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# ASSESSMENT OF NATURAL ENVIRONMENT FOR THE PURPOSES OF RECREATIONAL TOURISM-EXAMPLE ON DRINA RIVER FLOW (SERBIA)

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## Abstract

The role of applied geography has been increasing in interdisciplinary research due to the advantage of knowing spatial processes and relations. This role has reflected in the geo-ecological evaluations of a particular geographical area used for different social purposes. This paper represents the GIS analysis of the natural environment of a part of the Drina River flow in wider terms so to apply in recreational tourism. The quantitative V-Wert diversification method has used for the study with the focus on identification of the area that might be favorable for recreation. The analysis is based on the knowledge of natural geographical elements. Criteria taken into consideration are the edges of the forest and water, the relief energy, the manner in which the landscape is used and the climate factor. According to the benefits of the said purpose, the unfavorable areas amount to 1,520 km$^2$ (34.43%), conditionally favorable areas amount to 2,418 km$^2$ (54.77%), favorable areas amount to 310.33 km$^2$ (7.03%), very favorable areas amount to 163 km$^2$ (3.69%) and the most favorable areas amount to 3.67 km$^2$ (0.08%). The category of very favorable recreation contains a large area (167 km$^2$) from the total amount of 4245 km$^2$.

***Keywords:*** *Natural environment evaluation; GIS triangular network; Recreation, Tourism, Drina River*

## 1. INTRODUCTION

In an attempt to escape from overpopulation and noise together with rediscovering the landscape, people find natural oases outside cities. Thereby, both the rural and the inland environment outside the city centers become the so-called urban recreational environment more specifically Glikson defines as recreational movements of the population (Glikson, A., 1971). This is where the need for recreational facilities for maintaining the health and efficiency of the urban population is gradually recognized. Recreational movements should be considered a part of a wider contemporary phenomenon of population movement to and from large urban centers, which includes the spatial expansion of resources and goods, people and ideas (Glikson, A., 1971).

One of the aspects of geographical research is the landscape ecology, where the landscape, as a holistic entity, is composed of different elements that interact with one another and may have different benefits and attractions for recreation (Zonneveld 1989; Vink, 1982., Bartkowski, 1985). Referring to the concept of Pearson (1962), Van der Zee defines recreation as "refreshment of body or mind according to the activities, or planned inactivity of an individual without any moral, economic, social or another type of pressure" (Van der Zee 1990, 1987). Changes in landscape structures by human development are an immutable fact of contemporary society (Djurdjic et al., 2011). Therefore, for recreational purposes, the advantage is given to the natural landscapes with as little anthropogenic impact as possible. Recreation is an important segment in the organization of life and also stress release as a result of living in larger urban environments. Given this circumstance, the idea came in for geo-ecological evaluation of particular environment using geographic information systems to identify certain favorable parts for outdoor recreation. One of the most important factors in geo-ecological evaluation is the landscape, and its base is composed of relief as part of the natural components of the geographical area (Golijanin, J., 2011). It should be pointed out that weather, i.e. climate of a certain area is an extremely important factor for recreation planning. Climate as a natural resource can be evaluated for recreational purposes applying various concepts and methods in human bioclimatology. They can show the relationship between climatic characteristics and the human organism for the purposes of recreation and tourism (Pecelj, M, 2013). According to Andjelkovic, the air temperature is a key parameter of human comfort which can be combined with other parameters and find its application in tourism (2006).

Considering the complexity of natural geographical components of the environment, with the goal that they could be manifested in the form of recreational tourism, we marked a part of Western Serbia along the Drina River, what for we presume it could be suitable for this analysis.

There are different geospatial techniques developed using GIS platform. Measuring the recreational potential of natural tourism potentials using GIS is presented on the Grampians National Park (Australia) case (Chhetri, P., Arrowsmith, C., 2008). The mapping of specific categories on basis of quantitative assessment with the use of Geographic Information Systems can help decision makers to take further steps (Ilic et al., 2017), which can especially be useful to spatial planners when planning a space suitable for recreational purposes.

The objective of this paper is to put together a geo-ecological evaluation of described area trough GIS analysis with a focus on identifying and creating a synthesis map of the study area benefits for recreation. Particular idea is to estimate the individual parts of the study area from the aspect of recreational tourism. Using this method of estimation smaller surfaces obtained nevertheless they are more convenient for recreation. The advantage of the model is its compatibility and ability to be applied in the Geographic Information Systems as completes the visual analysis. Visual resources are important for identifying open recreational spaces and can be part of planning and management, with the aim of improving the quality of such recreational spaces (Sugimoto K., 2017). Several studies have been analyzed different environments using this method together with the Geographical Information Systems (Kaya & Aytekin, 2009, Pecelj M.R. et al. 2017, Pecelj et al., 2018, Pirselimoglu & Demirel, 2015, Popovic et al., 2018). The recreational potential of the city of Batin and its surroundings in Turkey was determined so as the coastline has the recreational potential value of 78% and is classified as very good (Kaya & Aytekin, 2009). In order to identify the utilization of the Altindere valley (Trabzon province-Turkey) and its surroundings with respect to ecology-based tourism, they find the potential of 9.7% categorized as very good (Pirselimoglu & Demirel, 2015). The urban city of Novi Sad in Serbia evaluated by the same method, shows favorable and very favorable conditions for recreation in the analyzed areas along the Danube River, which is a part of the central park in the city, along the mountain Fruska Gora and the Special Nature reserve Koviljsko-Petrovaradinski Rit (Pecelj et al., 2017). Uniformly, to get such a spacious offer where the recreation areas are situated in most favorable places without negative effects on the environment, the evaluation of the Kozara National Park (Republic of Srpska, BaH) with research area covering 3,907.54 ha shows recreational potential mostly conditionally suitable for recreational activities with 41.32% categories suitable and very suitable (Popovic et al., 2018). The intention of such a study is to contribute to the affirmation of geo-ecological evaluation in the field of planning and management of protected areas.

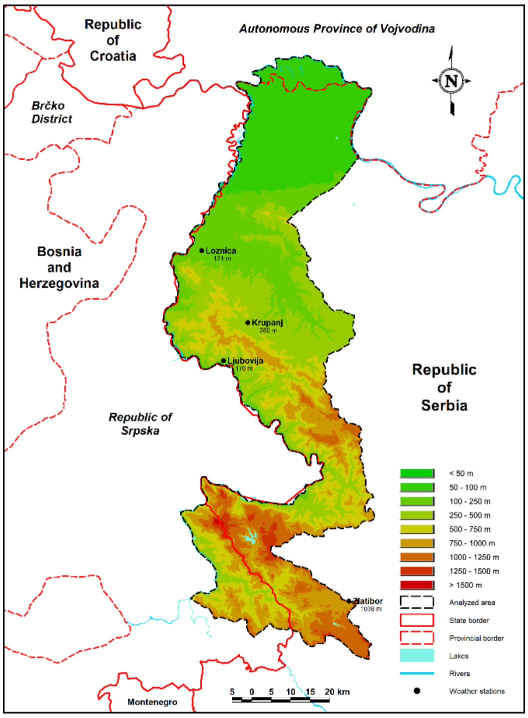


**Figure 1.** Elevation map of the study area

Therefore, in this study is considered the right part of the basin of the Drina River downstream from the estuary of the Lim River in Bosnia and Herzegovina, to the estuary of the rivers Drina and Sava. In addition to the basin of the Drina River the analysis is extended to encompass Macva, so that the Sava River makes the northern border, whereas the western border moves from the watershed between Jereza and Dobrava, across mountains Cer, Vlasic, Medvednik, Jablanik, Povlen, and Crna Gora (Black Mountain) all the way to the mountains Zlatibor and Varda in the south. The overall study area amounts to 4245 km. The Drina River is the largest tributary of the Sava River, and it mostly has a meridian flow towards the North. Being 220 km long, this river represents the border between Serbia and Bosnia and Herzegovina, and throughout its entire length with Republika Srpska. This could be seen on the elevation (relief) map (Figure 1). The analyzed territory may be categorized according to its natural characteristic into the basin area of the Drina River from Visegrad to Zvornik (a part of the middle flow) and the basin area of the Drina River from Zvornik to its estuary in the Sava River. This area is rich in a diverse environment that could be estimated as favorable for health and recreation. Staying in nature, near the water surfaces and forests, has a favorable impact on the psychological and physical condition of a man and improves the quality of life, especially for the urban population. Air pollution, noise, stress work and rhythm of life very often cause a range of pathological conditions in the urban population. The natural and most convenient way to improve impaired health is spending time in nature.

## 2. BACKGROUND

The quantitative V-Wert diversification method was used for evaluation of the right part of the basin of the Drina River in order to identify its usage in terms of recreation. General study area amounts to 4245 $km^2$. Research is based on the knowledge of physical geographical elements, and the criteria which have been taken into consideration are the edges of the forest and water, the relief energy, the manner in which the landscape is used and the climate factor (Kiemstedt, 1967a, 1967b, 1972). Evaluation of the terrain based on this method is especially suitable for areas with different relief forms, i.e. for hills and mountainous areas. GIS was used for the purposes of visualization and presentation of different methodological analyses in the planning of recreational terrain.
Based on the set criteria, the benefits of the recreational surfaces are given in the formula (1), (Kiemstedt, 1967a, 1967b):

$$V = \frac{W + G * 3 + R + N}{1000} * K \qquad (1)$$

where: W stands for the forest edges ($mm^{-2}$), G stands for water edges ($mm^{-2}$), R stands for relief energy ($mm^{-2}$), N stands for the manner of land use (%) and K stands for climate factor.

### 2.1 GIS triangular network

Geographic Information Systems provide a wide range of geoprocessing and spatial analysis functionality and customization potential of cartographic elements (Russo et al., 2017). This convenience has been utilized so that the entire space can be evaluated by all criteria individually, in order to obtain a synthesis map of suitability for recreation. A GIS analysis was carried out through the evaluation of the landscape according to the all abovementioned criteria. Finally, by overlapping the obtained layered data, as a result, we have synthesis maps of the suitability of the recreation. A comparative analysis was carried out using GIS software called GeoMedia Professional. In the beginning, it was created a network of 1x1km GRID cells in order to calculate the recreational suitability in relation to each criterion for each of the surfaces thus obtained. The first modification in relation to the Kiemstedt model implies a hexagonal network used for evaluation rather than GRID network. Instead of squares, the monitored area was divided in hexagons, with the surface of each hexagon in the network being precisely 1km, in order not to make any changes in the mutual relation of the significance of the criteria. The main reason for the selection of the hexagonal network is the higher degree of precision in comparison to the rectangular network (Fig 2). In order to improve the accuracy, the analysis was performed by using three separate hexagonal networks, arranged in such a way that their mutual cross-sections create a triangular network, i.e. a network of equilateral triangles (Fig 2-a). In the final analysis, it is necessary to calculate the arithmetic mean value of the three obtained results and present them in the form of triangular surfaces of 0.167 km2, and the total analyzed surface in order to obtain these individual results amounts to 2.167 km2, which clearly shows the precision of this modification (Fig 2-b).

 

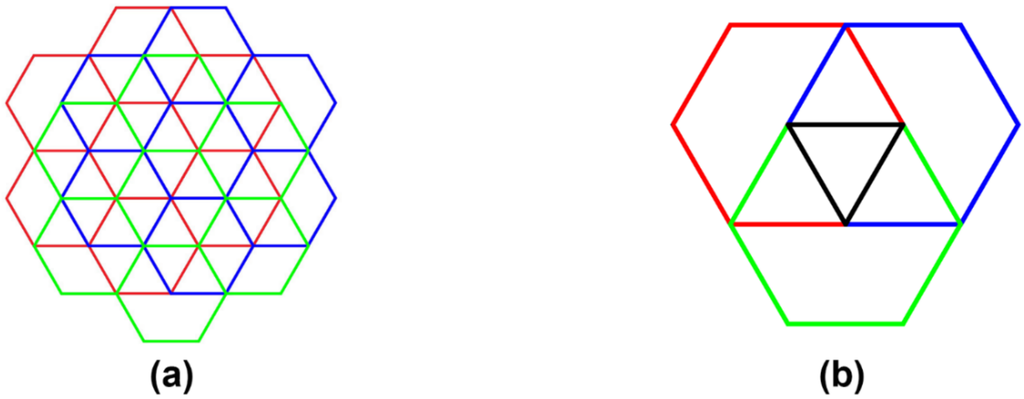


**Figure 2.** The triangular network formed by overlapping three hexagonal networks (a) and the relation of the analyzed surface and the display of results (the smallest inside triangle)

## 2.2 Evaluation criteria

Since the relief energy (R) represents the difference between the highest and the lowest point in meters within each of the isolated hexagonal cells, for the purposes of the evaluation of the surfaces according to this criterion it is necessary to use the data from the Digital Elevation Model (DEM) (http://earthexplorer.usgs.gov/) (Fig 3-a). Based on the calculated relative height difference in each of the cells, the points to be assigned for every one of them are determined (Hoffmann G., 1999).

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The landscape uses component (N) is defined as the ability using different regional elements for recreational purposes. In order to obtain the value of this factor, the percentage of participation of different types of landscape use in the respective raster square is calculated and then multiplied by the corresponding weight factor. For assessment of the surface for recreational purposes, the data from the database CORINE Land Cover 2012 were used (https://www.eea.europa.eu/data-and-maps/data/clc-2012-vector). Each surface from the mentioned database was allocated an adequate number of points according to its purpose and in relation to its recreational suitability, following which the percentage of each surface in every network cell was calculated. The obtained valued are multiplied by the corresponding weight factor, and then all the values on the surface of each cell are summed up and the total number of points that reflects the suitability of the surfaces according to this criterion is obtained (Fig 3-b). The edges of the forest (W) and the edges of the waters (G) are the carriers of contrasts and changes in the landscape that affect the senses of an observer represent the typical elements of the cultural landscape. The water edges are suitable for the development of recreational values of the observed landscape and make it even more diverse and attractive, especially from the recreational point of view. The roles of the forest and water edges are similar, with waters having an additional enriching effect on the area, and therefore the lengths of all water shores are valued by factor 3. For data on the length of forest and water edges, a digital database of the condition and changes of the landscape cover and the utilization purpose for entire Europe was used CORINE Land Cover 2012 (https://www.eea.europa.eu/data-and-maps/data/clc-2012-vector). The coefficient for the climate criterion (K) was obtained based on the physiological subjective temperature (PST). Physiological subjective temperature is an index representing the subjective feeling of the thermal environment of the human. The thermal influence of the environment is expressed as a mean radiation temperature on the surface of the skin. The physiological subjective temperature is the level of thermal stimulus that occurs directly near the surface of the skin after 15-20 minutes of intensive adaptation process (Blazejczyk K., 2006, 2007). This index was chosen because the subjective feeling is important for recreational purposes, and it lasts slightly longer than the brief feeling that occurs with the initial contact of a man and the external environment. A person’s sense of heat occurs as a result of the activation of the cold and warm receptors, which send signals to the brain through the nervous system, after which the brain sends an adequate response to the stimulus in the form of thermoregulation of the organism. Physiological subjective temperature (PST) was calculated applying the bioclimatic software BioKlima 2.6 (https://www.igipz.pan.pl/Bioklima-zgik.html). Mean monthly values of meteorological parameters with four meteorological stations: Loznica, Ljubovija, Krupanj, and Zlatibor were taken for the calculation during the monitoring period from 2006-2015. Physiological parameters were taken as constant values. The standard value of 135 Wm-2 was taken as the metabolic rate, which corresponds to a person moving at the speed of 4 kmh-1. This value, according to the standardization, corresponds to a man 30 years old, with a body weight of 75 kg and a height of 175 cm, and the skin surface of 1.8m2, or a woman 30 years old, with the body weight of 65 kg, height of 170 cm and the skin surface of 1.6m2 (ISO8996) (https://www.iso.org/standard/34251.html). The value 1 ‘clo’ (0.155 m-2KW-1) was taken as the isolation parameter and it corresponds to an average clothed man (Nishi, 1981).

## 3. ANALYSIS

The first evaluated criterion for the purposes of the recreational suitability evaluation is the length of the forest edges. From the entire database (44 classes of the application of surfaces), classes that include deciduous, coniferous and mixed forests are singled out, and then it was calculated how many edges of the forest in meters are contained in the above mentioned hexagonal cells (Fig 2-c). Based on the data in Table 1, the largest share in the total analyzed surface covers the category between 2000 and 4000 meters of forest edge (43%). However, classes are nearly equally distributed across the entire surface of the analyzed area. Only in the northern part, a larger absence of forest edge is present, which is caused by extremely flat relief of this part of the study area. Forests give contrast to the urban environment and they are important because of their own microclimate. Forests ecosystems could provide protection against high UV and reduce temperature differences and wind intensity.

The lengths of the edges of the water, as the second criterion of this analysis, were obtained in an identical manner described in the previous criterion, but this time, the standing and current waters and the length of their shores for each of the cells in all three networks were separated and analyzed. Therefore, the length of the coast per km2 for the entire surface of the investigated area was obtained. The class with surfaces without the presence of water edges with almost 90% of the total surface is dominant in this criterion (Table 1), since rivers represent the entire western and eastern border of the analyzed area, while the edge of the water in the central part is almost non-existent with the exception of the surfaces around the Lake Zaovine and the Lake Ribnica in the southern part and gravel pit Tabanovic in the northern part of the area. Due to the morphological diversity of the area and the difference between the maximum and minimum altitudes above 1000 m, it is difficult to evaluate the entire surface with an identical number of point. The most suitable surfaces according to this criterion were distributed along the Drina River, which was largely influenced by the river meandering, so the lengths of the edges of the water are higher on this concrete surface, as well as the appearance of artificial lakes caused by the construction of hydropower plants Bajina Basta (Lake Perucac) and Zvornik (Lake Zvornik), which also increases the length of the edges of the waters and has a beneficial effect on the senses of an observer (Fig 3-d). Regarding the relief energy criterion, the more suitable classes are distributed in the central and southern part of the investigated area, which was influenced by large slopes of this mountainous relief, unlike the northern part was valued by a significantly smaller number of points due to its pain relief. What is interesting about this criterion is that the most suitable class is also the one the most present, containing one-third of the entire analyzed surface (Table 1), which clearly indicates the extraordinary natural potential of this region for the recreational purposes (Fig 3-e).

**Table 1.** Results of evaluated criteria based on surface and share in total area

| Criteria | Criteria ranges | Surface (km$^2$) | analyzed area (%) | Criteria | Criteria ranges | Surface (km$^2$) | analyzed area (%) | Criteria | Criteria ranges | Surface (km$^2$) | analyzed area (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Length of the forest edges | 0 | 692,83 | 15,69 | Relief energy | 0 | 631,33 | 14,3 | Land cover | <1000 | 1473,67 | 33,38 |
| | <2000 | 1385,33 | 31,38 | | 220 | 405,67 | 9,19 | | 1000-2000 | 2811 | 63,66 |
| | 2000-4000 | 1916,83 | 43,41 | | 300 | 37,67 | 0,85 | | 2000-3000 | 114,33 | 2,59 |
| | 4000-6000 | 396 | 8,97 | | 400 | 115,33 | 2,61 | | 3000-4000 | 15,17 | 0,34 |
| | 6000-8000 | 23,33 | 0,53 | | 590 | 339,33 | 7,69 | | 4000-5000 | 1,17 | 0,03 |
| | 8000-10000 | 1 | 0,02 | | 860 | 1405,67 | 31,84 | Climate | <0,6 | 28,67 | 0,65 |
| Length of the water edges | 0 | 3942,5 | 89,29 | | 1200 | 1480,33 | 33,53 | | 0,6-0,8 | 440,33 | 9,97 |
| | <1500 | 236,17 | 5,96 | | | | | | 0,8-1,0 | 801,17 | 18,15 |
| | 1500-3000 | 196,67 | 4,45 | | | | | | 1,0-1,2 | 1145 | 25,93 |
| | 3000-4500 | 12,5 | 0,28 | | | | | | 1,2-1,35 | 1163,83 | 26,36 |
| | 4500-6000 | 0,5 | 0,01 | | | | | | >1,35 | 836,33 | 18,94 |

According to the criterion in the investigated area, the most favorable areas are represented on the land where the riverbed of the Drina is the widest, to be more precise-the surfaces around artificial lakes. (Fig 3-f). For this reason, for climatic factors, data from meteorological stations at various altitudes were used (Loznica-121 m, Ljubovija-170 m, Krupanj-280 m, Zlatibor-1038 m). Data were taken for a period of 10 years (2006-2015) years, which were processed and classified in the BioKlima 2.6 software. The average values of the physiological subjective temperature (PST) in Loznica, Ljubovija, and Krupanj correspond to the thermal bioclimatic state 'comfortable', while on the Zlatibor mountain the values correspond to the thermal bioclimatic state 'cool' (Table 2) (Fig 3-g).

**Table 2.** Average PST index values for the period 2006-2015

| meteo stations | Loznica | Ljubovija | Krupanj | Zlatibor |
|---|---|---|---|---|
| Altitude | 121 | 170 | 280 | 1038 |
| PST | 17,79 | 17,4 | 16,32 | 10,16 |
| Biothermal sensation | comfortable | comfortable | comfortable | cool |

The average values of the bioclimatic index physiological subjective temperature (PST) for the indicated time period show a linear dependence on altitude. There is the interdependence of the decline in the PST index with an increase in altitude, which appears in an almost ideal a linear path. Therefore, formula (2) is used to obtain the value of the PST index based on the average altitude of each cell in the hexagonal network. As with Kiemstedt, the maximum climatic factor is 1.8. The formula (2) is further modified (3) so that the maximum value of the PST index is reduced to this size, which is also applied through GIS to evaluate the surfaces according to this factor.

$$\text{PST} = -0.0083 * \text{h} + 18.756 \quad (2)$$
$$\text{Clim. factor} = -0.0083 * \text{h} + 18.756) * 0.075 \quad (3)$$

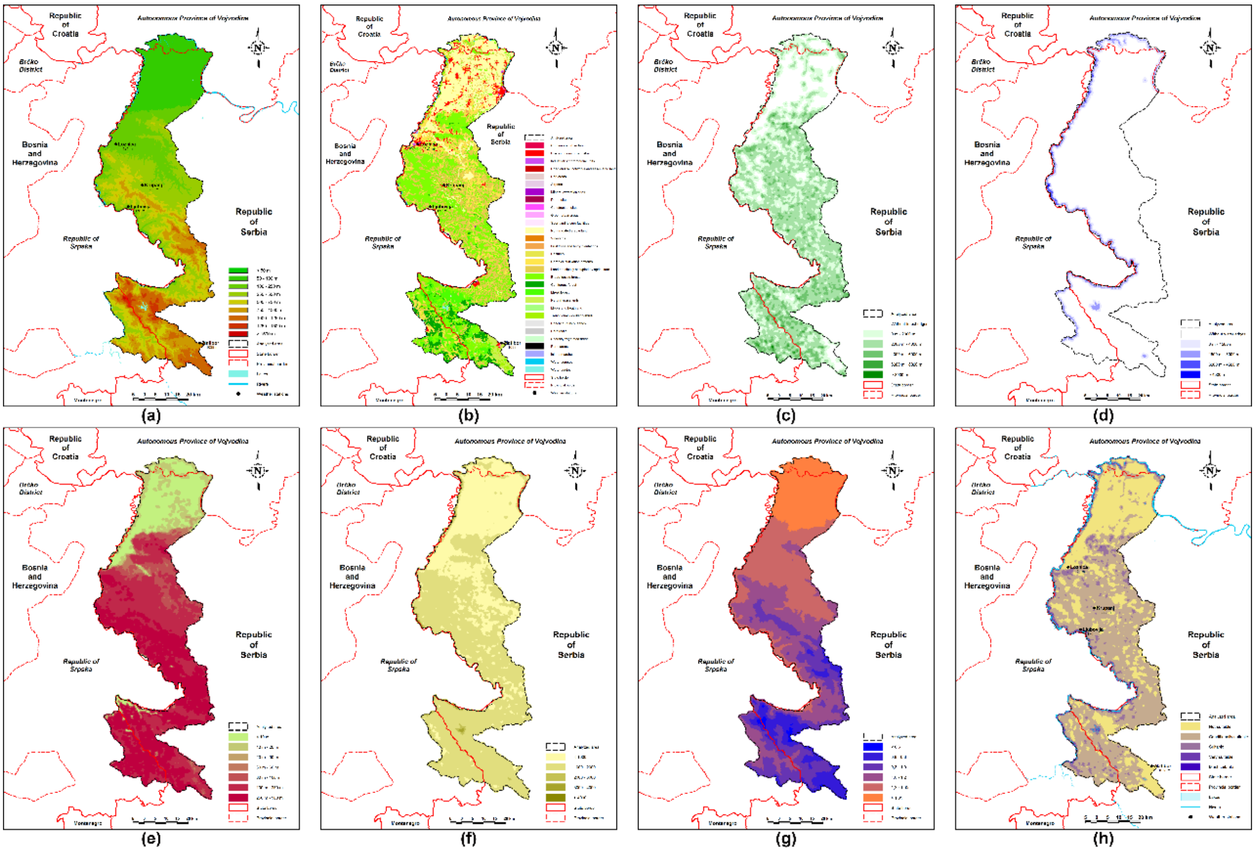


**Figure 3.** Thematic maps of research area — Map of elevation (a); and Map of land cover (b); Forest edges criterion map — shows length of forest edges per square km, classified in six ranges (c); water edges criterion map — shows length of water edges per square km, classified in five ranges (d); Relief energy criterion map — shows the difference between the highest and the lowest altitude in meters in every one square km cells of hexagonal network, classified in seven ranges (e); land cover criterion map — shows points for suitability for recreation according to the land cover criterion, classified in five ranges (f); Climate factor criterion map — shows the index of climate factor for calculation of suitability for recreation obtained from the PST index analysis, classified in six ranges (g); Suitability for recreation map — shows different classes of suitability for recreation, which is the final result of the analysis described in this paper (h)

Since for each of the above criteria one thematic map was obtained, which consists of the adequate attributable data with points for each of the criteria they represent, by "overlapping" all the obtained maps it is possible to perform different operations with their attributes, so the obtained attributes were used in order to get the final points which indicate the suitability of the segment of the Drina River basin for recreational purposes (Figure 3-h). The total surface of the basin of the Drina River for recreational purposes amounts to 4,415.33 km$^2$.

In addition to the existing four classes of suitability for recreational purposes, the fifth class was added in order to additionally single out the most suitable areas, because due to the large area analyzed, even the class, very favorable, includes a large surface. Taking into account all the criteria of the V-Wert model, their evaluation and summing up according to the above formula, results were obtained that were classified into one of the five classes of recreational suitability. In this way, according to the benefits for the given purpose, the unfavorable areas amount to 1,520.33 km$^2$ (34.43%), conditionally favorable areas amount to 2.418 km$^2$ (54.77%), favorable areas amount to 310.33 km$^2$ (7.03%), very favorable areas amount to163 km$^2$ (3.69%) and the most favorable areas amount to 3.67 km$^2$ (0.08%), Fig 3-h).

Finally, the study is done with the triangular network showed precision in relation to the hexagonal network. This precision can be seen on the map of suitability for recreation (Fig 4).

The figure shows the comparability of the results obtained with the classical methodology with the GRID network of 1x1km cells (a), the results in the form of a hexagonal network of cells with a surface area of 1 $km^2$ (b) and the results in the triangular network which is the result of a cross-section of three separate analysis in hexagonal cell networks (c).

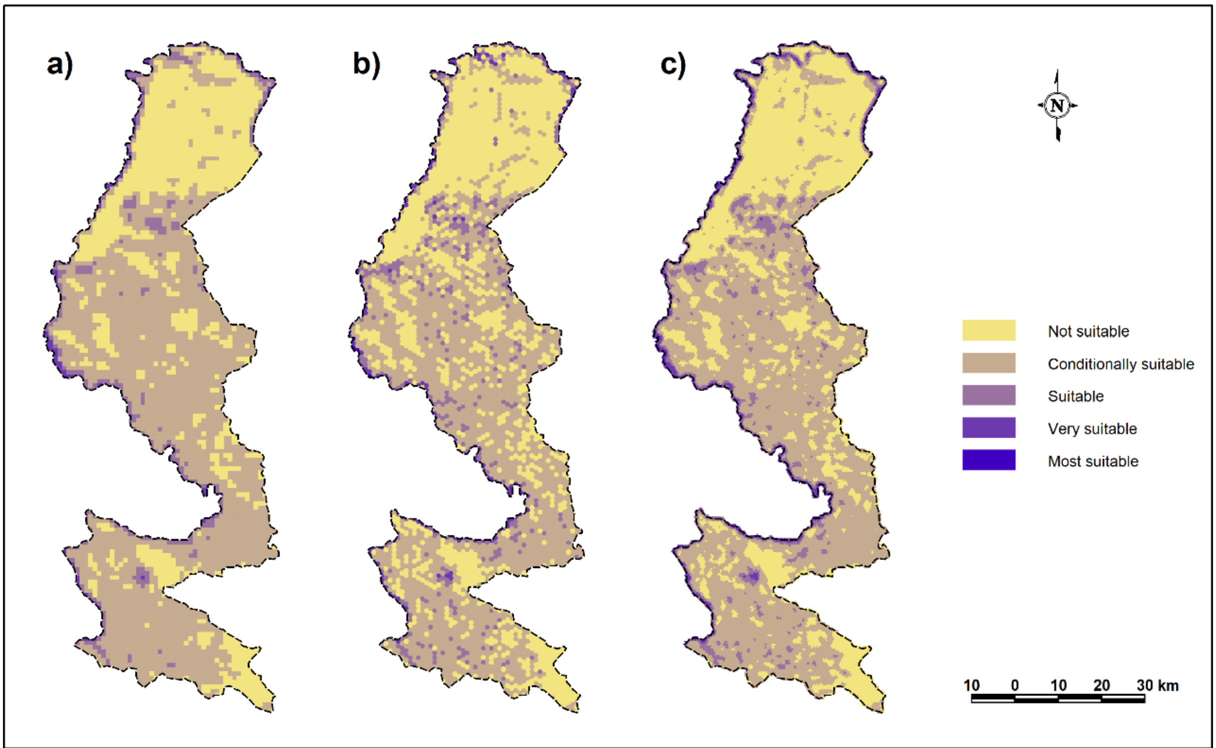


**Figure 4.** Comparison of grid network (a), hexagonal network (b) and triangular network (c)

The first map (a) clearly indicates a high degree of generalization that is obtained by using the classical GRID network cells for the analysis, and the minimum surface so may display the appropriate class of recreation suitability is too large (1$km^2$). This disadvantage is somewhat overcome by using the hexagonal network (b), however, on the map shows an overly pronounced division of the surface into hexagons, so the natural shape of the surfaces with the different class of recreational suitability could not be obtained. Lastly, by applying a cross-sectional analysis in three hexagonal networks, a minimum surface for displaying the class of recreational suitability is reduced 6 times, from 1 $km^2$ to 0.167 $km^2$ whereby the degree of generalization is considerably reduced as well, and since the triangles may be oriented both upwards and downwards, a much more consistent structure of surfaces for displaying the recreational suitability was enabled, which will more faithfully depict the real state of the natural conditions.

In the present study, it is about evaluating the natural aspects of the environment that recreation is based. According to previous analysis, the question is raised on which forms of recreation this analysis can be applied. Such analysis can be beneficial as there are different types of recreation that are related to natural components of the environment. There is a wide range term outdoor recreation associated with adventure tourism and nature-based tourism including wildlife viewing or moderate hiking river rafting, helicopter skiing, and rock climbing (UNWTO, 2014. P.12; TOURISM BC, 2005. P.6). As regards with Tomik (2007) importance of natural attributes of the environment such as weather and climate, landform, hydrosphere, vegetation, and animals, allow for the realization of the plans relating to active recreation. The features of the natural environment are particularly important, especially those which allow practicing the various forms of active tourism. Considering tourism based on a natural environment is growing, it is necessary to have in mind protected areas exposed to increased visitors pressure (Deng at al., 2002). Limitation of the visitors could be an option in the tourist organization of a potential geo-site. It should be taken into consideration what forms of recreation can be appropriate for visitors if it is a protected area. Based on the analysis of uncontrolled development of recreational tourism, supported with an opinion of local residents in Fruska Gora National Park in Serbia, Vujko (2017) states development is necessary for accordance with the basic principles of sustainability. Studying the long-term development of land use/land cover it is possible to understand dynamics and transition of the landscape and the land systems, thus, these analyses could it be used in landscape planning and natural conservation (Suto et al., 2017).

## 4. CONCLUSIONS

Analyzing the natural components of the investigated area, there are selected areas evaluated as favorable. The class of very favorable locations for recreational purposes encompasses a very large area (167 km2) of the total amount of analyzed area (4245 km2). For this reason, another class of the most favorable surfaces was obtained from it. Since the most important factor of evaluation is the length of the water edges, the most favorable areas were located near the shores of the Drina River, to be more precise, upstream from Loznica, between Culin and Mali Zvornik and downstream from Loznica, near LeSnica and Badovinci. The high level of points at these locations was mostly influenced by the Drina River meandering in the lower plain part of the stream and the appearance of artificial lakes in the middle mountainous part of the stream, as well as the large number of river islands and river branches of the Sava River (water edges). In addition to this criterion, the climatic factor has a significant impact as well, especially in river valleys and in the northern lowland part of the analyzed area. However, the other criteria should not be ignored since very favorable areas, beside the Drina and Sava rivers, are located on Cer, Tara and Zlatibor, which is critically influenced by the criteria of the length of the edges of the forest and the energy of the relief. Since environmental degradation and its protection have become more important, the issue of spatial organisation and ways of using space is being raised. The basic idea of this applied method is to identify the ecologically optimal spatial site for recreation, and it is important to satisfy the basic principle of use and protection of landscapes. The evaluation of natural attributes favorable recreational tourism could have a significant impact on tourism managers or stakeholders for better understanding how to manage such sites.

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