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LANDSCAPE EVALUATION FOR THE PURPOSES OF ECOTOURISM – CASE STUDY OF BURGENLAND

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Abstract

The objective of this paper is the landscape evaluation of Burgenland (federal state of Austria) for the purposes of ecotourism, based on the Quantitative method of diversity (V-Wert method), where the natural elements of landscape (forests, water surfaces, relief, climate) and land use of considered area are taken as the main criteria for the evaluation. The research was carried out using modern mapping methods and GIS software. By applying this method, more or less favorable surfaces are determinated for the given purposes, with the aim of identifying landscape units which have a high degree of convenience for the development of different types of sustainable and ecotourism, where the main motives of tourist activity are natural heritage and natural touristic values, which are making that landscape more exclusive and more attractive among tourists and visitors. The results of geospatial analysis and landscape evaluation of considered spatial entity in this paper could greatly contribute to an additional tourist valorization of Burgenland.

Keywords: quantitative method of diversity, landscape evaluation, ecotourism, GIS, Burgenland

INTRODUCTION

In recent decades, global trends in tourism have undergone a gradual transformation. Modern society becomes aware of the risks posed by the ecological crisis, and relies more on individual and collective responsibility to protect the environment. In many social activities, the environmental aspect strengthens, leaving a deep trace in the tourist activity itself, and the need arises to create an entirely new alternative concept with the expressed ecological dimension of "ecotourism" in contrast to traditional, massive forms of tourism (one of the most valuable manifestations of a sustainable tourism) [1,2]. Tourism based on ecologically responsible behavior, where the main motive is natural and cultural heritage, in many European countries such as Austria, Germany, the Netherlands, France and the United Kingdom is an effective instrument for protecting the natural environment, establishing sustainability and improving the health of the human population as well as local and regional economic development [3,4]. Burgenland is characterized by very rich and diverse landscapes, which due to their importance and specificity are often found under protection, such as nature reserves, nature parks (6), the famous National Park Neusiedler See, numerous areas within the European Natura 2000 network, etc. Preserved nature, diversity of biodiversity, protected areas and regional specificities are important resources on which the prosperity of this province rests. High quality and authentic landscape features except for the development of tourism and agriculture, contribute to education in the field of environmental

protection, energy production from renewable sources and overall regional development. Tourism is slowly becoming one of the key pillars of the regional economy of Burgenland and has been intensely developing over the last two decades. The promotion of tourism contributes to linking different types of tourist offer and introducing new tourist facilities that basically rely on the natural and cultural elements of the region: wellness, spa and health tourism, birdwatching, sports and recreational tourism (hiking, alpinism, cycling, wind and kitesurfing), camping, hunting and fishing, various water activities, educational, wine and gastronomic tourism, agritourism etc. Only in the period 2001-2015 the number of total overnight stays increased from 1 to 3 million (in 2015 it was 2 914 753). According to the official statistics, 5.9 million tourists visited Burgenland in 2015, with total tourist costs amounting to 1040 million euros. The highest growth rates are recorded in the area of sports and recreational, excursion, cultural and manifestation, educational, wellness and spa tourism [5]. However, not all the parts of the province were equally rapidly developing in tourism. Tourism has traditionally represented in northern Burgenland, where there is a largest number of tourists and visitors annually. Central and Southern parts experience their more intensive development in recent years, although growth rates are still lower than the northern zone. The main objectives of the future development of tourism in Burgenland are extending the duration of stay of tourists and visitors (currently is 3 days on average), expansion of accommodation facilities, development of daily and weekend tourism, as well as the organization of specific forms of sustainable and ecotourism for additional diversification of tourist offer [6]. Examples of strong growth are well-known spa centers – cities Lutzmannsburg, Bad Tatzmannsdorf (East and West part of Burgenland) and St. Martin (Neusiedler See), but lately more and more cities Gussing (southeast part) and Stadtschlaining (Central part) who managed to significantly increase tourist frequency in a relatively short time due to new and interesting ecotourism facilities. An interesting example of the new type of tourist offer is "energy tourism" where tourism activities are related to renewable energy sources (the most famous example is the European Center for Renewable Energy – EEE Gussing and wind, solar and biomass power plants). This type of tourism is in the initial stage of development, it is promising and provides numerous opportunities, so can easily be combined with educational tourism and tourism trips whose main motives are science and technological achievements in the field of sustainable development. Evaluation of natural and cultural areas and their most important elements, as well as additional valorization of tourist sites and zones, will enable the existing potentials to be used in an even more efficient and sustainable way, which will contribute to the conservation of landscapes and natural ecosystems on the one hand, and regional development of Burgenland on the other [7].

MATERIALS AND METHODS

Main goal of this paper is geoecological evaluation of landscapes of Burgenland for the needs of ecotourism. The evaluation was performed using the Quantitative method of diversity (V-Wert method). The criteria used in the geospatial analysis, on which the mentioned model is based, are: forests and forest land (W), water surfaces (G), relief (R), land use (N) and climate factor (K). Using these criteria authors will determined more or less

favorable areas for the given purposes. More or less suitable surfaces for the development of tourism are determined by the following formula [8,9]:

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

By this model, for the criteria of relief energy and the land use, the values of weight factors are defined (Table 1) by means of which the final value of the mentioned evaluation criteria are determined.

Table 1 *Scale of relief values and Weight factors for each category of land use [10]*

Altitude difference (m)	**Values of the relief**
10-20	220
20-30	300
30-60	400
60-100	590
100-250	860
250-500	1200
Land use	**Weight factors**
Agricultural areas (arable land)	6
Orchards and vineyards	8
Wetlands	10
Meadows and pastures	15
Forests	19
Artificial surfaces	21
Water bodies	50

At the beginning of the research, a raster network was formed with dimensions of 2000 x 2000 m (2 x 2 km) which covers the whole area of the Federal state of Burgenland, so that for each spatial unit - GRID cell (in total 1173) it would be possible to determine the category of suitability in relation to each evaluation criterion. After that, on the basis of the collected data, several thematic maps were created, and at the end by overlapping of these layers, as a final result was obtained a Map of Suitability of Burgenland for tourism purposes, which was the main goal of this research. For the needs of landscape evaluation, geospatial analysis and cartographic presentation of the results, GIS software based on ESRI technology (ArcGIS 10.2) was used.

Evaluation criteria

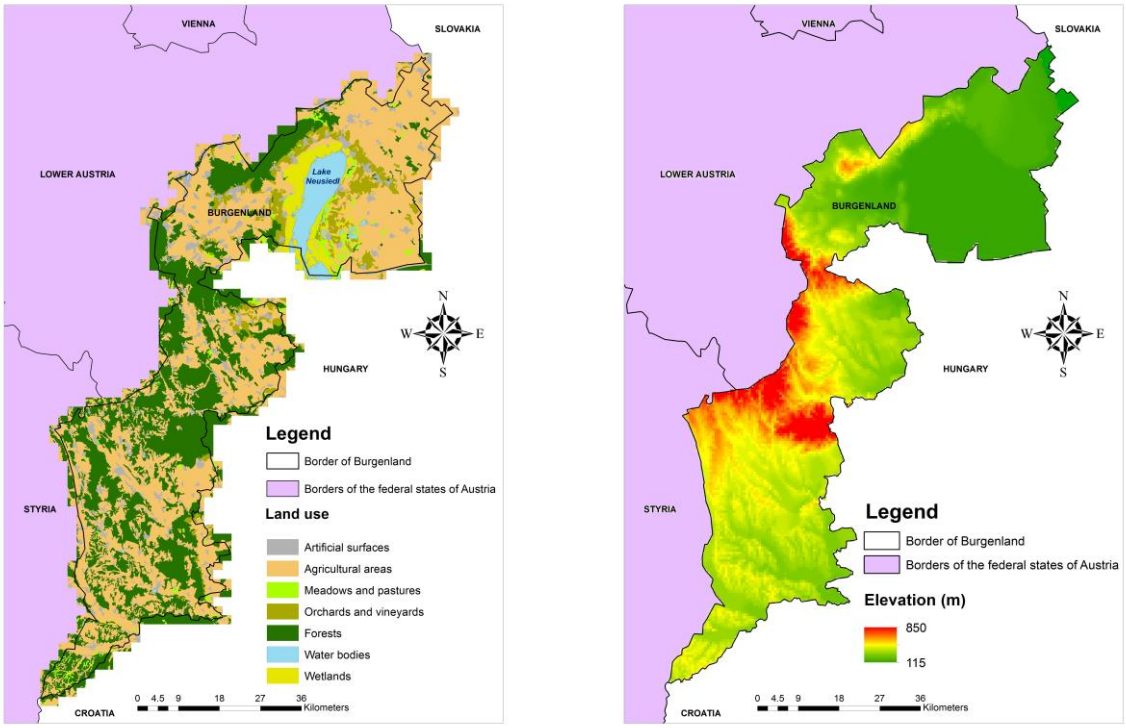
Forest edges and water edges - Forest edges (W) are the bearers of contrast and change in the space that have an impact on the observer's senses and represent the typical elements of the natural and cultural landscape [11,12]. Forest complexes represent the ideal spatial units intended for carrying out a number of tourist activities, but apart from tourism, they also have a great ecological significance as they contribute to the preservation of biological diversity.

The forests on the territory of Burgenland occupy about 130 000 ha, or 32.81% of the total area. The share of monoculture decreases (mostly coniferous), while the percentage of resistant and mixed forests is growing. Among the deciduous species dominate the oak (especially important is European oak-*Quercus robur*), linden, chestnut, hornbeam and black locust (*False acacia*), and among the conifers are fir tree (*abies*), pine and spruce. Forests are predominantly concentrated in the central, western and southern parts of the country. The northern parts are distinguished by vegetation predominantly composed of agricultural crops, wetland vegetation and steppe areas with spacious meadows and pastures [13]. Forests are represented to a lesser extent and as the dominant stand the temperate deciduous forests [14], [15]. Water edges (G) increase the tourist value of the area, make it more attractive and, from a recreational aspect, more inviting because they are suitable for the development of a number of recreational and tourist activities [12]. The most important, most famous and the largest hydrographic object of Burgenland is Lake Neusiedler See - a national park located on the territory of two European countries, an important element of cross-border cooperation, and since 2001 it has been on the UNESCO World Heritage List as Fertö/Neusiedlersee Cultural Landscape. The World Heritage Site corresponds to the Austrian National Park Neusiedler See and the Hungarian park Fertő-Hanság Nemzeti Park. The area is recognizable by the wide tourist offer: hunting and fishing, sports and recreational tourism, gastronomic and wine tourism, cultural, manifestation, educational, adventurous, wellness, spa and health tourism etc. The lake is a characteristic element of the landscape of northern Burgenland and it is a factor of recognizing the region in a wider environment. Lake surfing, wind and kite surfing are the most popular sporting activities that attract around 95 000 visitors annually. The National Park is a significant destination in the field of cultural and manifestation tourism, where the most famous is The Seefestspiele Mörbisch - the world's largest open-air opera and concert festival, which annually visits up to 220 000 visitors. The distinctive steppe landscapes harmoniously fit into the backdrop of the world's largest open-air stage. The area of National Parke also features a unique flora - the most typical representative is the reed (the reed belt around Neusiedler See is the second largest belt in the world) [16] and fauna, especially orinthofauna, so it is also an attraction for birds lovers (birdwatching). The area offers rich facilities for both athletes and recreationalists: arranged bicycle trails around the lake, hiking trails that match the wine routes (Gols town), as well as more demanding hiking trails on Leitha Mountains. The Neuseidler See region is known for its high level of integration of tourism and viticulture. Wine manifestations, numerous wine trails and tours (e.g. Jois a small town in the district of Neusiedl am See) complete the tourist offer of the region [7,14,17]. The roles of the forest and water edges in the geospatial analysis and geoecological evaluation of the landscapes, both natural and cultural, are very similar, with the fact that waters additionally enriching the area, the lengths of all water shores are multiplied by a value of 3 [12]. In order to obtain data on the lengths of the water and forest edges, a digital database on the status and changes of the land cover and the way of land use throughout Europe CORINE Land Cover (2012) was used [18]. The database contains 44 categories of land use, and on the basis of available data for the state of Burgenland, three types of forest are distinguished: deciduous, coniferous and mixed forests. The analysis also includes transitional woodland shrub (forest-bush ecosystems). Then, the lengths of forest and water edges were determined in meters, i.e. km^2 for each individual GRID cell, for the entire

surface of the analyzed area. The types of vegetation covered by the research, as well as the position of hydrographic objects are shown on Figure 1.

Relief energy - Relief (R) is one of the most important natural components that can be analyzed and evaluated [12]. The relief energy represents the height difference between the highest and the lowest point in the corresponding square of the raster, expressed in meters. To determine this evaluation criterion, it was necessary to use the data obtained from a digital elevation model (DEM) [19]. The digital elevation model is shown on the Relief map of Burgenland (Figure 2). Each GRID cell is assigned a value that represents the difference between the highest and the lowest point of altitude. According to this difference, the relief values are assigned [10], (Table 1). Burgenland is mostly part of the Pannonian Basin, which is morphologically different from the rest of Austria. The relief is predominantly flat, with altitudes between 120 and 250 m. On the territory of this province is the lowest point of Austria (115m). A smaller part, in the western parts has characteristics of mountainous terrain, altitudes up to 850m and belongs to the first, lower mountains of the Alps.

Land use - Land use (N) is an inevitable criteria in this analysis in order to determine the possibilities of different elements of landscape for the needs of ecotourism and recreation. In order to ascertain the values of this evaluation criterion, it is necessary to calculate the percentage of participation of different types of land use in the appropriate square of the raster, which is then multiplied by the corresponding weight factor for this criterion (Table 1) (Figure 1). By summing up the partial values of each type of land use, the final value for every GRID cell is obtained. For the purposes of determining this criterion, the data from the digital database CORINE Land Cover (2012) were used.



Figures 1 and 2 *Land use of the territory of Burgenland (left), Relief map of Burgenland (right)*

Climate factor - The climate factor (K) is calculated based on the annual values of the air temperature and the amount of precipitation, altitude and type of landscape. The value of the climate factor is taken as equal to the entire considered area, ie. all raster units carry the same value of the mentioned factor. Burgenland is characterized by a warm and humid continental climate witch suits to the development of various tourist activities.

RESULTS AND DISCUSSION

Landscape evaluation was conducted in a wider area compared to administrative boundaries of Burgenland, so instead of 3 962 km^2 (the surface of this federal state of Austria), the analysed area amounted to 4 692 km^2. The reason for this was the consideration of each raster unit within which there is even the smallest part of the territory of Burgenland. The degree of suitability of the various parts of considered area for ecotourism purposes are shown in Figure 3, according to the categories of diversity presented in the Table 2.

Table 2 *Categories of diversity (V-Wert method) [9]*

Categories	Classes	Span
I	Unfavorable	V < 3.72
II	Conditionally favorable	3.72 < V < 7.44
III	Favorable	7.44 < V < 11.16
IV	Very favorable	V > 11.16

All spatial units (GRID cells) are classified into one of four categories according to the degree of suitability: unfavorable areas of 1632 km^2 (34.78%), conditionally favorable areas 1200 km^2 (25.58%), favorable areas 932 km^2 (19.86%) and very favorable areas 928 km^2 (19.78%). Based on the results obtained, it can be easily concluded that a large part of Burgenland territory has the basic amenities for ecotourism. Very favorable and favorable areas account for almost 40% of the total considered area. They are predominantly concentrated in the southern and western parts and coincide with the zones of distribution of forest complexes, while in the central part they coincide with the mountainous area that has significant tourist potential (e.g. Rosalia Mountain). In the northern part of Burgenland, the area around the Neusiedler See is recognized as dominantly favorable - which stands out as the most attractive ecotourism destination of this federal state. A large part of northern Burgenland lies between the Danube and Lake Neusiedler See in the so-called "Green center", a space that is located between three major European cities: Vienna, Bratislava and Gyor. In the last decade, the North Burgenland region has experienced dynamic development, not only due to its natural values, but also due to its favorable geographical location and proximity to the international tourist market. What is interesting about this region is that, according to the results of the conducted evaluation, it has been singled out as an area with the largest share of unfavorable areas, but the reason for this should be found in the land use of this area, dominated by arable agricultural land and numerous vineyards – the most famous feature of Burgenland as a wine region. One of the main principles of the State is the permanent protection of fertile land intended for sustainable agriculture - the basis of the rural development of Burgenland. At the same time, the importance of the intensive cooperation of

tourism and agriculture, harmonization of the development objectives of these two fields, the placement of joint brands (e.g. wine tourism, rural and agritourism - Austria, along with Italy, a pioneer of agritourism) are emphasized, so the "unfavorable" should be understood only conditionally.

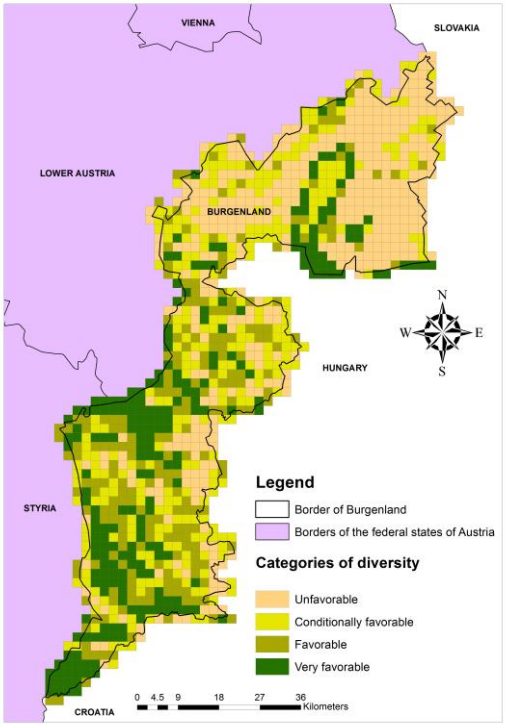


Figure 3 *Suitability of Burgenland for ecotourism purposes*

CONCLUSION

Tourism is an important economic support of Burgenland, especially in the domain of innovation and creation of new tourism products and services, primarily in the field of ecotourism. Especially important is the cooperation and networking of tourism activities with other sectors such as agriculture, forestry, nature protection, energy production from RES and culture. The preserved environment is an important resource that can be successfully used for the promotion of Burgenland as an attractive ecotourism destination at the international level. Advantages of the Quantitative method of diversity in evaluating the natural elements of landscapes for planning of tourist and recreational zones are confirmed once again by this paper. By applying this model, on the territory of Burgenland an area of 1860 km^2, or 39.64% of the total area, was assessed as particularly suitable for the given purposes. Significant potentials have also those parts which are designated as conditionally favorable (25.58%), which means that more than 2/3 of the area of this federal state has the appropriate conditions of its natural components that have an important, often a decisive role in the development of ecotourism.

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REFERENCES

[1] E. Csirmaz, K. Peto, Procedia Econ. Financ; 32 (2015) 755–762.
[2] F. Higgins-Desbiolles, Tourism Manage; 25 (2018) 157–160.
[3] C. Heagney, J. Rose, A. Ardeshiri, M. Kovac, Ecosyst. Serv; 31 (2018) 358–370.
[4] P. Picket, E. Eijgelaar, P. Peeters, Apstract; (2013) 115–119.
[5] Tourismusstrategie Burgenland 2022, (Tourism strategy of Burgenland 2022), Burgenland Tourismus GmbH, Eisenstadt (1998).
[6] Entwicklungsstrategie Burgenland 2020, (Development strategy "Burgenland 2020"), Österreichisches Institut für Raumplanung ÖIR GmbH, Wien (2012).
[7] Landesentwicklungsprogramm Burgenland – LEP 2011 (State development program Burgenland), Amt der Burgenländischen Landesregierung, Eisenstadt (2012).
[8] H. Kiemstedt, To assess the landscape for recreation, Contributions to Landes pflege, Stuttgart (1967) p. 19.
[9] H. Kiemstedt, Zur Bewertung natürlicher Landschaftselemente für die Planung von Erholungsgebieten, Technische Hochschule Hannover, Fakultät für Gartenbau und Landeskultur, Dissertation, Jänecke, Hannover (1967), p. 149.
[10] G. Hoffmann, Tourismus in Luftkurorten Nordrhein-Westfalens, Bewertung und Perspektiven, Dissertation, Universität Gesamthochschule, Paderborn (1999), p. 60.
[11] M. R. Pecelj, M. Lukić, M., Pecelj, *et al*., Arch. Tech. Sci; 17 (2017) 89–97.
[12] M. Pecelj, M. Lukić, A. Vučičević, *et al*., J. Geogr. Inst. Cvijic. SASA; 68 (2) (2018) 215–231.
[13] K.P. Zulka, M. Abensperg-Trauna, N. Milasowszky *et al*., Agric. Ecosyst. Environ; 182 (2014) 25–36.
[14] Managementplan Europaschutzgebiet Neusiedler See Nordostliches leithagebirge (Management Plan of National Park Neusiedler See – Seewinkel), Suske consulting, Wienna (2015).
[15] Waldumweltprogramm Burgenland (Forest Environmental Program Burgenland), Naturschutzbund Burgenland, Eisenstadt (2014).
[16] K. Euller, K. Zmelik, A. Schneidergruber, *et al*., Acta ZooBot; 150/151 (2014) 41–62.
[17] C. Hainz-Renetzeder, A. Schneidergruber, M. Kuttner, *et al*., Ecol. Model; 295 (2015) 196–206.
[18] European Environment Agency, Corine Land Cover 2012, *Available on the following link:* http://land.copernicus.eu/pan-european/corine-land-cover/clc-2012/
[19] Open Digital Elevation Model (OpenDEM), *Available on the following link*: http://www.opendem.info/download_contours.html/