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GEOECOLOGICAL EVALUATION OF RAVNA PLANINA IN THE FUNCTION OF WINTER TOURISM

*Jelena Golijanin¹**

** Faculty of Philosophy, University of East Sarajevo, Pale, Bosnia and Herzegovina*

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Abstract: Geoeological evaluation of Ravna planina terrain in the context of its industrial exploitation is carried out on the basis of previous geomorphological analysis. The evaluation of this area is carried out from the point of its possible exploitation in the function of winter tourism. Development of winter tourism is mostly conditioned by the morphometrical characteristics of the relief that is dominated by mountain areas in the first place, due to their hipsometric characteristics, and to the features of the terrain slope and exposure. Therefore, mountain areas have better preconditions for the development of this branch of tourism in comparison to the low-lying areas. This paper provides the evaluation of morphometrical characteristics of Ravna planina terrain, in the possible function of winter tourism development, using GIS. The paper tried to present the needs of certain branches of tourism (such as Alpine and Nordic skiing and different kinds of extreme ski disciplines) as possible preconditions for winter sport tourism development. The evaluation in this paper is based on classification method that provided the scale of Ravna planina terrain relevant values.

Key words: geoeological evaluation, morphometrical characteristics, Ravna planina, winter tourism, GIS.

Introduction

Ravna planina is the northern part of the great Jahorina massive that is placed in the southeast of Sarajevo. According to Greenwich, it occupies the area between 43° 43' 29'' and 43° 48' 49'' of northern geographical latitude and 18° 31' 47'' and 18° 42' 32'' of eastern geographical longitude. The researched area belongs to the Municipality of Pale (Figure 1).

Orographically, Ravna planina belongs to the Dinara Mountains, precisely to the Inner Dinara Mountains. It is characterized by a complex orographic structure, and is dominated by a vast karst plane, with the approximate height of 1300 m. The highest point of the researched area, Zelena glavica peak (1640 m) belongs to the furthest southwest part of the plane, whereas its lowest point (740 m)

¹ Correspondence to: jelenagolijanin@gmail.com

coincides with the mouth of the river Grabovica into the river Prača, nearby the village of Podgrab. The high-altitude amplitude of the researched area is 900 m, and its average height 1190 m. The researched area is around 79.4 km² (Golijanin, 2010a).



Figure 1. Geographical location of Ravna planina

The biggest part of Ravna planina, called Protected Landscape of Javorina (around 115.47 km²), belongs to the protected area of Jahorina, according to the special Regulatory Plan from 2008 (A.D. „Project“, 2008).

Jahorina (together with Ravna planina) differs from the neighboring mountains in that it has much natural potential offering the flourishing of many different branches of economy, the most important of which is tourism. Accordingly, the aim of the paper is to investigate the possibilities for the development of winter tourism in Ravna planina.

Methodology of the Research

Methodology used in this research is based on GIS. Digital and vector topographic maps with the scale 1:25 000 served its purpose in creating digital elevation model (DEM) of the researched area. The analysis of morphometrical and structural characteristics of the area was carried out using Programme ArcGIS. DEM horizontal resolution of 30 m provided very reliable results in digital analysis of the area and it's presenting (Pahernik, 2007). Quantitative interpretation via geomorphologic maps and numeric values proved to be most appropriate for the landscape evaluation and determining the type of its influence.

Evaluation of landscape, as a rather independent element of natural setting, represents a rather difficult task. Landscape may be viewed as a precondition for the type of influence of all the other natural components in space, and as such it influences the qualitative characteristic of surface and surfacing part of lithosphere, climate conditions, soil, vegetation, the quotient of outflow etc. For the above mentioned reasons it is often impossible to define the value of landscape, because the theory of evaluation has not completely defined the principles and criteria of evaluation (Lješević, 1992). Accordingly, the evaluation of landscape morphometrical characteristics in this paper is based on the method of classification, and its quantitative way of evaluation the researched area for the purpose of development of winter tourism.

On the basis of the classification method, the scale of classification values has been created (Lješević, 1986). First of all, influences of some of the morphometrical characteristics were classified individually. After that they were given the appropriate numeric values, through comparison and function of each classification (Lješević, 1986). In the end, final results of landscape morphometrical characteristics were presented, in the synthesis of a map comprising the results of its individual values.

Geocological evaluation of Ravna planina

One of the main factors in relief creating is landscape. It represents the basis for the greatest part of social activities, settlements, roads, water flow, soil and vegetation. Landscape has constantly been modified by natural, natural-anthropological and anthropological morphological processes. Therefore, the relief shape, its modifications and invariability (together with morphological processes that modify it) usually have the crucial role in development of economy and dispersion of population (Bognar, 1990).

This served as a good reason for a complex evaluation to be carried out of the relief features of Ravna planina from the economic-geomorphologic aspect, that is, evaluation of its suitability for different economic purposes, from the aspect of sustainable development. The accent of the research was put on evaluation of morphometrical relief features.

The evaluation of morphometrical relief features in this paper is based on the application of classification method. First of all single researches were carried out, and that served as a starting point for estimation of the potential of Ravna planina in sustainable tourism development. Special interest was focused on sustainable use of the area and protection of environment and places of work.

Classification scales with positive values were used, with the aim of comparison and classification of the results. The zero value was also introduced, because of certain negative values that appear. Those values express impossibility of the use of the researched area for the above mentioned purposes. The zero values might sometimes have eliminatory function. The classification scale with following values was chosen for the research (Table 1).

Table 1. Scale of classification values

Qualitative feature	Classification value
Very suitable	5
Suitable	4
Barely suitable	3
Inadequate	2
Unsuitable	1
Very unsuitable	0
Zero	Eliminatory

Source of data: Golijanin, 2010b

The scale (Table 1) provided a good basis for a simple evaluation of morphometrical features of the researched area, with the purpose for winter tourism development.

Evaluation of the area with the purpose of winter tourism development

The evaluation of this area from the aspect of possible winter tourism is a rather complex and demanding task. Mountains belong to geomorphologic touristic values which stand for the most complex touristic value, viewed from many different elements and processes.

Winter tourism is a special branch of tourism that implies a tourist doing different kinds of sports in the snow. The development of sustainable winter tourism is mostly conditioned by morphometrical relief features, especially mountainous areas that have much better conditions for development of the branch than low-lying areas. This is due to its hypsometric features and terrain exposition and slope. This branch of tourism has also been greatly influenced by some other factors. Within this paper the evaluation of morphometrical features of high-lying terrain of the researched area with the purpose of sustainable winter tourism development was carried out.

Geocological evaluation of Ravna planina in the function of winter tourism

Table 2. Evaluation of suitability of certain morphometrical characteristics of Ravna planina for the purpose of winter tourism development

No	Morpho. Features of the Terrain	Classes (Measuring Values)	Class Description	Classification Values
1	Hypsometric features of the terrain	< 800 m	Bottoms of the valleys	0
		800 – 1000 m	Sides of the valleys	2
		1000 – 1300 m	Plains and watershed peaks	3
		1300 – 1600 m	High-plains	4
		over 1600 m	Highest peaks	5
2	Terrain slopes	< 2°	Plains	2
		2 – 5°	Slightly sloping terrain	2
		5 – 10°	Sloping terrain	3
		10 – 15°	Quite sloping terrain	4
		15 – 35°	Rather sloping terrain	5
		35 – 55°	Highly sloping terrain	4
3	Relief vertical dissection	> 55°	Cliffs and sharp slopes	Eliminatory val.
		< 20 m/km ²	Leveled relief	2
		20 – 40 m/km ²	Slightly dissected plains	3
		40 – 60 m/km ²	Slightly dissected relief	3
		60 – 100 m/km ²	Moderately dissected relief	5
		100 – 200 m/km ²	Dissected relief	4
		> 200 m/km ²	Highly dissected relief	Eliminatory val.
4	Exposition of slopes	Horizontal areas	Terrains without noticeable exposition	3
		N	Terrains of northern exposition	5
		NE	Terrains of north-eastern exposition	5
		E	Terrains of eastern exposition	3
		SE	Terrains of south-eastern exposition	2
		S	Terrains of southern exposition	1
		SW	Terrains of south-western exposition	2
		W	Terrains of western exposition	3
		NW	Terrains of north-western exposition	4
5	Distortion of slopes	< -2 StDev	Highly convex shapes	1
		-1 StDev	Convex shapes	2
		0 StDev	Plateaus and balanced slopes	1
		1 StDev	Concave shapes	2
		> 2 StDev	Highly concave shapes	0.5

Source of data: Golijanin, 2010b

The touristic field in this area is specially based on sport activities related to snow (such as Alpine and Nordic skiing and different kinds of extreme ski

disciplines). In that sense, the carried research might be viewed as a considerable contribution to the planning of possible sustainable winter tourism development of Ravna planina terrain.

One of greater difficulties during the process of terrain evaluation with the purpose of winter tourism development is the lack of appropriate methodology. Furthermore, not all the morphometrical values have the same influence on possible development of winter tourism. Therefore, the paper shows primary variables (hypsoetry, slopes, vertical dissection and exposition of slopes), as well as the secondary ones (distortion of slopes) (Pahernik & Kareša, 2007). Quantitative methodology is used in the paper, and it proved to be the most appropriate for relief evaluation, the evaluation of terrain morphometrical features and the type of its influence on winter tourism development.

Morphometrical characteristics of the terrain influence the possibility of winter tourism development in the researched area in many different ways, as being either stimulating or preventing factor. The following table (Table 2) shows individual influence of morphometrical characteristics on either possibility or impossibility of winter tourism development in the researched area.

The synthetic chart of possible purpose of Ravna planina for the development of winter tourism was made on the basis of the results presented in Table 2 (Figure 2 and 3). The chart was made on the basis of total classification values of the terrain (Table 3).

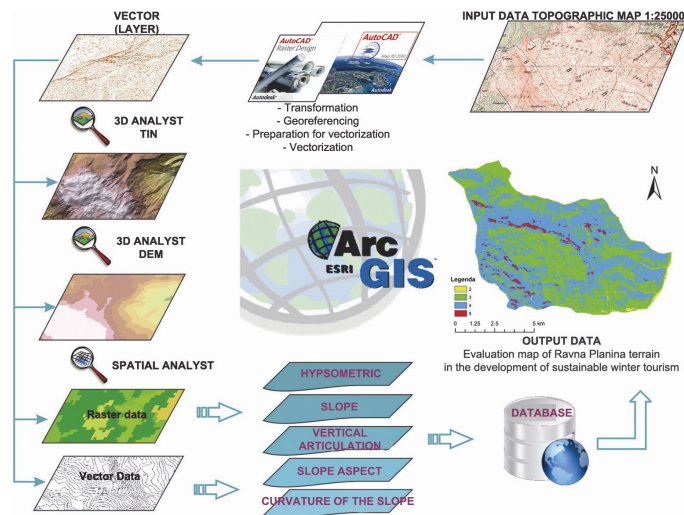


Figure 2. Procedure of making the synthesis map

Geocological evaluation of Ravna planina in the function of winter tourism

The given synthesis map of Ravna planina terrain value for the purpose of winter tourism clearly shows more or less suitable terrain parts – i.e. different according to the level of value for the winter sport tourism. This is even more evident from reviewing the charts (Figure 4) with the percentage of classification values of Ravna planina terrain values in the function of winter tourism.

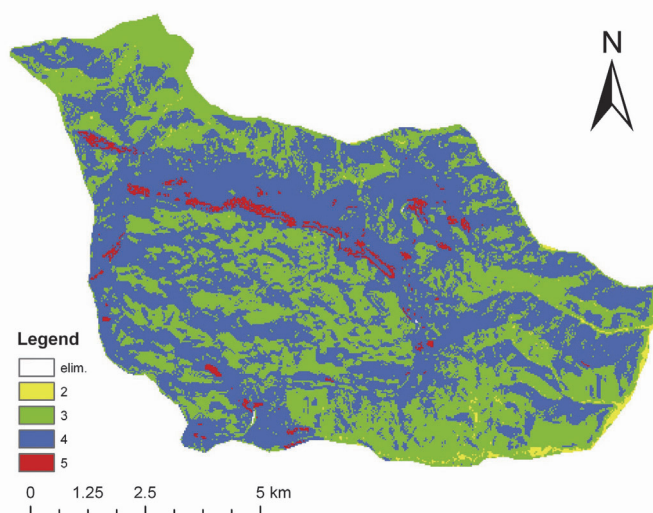


Figure 3. Map of the terrain values for the purpose of winter tourism development (based on a scale of classification values 1-5)

From the aspect of winter tourism, the most valuable parts of Ravna planina terrain are presented with the percentage of 1.7%. These areas are actually forests in the northern and northern east parts of Ravna planina.

Table 3. General classification values of Ravna planina terrain for the purpose of winter tourism

Category	Degree of terrain value	Points
5	The most valuable parts of the terrain	20-22
4	Mainly suitable parts of the terrain	15-20
3	Relatively suitable parts of the terrain	10-15
2	Mostly unsuitable parts of the terrain	5-10
1	Unsuitable parts of the terrain	1-5
0	Extremely unsuitable parts of the terrain	0-1

Source of data: Golijanin, 2010b

The terrains evaluated with classification mark 4 take the largest part of the researched area. The fact that 55.8% of the researched area is dominated by

terrains characterized as mainly suitable for the development of ski sport disciplines and winter tourism is certainly very important precondition for winter tourism development on Ravna planina. This development could be easily supervised on the already existing winter tourism on Jahorina. Terrains from the category of relatively satisfactory terrains for the usage of winter tourism development on Ravna planina take 41.6% of the territory and are marked with classification mark 3.

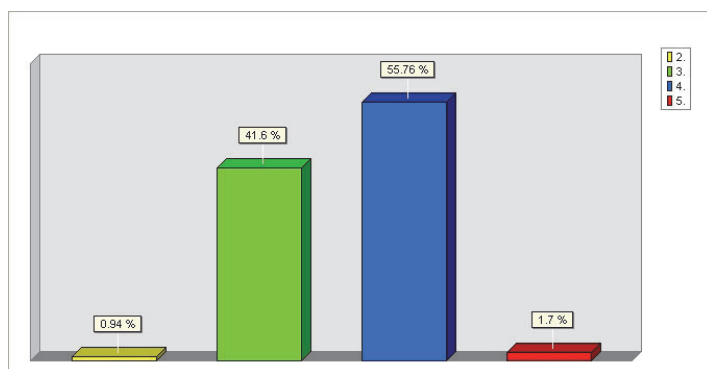


Figure 4. Percentage of classification value categories of Ravna planina terrain for winter tourism development

As to winter tourism development on Ravna planina, less valuable parts of the terrain participate with the minimal percentage. These terrains are placed near the river valleys and take only 0.94%. Terrains with the lowest potential touristic values on the researched area are marked with 2, because values 1 and 0 do not appear in the general data processing and are therefore not presented on the synthesis map.

From the above mentioned facts, it can be concluded that the area of Ravna planina, according to its morphometrical features, possesses immense preconditions for the winter tourism development, especially certain ski sport disciplines. The researched area is especially suitable for making Nordic ski terrains on the central plateau of Ravna planina slope, as well as for Alpine ski terrains and terrains for extreme ski sport disciplines.

This distribution of terrain values positively influences the overall picture of examined terrain values from the aspect of terrain usage for winter tourism development, especially when one takes into account that mainly suitable terrains for such activities are rated with classification values 4 and 5 participate with less than 58%.

Conclusion

This paper gives insight into Ravna planina relief potential in terms of general usability and purpose of the area, i.e. terrain convenience for the winter tourism development. The best parts of the terrain, less useful areas were separately defined and determined, as well as areas that cannot be used for the stated purposes (so called eliminatory areas).

As a result, the optimal land purpose map was obtained (a spatial display of qualitative differences within the researched area). The terrains qualified as less suitable take less than 1% and this gives a positive image in final score and clearly shows that Ravna planina, according to its morphometrical features, possesses extraordinary preconditions for winter tourism development that already exists near the researched area – that is, on Jahorina).

One of the prejudices that prevails is that protection of environment confronts with the interests of economic development, social product development, standard of living and new posts. Therefore, the research carried out and presented in this paper offers a scope of opportunities for the possible development of sustainable winter tourism in the researched area. Application of sustainable branches of industry should be seen as a major chance for the development of this area and winter tourism development should be priority. The main reason for this statement is the fact that morphometrical terrain features of the researched area are very suitable for the development of this branch of industry.

In short, the given results are a reliable basis for future planning and subsequent implementation of the plans, both from the point of improvement and protection of the researched area. Geoecological evaluation of Ravna planina terrain in this paper is carried out only partly. Accordingly, a more detailed research of the area should be carried out.

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