are distinguished: excursion places (<9°), island mountains in the plain (9), climatic health resorts (14), and winter ski centers (>45°).

If for the coefficient of tourist attraction of the relief K_h is $0 < K_h < 1$, then the space is suitable for the development of tourism, i.e. if $0 < K_h < 0.5$ the places are, from the point of view of the relief, suitable for excursions; $0.5 < K_h < 0.75$, the sites are suitable for the development of climate - health tourism, and when $0.75 < K_h < 0.75$ the tourist sites are suitable for the development of winter ski tourism [47].

Tourist Attractiveness of Hydrological Characteristics

In assessing the tourist significance of the relief, it is necessary to consider its influence on the climate and hydrological characteristics of the given space. Many hydrological objects give the area a special attraction (waterfalls, lakes, rivers, and thermo-mineral springs). A model for the evaluation of the tourist attractiveness of hydrological characteristics of the region was given in [47], where the coefficient (K_w) is defined by formula (2):

$$log\, K_w = C\, \frac{Q_i}{Q_w}\, log\, r\, \frac{F_{ci} - F_{wi}}{F_{ci}} \qquad (2)$$

Where:

C - the coefficient determining the quality of waters and their class,

Q_i - the average annual yield of the largest (or the smallest) source in the observed area (l/s),
Q_w - the average annual yield of the largest source in the region (l/s),
F_{ci} - the area of the tourist place (m²),
F_{wi} - the water area in that place,
r – the corrective factor that signifies the effect of relief, erosion, people, etc. (must be <1).

If r was equal to 1, then water would depend entirely on relief, erosion, people, etc. and their hydrological properties would be ignored. With coefficient C, the quality and class of water are determined, so we distinguish: I class - water is good for drinking and healing people, as well as bathing *(C = 1)*; Class II - good for therapeutic and recreational use *(C = 0.75)*; Class III - water must be purified and suitable only for water sports *(C = 0.50)*; Class IV - water is not for use *(C = 0.25)*.

If $K_w < 1$ the spaces have the conditions for tourism development, and if $Kw > 1$, then these spaces are not suitable for tourist activity [47].

Tourist Attractiveness of Vegetation

Plant communities provide aesthetic, tourism, health-recreational, food and medical character to the people. Namely, the coefficient of attractiveness of vegetation (K_l) is determined on the basis of formula (3):

$$log\, K_l = \frac{1}{l}\, \frac{L_{sw}}{L_i}\, log\, \frac{L_i}{L_{ci}} \qquad (3)$$

Where:

L_i - the area of plant communities in a tourist place (ha),
L_{ci} – the area of the site (ha),
L_{sw} - the average area of plant communities in a city per inhabitant,
l – forest class coefficient.

There are five classes of forests, namely: I class - forests suitable for treatment, hunting and recreation ($l = 5$); Class II - forests at a height from 800 to 1200 m above sea level and suitable for treatment, hunting and recreation ($l = 4$); III class - forests with a small amount of tourist values ($l = 3$); IV class - forests that are not suitable for the treatment facilities ($l = 2$) and V class - forests that are very weak and unsuitable for the treatment facilities ($l = 1$). If the value is $K_l < 1$; the premises have suitable conditions for the development of tourism based on plant communities, i.e. vegetation [47]; if $K_l > 0 \geq 0.5$, the area has low values for the development of tourism based on plant communities; if $K_l > 0.5 \geq 0.75$, the area has average values for the development of tourism based on plant communities, and if $K_l > 0.75 > 1$, the area has high values for the development of tourism based on plant communities.

Relief and climate are of particular importance for the development of the winter tourist season. The particularity of the significance refers to the slope of the terrain and the number of days with snow cover, and their significance for the development of tourism in a given space can be seen from the indicators that valorize these conditions. The tourist attractiveness coefficient for the development of winter sports tourism (K_z) is determined by the following formula [47] (4):

$$K_z = K_h^{\frac{s_0}{s_i}} \qquad (4)$$

Where:

K_h - relief attractiveness coefficient,
S_o - average duration of snow cover in the region,
S_i - average duration of snow cover in the observed location.

If $K_z>0\geq0.5$, the area has low values for the development of the winter tourist season, if $K_z>0.5\geq0.75$, the area has average values for the development of the winter tourist season, and if $K_z>0.75\geq1$, the area has high values for the development of the winter tourist season.

The tourist attraction of relief, hydrological characteristics and vegetation in the areas where there is a retention of snow cover during the year affect the overall attractiveness of the place for tourism development, so for the coefficient determining the attractiveness of the tourist offer (K_o) of a particular place the synthetic indicator is taken, which is determined by formula (5) [47]:

$$K_0 = \sqrt{\frac{K_h^2+K_w^2+K_l^2+K_z^2}{4}} \qquad (5)$$

If $K_0>0>0.5$, the area has low values for tourism development; if $K_0>0.5>0.75$, the area has medium values for tourism development; and if $K_0>0.75>1$, the area has high values for tourism development.

Assessment of Landscape Natural Values in Tourism

To assess the attractiveness and evaluation of natural landscapes of Kopaonik National Park, the method originally developed in their research was developed by Fornal-Pieniak and Hungary [48] and implemented in the Otwock commune area, central Poland, the European Lowland. Eight assessment criteria and the scale with the scores ranging from 0

to 3 points have been used for landscape evaluation (0 points - when a given landscape feature does not occur). All distinguished spatial-landscape units have been assessed according to defined criteria (Table 1). The assessment was preceded by several research phases. First, field research was conducted (systematic observation - types of vegetation, terrain relief, surface water occurrence and land use, taking into account natural protected areas) and then cabinet research was conducted based on the historical method and review of available literature (literature, written documents, statistical and cartographic data, archives, etc.).

According to points scale (assumed within evaluation criteria) and total of points received by spatial-landscape units during landscape evaluation, four categories of areas landscape natural values in tourism aspect have been distinguished: Category A - areas with very high natural landscape values in tourism aspect (spatial-landscape units obtained from 20 to 24 points in the assessment); Category B - areas with high natural values in tourism aspect (unit score from 15 to 19 points); Category C - areas with medium natural values in tourism aspect (from 9 to 14 points); Category D - areas with relatively low natural values in tourism aspect (≤8 points) [48].

Results and Discussion

Attractiveness of Natural Values in the Area of NP Kopaonik

Values that determine the tourist attraction of relief, hydrological characteristics, vegetation, relief and climatological characteristics for the development of winter sports, as well as the overall assessment of the attractiveness of natural tourist values are given in Table 2.

The intensity of the relief ruggedness is the product of the difference between the maximum and the minimum altitudes in the region and in the of NP Kopaonik. The relief ruggedness coefficient (Table 2) of NP Kopaonik is h = 4.92, which confirms that the relief is large, unique and suitable for health centers and sports and recreational terrains. The 47° sloping terrain in Kopaonik confirms that the area is suitable for winter ski center. Based on the relief attractiveness coefficient K_h = 0.770994 (Table 2 and 3), this tourist destination is suitable for the development of winter ski tourism.

Among the attractive relief forms, deep cut river valleys, mountain peaks and wide and flat high ridges stand out. As the slope relief is represented on a large area of the Kopaonik National Park, large interventions have been performed in order for the ski slopes and ski lifts to be constructed, together with buildings and infrastructure facilities. Among the geological objects, six sites stand out [50]. Hydrogeological sites (Duboka Hot Spring and Marina Vode and Krčmar Voda springs) have special aesthetic and curiosity

Table 1. Criteria for the assessment of landscape natural values with special reference to the vegetation of NP Kopaonik [48].

Criteria of assessment	Score			
	0	1	2	3
C1 — Protected areas occurring	No protected areas	One or more protected areas of lower range (e.g. Area of protected landscape, ecological site) occupying a small part of the area	One or more protected areas of mostly middle rank (e.g. Landscape park, Nature 2000 area) covering the most of the area	The whole/most of area under protection of high range (e.g. National park, nature reserves) or more than one protected areas of high and middle range (e.g. National park, nature reserve, landscape park, Nature 2000 area)
C2 — Protected objects occurring	No objects	1 object	2-3 objects	4 or more objects (nature monuments, documentation sites of inanimate nature, ecological sites, nature-landscape sites)
C3 — The degree of naturalness of the vegetation	-	Low	Medium	High degree
C4 — Plant communities resistant to recreational use	Very sensitive	Low	Medium	Quite resistant and highly resistant
C5 — Attractiveness of plant communities -tourism aspect	No vegetation	Not very attractive	Medium attractive	Very attractive (e.g. Forests, surface waters).
C6 — Diversity of vegetation	No vegetation	Rather small: mostly synanthropic types of vegetation covering most of the area	Different types of vegetation (natural, semi-natural and synanthropic plant communities) covering most of the area	Different types of vegetation of mainly natural and semi-natural character covering the whole/ most of the area
C7 — Surface waters occurring	No surface water in the area and in the vicinity at the distance up to 200 m from unit borders	Small water courses/water reservoirs are located in the vicinity of the area at the distance up to 200 m	Small/medium river/ water reservoir is located within the area or in the neighborhood directly at the border	Medium/large river/water reservoir is located in the area or directly at the border
C8 — Land relief	-	Low diversity (rather flat area)	Medium diversity (wavy/ hilly terrain)	High diversity with occurrence of specific forms of relief (e.g. River valleys, natural water courses, old river beds, distinctive terrain culminations, scarps, edges, dunes, eskers, kames, rocks, caves, erratic boulders et cetera)

Table 2. Coefficient of attractiveness of natural tourist values in the area of NP Kopaonik

Indicators	Description	Values
H_{max}	Maximal altitude of touristy place	2017 m
H_{min}	Minimal altitude of touristy place	700 m
H_m	Maximal altitude in touristy region	2017 m
H_n	Minimal altitude in touristy region	290 m
H_w	Altitude difference between the highest and lowest points in the region	1727 m
H_{wi}	Altitude difference between the highest and lowest points within the place	1317 m
N	Number of possible positions for tourism development in the region	9
d_{av}	Average length of the area under study	13079 m
h	Intensity of relief ruggedness	4.92
A	Terrain slope towards Kopaonik	47.00°C
K_h	Relief attractiveness coefficient	0.770994
C	Coefficient determining quality of waters and their class	1
Q_i	Average annual flow rate of the largest spring in the place under study	65.0 l/s
Q_w	Average annual flow rate of the largest spring in the region	65.0 l/s
F_{ci}	Area of touristy place	12106.03 ha
F_{wi}	Area of waters in touristy place	14.51 ha
R	Corrective factor (influence of relief, erosion, human activity)	0.5
K_w	**Attractiveness coefficient of hydrological characteristics**	**0.73967**
L_i	Area of plant communities in touristy place	10042.40 ha
L_{ci}	Area of touristy place	12106.03 ha
L_{sw}	Average area of plant communities in touristy place per inhabitant	2.50122
L	Forest class	5
N_{LB}	Number of inhabitants of touristy place	4015
K_l	**Vegetation attractiveness coefficient**	**0.999990**
S_o	Average snow cover duration in touristy region	98,95 days
S_i	Average snow cover duration in tourist place	155 days
K_z	Relief and climate attractiveness coefficient for development of winter sports	0.95268
K_o	**Place attractiveness coefficient for tourism development**	**0.849848**

features, geomorphological - circuses and stone granite figures (rocky outcrops on mountain peaks), hydrological - springs, waterfalls, peat and strictly protected watercourses of basins (Samokovska River, Gobeljska River, Barska River, Brzećka River and Duboka River). Rivers have rapids, waterfalls on their flows, which increases their attractiveness, and the valorization of gorges and canyons cannot be separated from the valorization of the river as a hydrological tourist attraction. Thus, valorisation is performed for the entire area. The great disintegration of the relief and the altitude outside the area of the Kopaonik National Park enable the development of winter tourism, and the richness of thermo-mineral springs affects the overall

attractiveness of the Kopaonik region in all seasons [54-57].

By analyzing the distribution of all hydrographic objects in the area of NP Kopaonik and their hydrological characteristics, it was concluded that they are suitable for the development of tourism and as such have a complementary tourist value. The distribution of hydrological facilities in the area of NP Kopaonik is not large. The most represented are mountain watercourses whose tourist value is increased by waterfalls, cascades, springs, meanders, gorges and canyon valleys through which they flow. Geyser Gvozdac, is a concentrated jet of groundwater 5-6 m high, which flows out of the exploration well, under a pressure of 1.5-2 l/s, and as

Table 3. Qualification of the area of NP Kopaonik.

Coefficient of atractivity	Low	Middle	High	Qualification
K_h			0.770994	Area is suitable for all types of tourism, especially suitable for the development of winter skiing tourism.
K_w		0.73967		Area has middle touristic values of hydrological objects, the main attractiveness is presented by waterfalls, overfalls and cascades on rivers, geyser Metodje and strong mountain springs.
K_l			0.999990	Area has high values of plant communities which are suitable for tourism development
K_z			0.95268	Relief and climate are of the special value for high area attraciveness for winter touristic season development
K_o			**0.849848**	**Based on all natural elements for touristic attractiveness of the area, NP Kopaonik has high value.**

such is the largest tourist attraction for those who come to visit the area [50].

The waters on Kopaonik are first class, i.e. they are good for drinking and healing of people, as well as bathing. Based on the data presented in Table 2, the coefficient of attractiveness of hydrologic properties is K_w = 0.73967, i.e. this tourist site has conditions for the development of tourism based on its hydrological characteristics. Based on the coefficient of attractiveness, the area has an average tourist value of hydrological facilities (Table 2).

The tourist attractiveness of NP Kopaonik is indirectly influenced by numerous sources of mineral, thermal, gas and radioactive water, which in the Kopaonik region represent the basis for the development of classic spa health tourism and rehabilitation, as well as prevention and recreation of healthy people. Among the significant chirological objects in the protected zone of the Kopaonik National Park is Smeteško Lake, on which there are small floating islands, with a bog developed along the rim. The lake is located only 200 m from the national park and is the largest barrier lake on Kopaonik.

Plant communities in the area of Kopaonik National Park are especially significant for tourist movements. They are manifested as a great direct and indirect tourist value. They have accentuated recreational, aesthetic, health, curiosity, relic, endemic and famous properties of a tourist attraction. They enable specific types of tourism, and many biogeographical values are presented to tourists in nature reserves and other nature protection regimes. The areas under vegetation and their class have determined the functional typology of the NP Kopaonik area. Based on the coefficient of attractiveness K_l = 0.999990 (Table 2 and 3), the area of NP Kopaonik has high plant communities values that are crucial for the development of tourism.

The climate on NP Kopaonik is one of the most important tourist motives. Its significance is expressed in the direct attractiveness of the climate, but also in the indirect influence on the attractiveness of other motives. With its characteristics, the climate directly creates

conditions suitable for engaging in certain recreational activities, and indirectly influences tourist movements. Air temperature and insolation are of special importance for heliotherapy, the appearance of the landscape, and the duration of the snow cover in the observed area. The number of days with snowfall, the height of the snow cover, the quality of the snow and its duration are important for tourist valorization. NP Kopaonik is well visited during winter due to the snowfall. Snow is the basis for the development of skiing and other winter sports. In Table 2 and 3 the coefficient of attractiveness for the development of winter sports tourism is K_z = 0.95268, i.e. the NP Kopaonik has very favorable conditions for the development of winter tourism, which was confirmed with the coefficient of attractiveness of relief (K_h).

Based on clearly defined models for assessing the attractiveness of natural values in the area of NP Kopaonik, we came to the coefficient of attractiveness concerning relief, hydrological facilities, and vegetation. Based on relief and climate, we calculated the coefficient of attractiveness concerning the possibility of winter tourism (Table 3). The obtained values (attractiveness coefficients) determined the attractiveness of the area for tourism development. The coefficient of attractiveness was determined on the basis of mathematical expression (5). The area of NP Kopaonik has a high attractiveness for tourism development (K_o = 0.849848). Based on the obtained results in the research, we conclude that the area of NP Kopanik is suitable for several types of tourism: winter ski, sports, recreational, excursion, health, and eco-tourism, while various forms of geosites and protected plant species give the opportunity to develop educational tourism.

In order to compare our research with other researches done for the mountainous areas of the Alps and the Carpathians, we searched the Web of Science database, and the search query gave us the results of studies that dealt with individual climate and landscape research in the Alps [58, 59]. The Carpathian area is linked to the studies that deal with geoheritage [60] and the potential for the development of rural tourism

Table 4. Results of landscape natural values evaluation, with special regard to vegetation, in terms of tourism in Kopaoniku.

	Criteria of assessment	Score			
		Suvo Rudište	Bele stene	Gobelja	Kozje stene
C1	Protected areas occurring	3	3	3	3
C2	Protected objects occurring	3	2	2	2
C3	The degree of naturalness of the vegetation	3	3	3	3
C4	Plant communities resistant to recreational use	1	3	3	3
C5	Attractiveness of plant communities - tourism aspect	2	3	3	3
C6	Diversity of vegetation	3	3	3	3
C7	Surface waters occurring	2	1	2	3
C8	Land relief	3	3	3	3
	Total score	20	21	22	23
	Category	A	A	A	A

and eco-tourism. Hence, the importance of the applied model in this study is more significant because it deals with the assessment of the attractiveness of all natural values in a given area.

Landscape Natural Values in Tourism

Based on the given methodology for the assessment of natural landscapes, the total number of points was reached, based on which we conclude that the area of Kopaonik National Park represents an area with very high natural landscape values in the aspect of tourism (Table 4).

Analyzing the results from Table 4, we draw the following conclusions:

– The analyzed sites (Suvo Rudište, Bele Stene, Gobelja and Kozje Stene) are natural monuments that belong to the first category of protection (protected area of international, national, i.e. exceptional importance);

– All analyzed localities belong to A category (areas with very high natural landscape values in the aspect of tourism);

– Among the analyzed sites, Kozje Stene has the highest number of points (23). This site covers the largest area (471.38 ha) among the natural monuments of Kopaonik National Park. On the left side of the Samokovska River, below the Kukavica peak, there is a large rocky ridge, with steep and mostly vertical sides with a large number of lookouts, from where the view extends towards the surrounding mountains. The area is characterized by relict communities of spruce, fir and heather. At the foot of the ridge there is shrubby vegetation. The space is very attractive for tourists;

– The site with a slightly lower number of points (22) in the assessment of natural values of the landscape is Gobelja. On this arched ridge with an altitude of 1500-1900 m above sea level, the source of the Gobelj River, visible traces of glaciation and

geological monuments are located. This is one of the wild landscapes of Kopaonik and the only habitat of eelgrass, with a rich forest community, as well as a mosaically distributed shrub community;

– Bele Stene, a locality with a slightly lower number of points (21) in the assessment of the natural values of the landscape when compared to Kozje Stene and Gobelja. This site is one of the best preserved natural environments of Kopaonik NP. It is characterized by the preservation of mosaically distributed natural high mountain habitats with floristically rich communities of meadows, forests, subalpine shrubby vegetation and tall greenery. The peak Žljeb is one of the most popular viewpoints for all visitors to Kopaonik;

– Suvo Rudište (peak at 1976 m) is the second elevation point of Kopaonik, from where there is a view of the mountains of central and southern Serbia, as well as the northern parts of Montenegro. This area is dominated by bushy vegetation that is endangered in parts of ski slopes and cable cars, so this site received the lowest number of points (20) among the analyzed sites. The site includes a geomorphological natural monument, a hydrological natural monument, a habitat for important insects and a protected ridge of the Kopaonik watershed. This locality is visited by the largest number of tourists during the year;

– Numerous and different geoheritage objects testify to the diversity of physical and geographical factors that were crucial for the character and appearance of the landscape, and the evaluation of these objects encourages the development of tourism outside the winter tourist season.

Conclusion

In this study, the assessment of the tourist attractiveness of natural values is based mathematical

model that determines the coefficient of relief attractiveness, hydrological objects, biocenosis, winter tourist season and overall attractiveness of places for tourism development and on assessing the attractiveness of natural landscapes.

Kopaonik National Park belongs to the Kopaonik Mountain, the largest winter tourist center in Serbia. One of the main tasks of this research is the analysis of opportunities for the development of tourism in the summer. In addition to the relief, the climate has a very important role for the development of tourism in the mountainous area.

Based on the derived mathematical models for the NP area, we came to the following results:

– the area has a high coefficient of attractiveness of the relief that is suitable for all types of tourism, especially suitable for winter ski tourism;
– the area has a medium level of tourist values for hydrological facilities, which are attractive for tourism in the summer;
– the area has a high tourist attractiveness of plant communities, which gives an advantage to the development of tourism in the summer.

Based on the results of relief and climate attractiveness, it is concluded that the area of NP Kopaonik has a high value for the development of the winter tourist season.

By applying the methodology for the assessment of natural landscapes, it was concluded that the sites in the area of Kopaonik National Park have very high tourist values of natural landscapes.

The analysis of the attractiveness coefficient of all natural values leads to the conclusion that the area has a high tourist value for the development of tourism in the summer.

The suitability of the model for the assessment of tourist attractiveness is also proven by the final derived value, which based on individual analysis shows that the area of NP Kopaonik has a high tourist attractiveness for tourism development. The model can be applied to assess the tourist attractiveness of other mountainous areas with an altitude of up to 2000 m.

Acknowledgments

Conflict of Interest

The authors declare no conflict of interest.

References

1. ADOMAITIENE R., SEYIDOV J., Factors influencing local tourists' decision-making on choosing a destination: a case of Azerbaijan. Ekonomika. **95**, (3), 112, **2016.**
2. DHAMI I., DENG J., BURNS R.C., PIERSKALLA C., Identifying and mapping forest-based ecotourism areas in West Virginia Incorporating visitors' preferences. Tourism Management. **42**, 165, **2014.**
3. Mäntymaa E., Tyrväinen L., Juutinen A., Kurttila M., Importance of forest landscape quality for companies operating in nature tourism areas. Land Use Policy. **107**, 104095, **2021.**
4. RAHAYUNINGSIH T., MUNTASIB H.E.K.S., PRASETYO L.B. Nature Based Tourism Resources Assessment Using Geographic Information System (GIS): Case Study in Bogor. Procedia Environmental Sciences. **33**, 365, **2016.**
5. HESHMATI M., GHEITURY M., SHADFAR S. Factors affecting possibility of ecotourism development and sustaining natural resources using SWOT approach in west Iran. International Journal of Geoheritage and Parks. **10**, (2), 173, **2022.**
6. MUELLER L., EULENSTEIN F., MIRSCHEL W., ANTROP M., JONES M., MCKENZIE B.M., DRONIN N.M., KAZAKOV L.K., KRAVCHENKO V.V., KHOROSHEV A.V., et al., Their Exploration and Utilisation: Status and Trends of Landscape Research. Current Trends in Landscape Research. 105, **2019.**
7. DOHERTY G., WALDHEIM C., Is landscape...? Essays on the identity of landscape. Routledge, **2015.**
8. BERRAHOU L., LALANDE N., SERRANO E., MOLLA G., BERTI-ÉQUILLE L., BIMONTE S., BRINGAY S., CERNESSON F., GRAC C., IENCO D., LE BER F., TEISSEIRE M. A quality-aware spatial data warehouse for querying hydro-ecological data. Computers & Geosciences. **85** (12), 126, **2015.**
9. GERMAIN R.M., STRAUSS S.Y., GILBERT B. Experimental dispersal reveals characteristic scales of biodiversity in a natural landscape. Proceedings of the National Academy of Sciences. **114** (17), 4447, **2017.**
10. KÜHNE O. Landscape and power in geographical space as a social-aesthetic construct. Springer, **2018.**
11. JIANG P., LI M., LV J. The causes of farmland landscape structural changes in different geographical environments. Science of The Total Environment. **685**, 667, **2019.**
12. ERDENEJARGAL N, DORJSUREN B., CHOIJINJAV L., DOLJIN D., ENKHBOLD A., MUNKHUU B., NATSAGDORJ B., GIRMA A. Evaluation of the Natural Landscape Aesthetic: a Case Study of Uvs Province, Mongolia. Pol. J. Environ. Stud. **30** (5), 4497, **2021.**
13. HAINES-YOUNG R., POTSCHIN M. CICES V5.1. Guidance on the Application of the Revised Structure. Fabis Consulting Ltd, Nottingham, UK, **2018.**
14. LEE-HSUEH L. Ecological Aesthetics: Design Thinking to Landscape Beauty with Healthy Ecology. In Landscape Architecture-The Sense of Places. Models and Applications. Intech Open, **2018.**
15. CORTINOVIS C., ZULIAN G., GENELETTI D. Assessing Nature-Based Recreation to Support Urban Green Infrastructure Planning in Trento (Italy). Land. **7**, (4), 112, **2018.**
16. RISTIĆ D., VUKOIČIĆ D., MILINČIĆ M. Tourism and Sustainable Development of Rural Settlements in Protected

Areas - Example Kopaonik NP (Serbia). Land Use Policy. **89**, 104231, **2019**.

17. PTÁČEK P., ROUBÍNEK P., RÁJA J. Historical Heritage Potential and Tourism Marketing: The Example of Olomouc. Central European Regional Policy and Human Geography. **5** (1), 7, **2015**.

18. MIKA M., ZAWLIŃSKA B., PAWLUSIŃSKI R. Exploring the economic impact of national parks on the local economy. Functional approach in the context of Poland's transition economy. Human Geographies – Journal of Studies and Research in Human Geography. **10** (1), 7, **2016**.

19. ZAWILIŃSKA B., MIKA M. National parks and local development in Poland: a municipal perspective. Human Geographies – Journal of Studies and Research in Human Geography. **7** (1), 43, **2013**.

20. SGROI F. Forest resources and sustainable tourism, a combination for the resilience of the landscape and development of mountain areas. Science of The Total Environment. **736**, 139539, **2020**.

21. MÄNTYMAA E., JUUTINEN A., TYRVÄINEN L., KARHU J., KURTTILA M. Participation and compensation claims in voluntary forest landscape conservation: The case of the Ruka-Kuusamo tourism area, Finland. Journal of Forest Economics. **33**, 14, **2018**.

22. SCHIRPKE U., MEISCH C., MARSONER T., TAPPEINER U. Revealing spatial and temporal patterns of outdoor recreation in the European Alps and their surroundings. Ecosystem Services. **31**, C, 336, **2018**.

23. SCOLOZZI R., SCHIRPKE U., DETASSIS C., ABDULLAH S., GRETTER A. Mapping alpine landscape values and related threats as perceived by tourists. Landscape Research. **40** (4), 451, **2015**.

24. TENERELLI P., DEMŠAR U., LUQUE S. Crowdsourcing indicators for cultural ecosystem services: A geographically weighted approach for mountain landscapes. Ecological Indicators. **64**, 237, **2016**.

25. ZODERER B.M., TASSER E., CARVER S., TAPPEINER U. An integrated method for the mapping of landscape preferences at the regional scale. Ecological Indicators. **106**, 105430, **2019**.

26. SILVENNOINEN H. Scenic beauty of forest stands and impact of management. (Metsämaiseman kauneus ja metsänhoidon vaikutus koettuun maisemaan metsikkötasolla. In Finnish) Diss. For. **242**, 86, **2017**.

27. LAVOREL S., GRIGULIS K., LEITINGER G., KOHLER M., SCHIRPKE U., TAPPEINER U. Historical trajectories in land use pattern and grassland ecosystem services in two European alpine landscapes. Regional Environmental Change. **17** (8), 2251, **2017**.

28. SCHIRPKE U., TIMMERMANN F., TAPPEINER U., TASSER E. Cultural ecosystem services of mountain regions: Modelling the aesthetic value. Ecological Indicators. **69**, 78, **2016**.

29. SCHIRPKE U., TAPPEINER U., TASSER E. A transnational perspective of global and regional ecosystem service flows from and to mountain regions. Scientific Reports. **9**, 6678, **2019**.

30. ALMEIDA M., LOUPA-RAMOS I., MENEZES H., CARVALHO-RIBEIRO S., GUIOMAR N., PINTO-CORREIAN T. Urban population looking for rural landscapes: different appreciation patterns identified in Southern Europe. Land Use Policy. **53**, 44, **2016**.

31. CUCARI N., WANKOWICZ E., ESPOSITO DE FALCO S. Rural tourism and Albergo Diffuso: a case study for sustainable land-use planning. Land Use Policy. **82**, 105, **2019**.

32. ROVAI M., ANDREOLI M., GORELLI S., JUSSILA H. A DSS model for the governance of sustainable rural landscape: a first application to the cultural landscape of Orcia Valley (Tuscany, Italy). Land Use Policy. **56**, 217, **2016**.

33. ŠŤASTNÁ M., VAISHAR A. Values of rural landscape: the case study Chlum u Třeboně (Bohemia). Land Use Policy. **97**, 104699, **2020**.

34. UL ISLAM N., CHAUDHARY M. Index of Destination Attractiveness: a Quantitative Approach for Measuring Tourism Attractiveness. Turizam. **25** (1), 31, **2021**.

35. COMERIO N., STROZZI F. Tourism and its economic impact: A literature review using bibliometric tools. Tourism Economics. **25** (1), 109, **2019**.

36. TRUCHET S., PIGUET V., AUBERT F., CALLOIS J.M. Spatial influence of attractions on tourism development. Tourism Geographies. **18** (5), 539, **2016**.

37. KIRILENKO A.P., STEPCHENKOVA S.O., HERNANDEZ J.M. Comparative clustering of destination attractions for different origin markets with network and spatial analyses of online reviews. Tourism Management. **72**, 400, **2019**.

38. CHEN Y-S., WU S-T. An exploration of actor-network theory and social affordance for the development of a tourist attraction: A case study of a Jimmy-related theme park, Taiwan. Tourism Management. **82** (1-12), 104206, **2021**.

39. WALZA U., STEIN C. Indicator for a monitoring of Germany's landscape attractiveness. Ecological Indicators. **94** (2), 64, **2018**.

40. BACHI L., RIBEIRO C.S., HERMES J., SAADI A. Cultural Ecosystem Services (CES) in landscapes with a tourist vocation: Mapping and modeling the physical landscape components that bring benefits to people in a mountain tourist destination in southeastern Brazil. Tourism Management. **77**, 104017, **2020**.

41. CHERNOVA E.O., SUKHOVA M.G., ZHURAVLEVA O.V., KARANIN A.V., MINAEV A.I. Hydro-environmental safety as an indicator of recreational attractiveness of regions – A case of Russian part of the transboundary Altai. Ecohydrology & Hydrobiology. **19**, 452, **2019**.

42. VUKOIČIĆ D., MILOSAVLJEVIĆ S., PENJIŠEVIĆ I., ET AL. Spatial analysis of air temperature and its impact on the sustainable development of mountain tourism in Central and Western Serbia. IDŐJÁRÁS - Quarterly Journal of the Hungarian Meteorological Service. **122** (3), 259, **2018**.

43. PRÖBSTL-HAIDER U., HAIDER W., WIRTH V., BEARDMORE B. Will climate change increase the attractiveness of summer destinations in the European Alps? A survey of German tourists. Journal of Outdoor Recreation and Tourism. **11**, 44, **2015.**

44. BAUSCH T., GARTNER W.C. Winter tourism in the European Alps: Is a new paradigm needed? Journal of Outdoor Recreation and Tourism. **31**, 100297, **2020**.

45. ALBERT Y.P., MORALES J.I.M., ANDREU M.N.L. Impacts of 'home stays' on the protected urban landscape and the social environment (Vinales, Cuba). Journal of Tourism and Cultural Change. **19** (3), 277, **2020**.

46. JIMÉNEZ-GARCÍA M., RUIZ-CHICO J., PEÑA-SÁNCHEZ R.A. Landscape and Tourism: Evolution of Research Topics. Land. **9** (12), 488, **2020**.

47. VALJAREVIĆ A., VUKOIČIĆ D., VALJAREVIĆ D. Evaluation of the tourist potential and natural attractiveness of the Lukovska Spa. Tourism Management Perspectives. **22**, 7, **2017**.

48. FORNAL-PIENIAK E.B., ŻARSKA B. Evaluation of Landscape Natural Values in Tourism, with Special Regard to Vegetation– Case Study: Otwock Commune, Central Poland. Pol. J. Environ. Stud. **31** (1), 665, **2022**.

49. NEŠIĆ D., MILINČIĆ M., LUKIĆ B. Relict Cryoplanation Terraces of Central Kopaonik (Serbia). Carpathian Journal of Earth and Environmental Sciences. **12**, (1), 61, **2017**.

50. VUKOIČIĆ D., MILOSAVLJEVIĆ S., VALJAREVIĆ A, ET AL. The evaluation of geosites in the territory of National Park „Kopaonik" (Serbia). Open Geoscience. **10** (1), 618, **2018**.

51. Republic hydrometeorological service of Serbia, Available at: http://www.hidmet.gov.rs/(accessed 22 January 2018), **2018**.

52. Ski resorts of Serbia, Available at:http://www.skijalistasrbije.rs/ (accessed 16 January2018), **2018**.

53. VUKOIČIĆ D., RISTIĆ D., LUKIĆ B., SEĆEROV V., VAGIĆ N., MILINČIĆ M. Evaluating the attractiveness and competitiveness of a tourist destinations (ATD) Balkan mountain centers. Fresenius Environmental Bulletin. **30**, 13231, **2021**.

54. RISTIĆ D., VUKOIČIĆ D., NIKOLIĆ M., ET AL. Capacities and energy potential of thermal-mineral springs in the area of the Kopaonik tourist region (Serbia). Renewable and Sustainable Energy Reviews. **102**, 129, **2019**.

55. TOMIĆ N., KOŠIĆ K. Developing the Spa Assessment Model (SAM) and its application on the Kopaonik-Jastrebac spa zone (Serbia). Tourism Management Perspectives. **36**, (2), 100753, **2020**.

56. Leksikon nacionalnih parkova Srbije "Kopaonik". JP Službeni glasnik, JP Nacionalni park Kopaonik, Geografski institute "Jovan Cvijić" SANU, **2015**.

57. VALJAREVIĆ A., VALJAREVIĆ D., FILIPOVIĆ D., DRAGOJLOVIĆ J., MILOSAVLJEVIĆ S., MILANOVIĆ M. One Small Municipality and Future of Renewable Energy Strategy. Pol. J. Environ. Stud. **30** (1), 1, **2021**.

58. PRÖBSTL-HAIDER U., HAIDER W., WIRTH V., ET AL. Will climate change increase the attractiveness of summer destinations in the European Alps? A survey of German tourists. Journal of Outdoor Recreation and Tourism. **11**, 44, **2015**.

59. SCHIRPKE U., ZODERER M.B., TAPPEINER U., ET AL. Effects of past landscape changes on aesthetic landscape values in the European Alps. Landscape and Urban Planning. **212**, 104109, **2021**.

60. TOMIĆ N., MARKOVIĆ B.S., ANTIĆ A., ET AL. Exploring the potential for geotourism development in the Danube region of Serbia. International Journal of Geoheritage and Parks. **8**, 123, **2020**.