PLANTS
IN URBAN AREAS AND LANDSCAPE

ASSESSMENT OF THE RECREATIONAL POTENTIAL OF SELECTED POLISH AND SLOVAK TOWNS DUE TO THEIR NATURAL VALUES

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There are many research methods used in landscape evaluation, but attention should be paid to the fact that most of them concern non-urbanized areas. There is a lack of many elements closely integrated with urban space, in particular concerning the recreational potential of open urban green areas. The goal of the project is: to present the methodical approach to natural assessment of selected Polish and Slovak towns and to formulate guidelines in the field of landscape design for the recreational aspect. The research will be conducted in Slovak and Polish towns. The landscape structure will be analyzed in three dimensions, i.e. qualitative analysis, quantitative analysis and spatial analysis. The qualitative analysis concerns elements that built the landscape of the studied area, e.g. forest ecosystems, water, arable land, meadows, built-up areas, etc. The quantitative aspect shows the contribution of each type of structural elements in the total area. On the basis of spatial-landscape units, landscape assessment will be made, taking into account natural elements. In order to assess the quality of landscape, a list containing all relevant assessment criteria and their possible bonitation results from 3 points to 1 point was compiled. In the next stage of research there will be distinguished areas with very high natural values, areas with high natural values, areas with medium natural values, and areas with low values.

Keywords: natural evaluation, vegetation, recreation, Nitra, Brzesko, towns

1 Introduction

Natural evaluation is a very important method for analysis of landscape values (Kil and Kowalczyk, 2011; Łukowiak et al., 2017). There are many landscape evaluation methods such as: Bajerowski's value matrix method, Janecki's straight lines method (Janecki 1981), Wojciechowski method (1986), Gacka-Grześkiewicz et al. method (1994), Żarska method (2014). It is necessary to collect much information about nature before the landscape evaluation (Litwin et al., 2009). Landscapes are much diversified, so sometimes it is needed to do modifications of two or three evaluation methods. After that, it is possible to achieve good results with valuable information about values of the studied areas (Litwin et al., 2009). Most of evaluation methods are based on bonitation points consisting in assigning point values to individual elements. However, the very important criterion for choosing a particular method of landscape evaluation is the aim of this assessment (Bajerowski, 2001; Myga-Piątek, 2007; Żarska, 2014). The application of this method may be the basis for determining the valuable natural resources of Polish and Slovak municipalities. Application of this evaluation method may be helpful in defining future directions of development recreation services of urban municipalities, as well as being a determinant of a new trend in spatial landscape planning. Proper management of systems of green areas, including legally protected sites, gives a real chance to keep relatively high biological diversity in towns. Birds are a good bioindicator of whether environmental conditions in urbanized areas are good for human population (Shanahan et al., 2011; Threlfall et al., 2016). These towns will also be more attractive for users, including the recreational aspect. It is necessary to add that the "green infrastructure" concept has emerged in the USA in the end of the 20th century and concerned mainly good environmental life conditions for humans (Benedict and McMachon, 2006), later used in Europe. Today, you can no longer afford town planning without a system of natural areas, without pro-ecological space and solutions. Many researches give evidence that the increase of green areas in the total area of towns

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influence the improvement of climate conditions, such as decreasing temperatures and increasing the ability to collect rainwater, to a large extent (Gill et al., 2007, Emanuel and Loconsole, 2015). It is really important for the recreational aspect in towns, too.

■ **Figure 1:** Localization of Nitra (Slovakia) and Brzesko (Poland)

The aim of the paper is to present a methodical approach to nature evaluation and recommend changes and improvements regarding the landscape planning for the selected Polish and Slovak towns for the purpose of recreation resources and other landscape features beneficial for inhabitants. It is also vital to compare the urban nature values in the selected Polish and Slovak towns, including the recreational aspect. The nature evaluations were performed in Brzesko and Nitra. The total population is about 11,000 in Brzesko and about 80,000 in Nitra.

2 Methods

The landscape structure was analysed in three important aspects: qualitative analysis, quantitative analysis and spatial analysis (Żarska et al., 2014). The qualitative analysis is concerned with the types of land uses in the areas, e.g. forest ecosystems, water, arable lands, meadows, built-up areas etc. The quantitative aspect shows the share of every type of structural elements in the total area. In this work, diverse types

Table 1 Criteria of assesment with bonitation scale

	Criteria	Bonitation
Diversity of green areas	3 types of green areas	3
	2 types of green areas	2
	1 type of green area	1
Degree of vegetation naturalness	natural vegetation dominated (forests, parks)	3
	semi-natural vegetation dominated (grass vegetations)	2
	synanthropic vegetation dominated	1
Water elements occurring	>75% – cover of spatial-landscape unit	3
	50–75% (cover)	2
	<50% – cover of spatial-landscape unit	1
Active biological surface	>75% – cover of spatial-landscape unit	3
	50–75% – cover of spatial-landscape unit	2
	<50% – cover of spatial-landscape unit	1
Density of built-up areas	intensive density of built-up area	0
	medium density of built-up area	1
	low density of built up area	2
	lack of built-up areas	3
Number of ecological connections	above 4 ecological connections	3
	2–3 ecological connections	2
	1 ecological connection	1
Afforestation areas	>75% cover of spatial-landscape unit	3
	50–75% cover of spatial-landscape unit	2
	<50% cover of spatial-landscape unit	1

Four category of spatial-landscape units (areas) are distinguished: First category (A) from 17 to 21 points – areas with very high natural values, second category (B) from 12–16 points – areas with high natural values, third category (C) from 7 to 11 points – areas with medium natural values and fourth category (D) <6 points – areas with low natural values. The differences between structure and nature values of Nitra and Brzesko were determined

of coverage were calculated and estimated with help of maps and the field research, which also presents the spatial layout of the landscape and its elements.

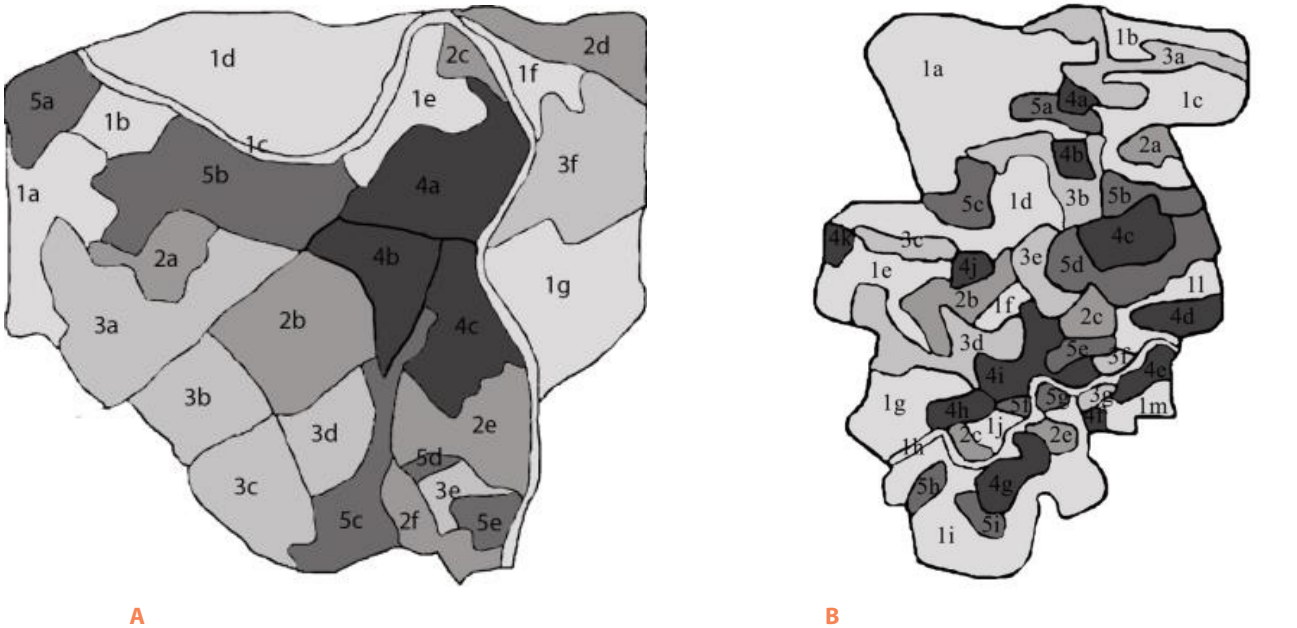
Based on the spatial-landscape units a natural evaluation of landscape was conducted in the next stage of the work. In order to assess the quality of the landscape, a list with all relevant criteria and their possible bonitation scores from 3 to 1 was compiled (Table 1). Every spatial-landscape unit was assessed individually according to this list.

3 Results

According to natural evalution, there were distinguished five types of spatial landscape units in Brzesko and Nitra (Figure 2). The types of spatial landscape units were represented by: areas with dominant natural and semi-natural vegetation, areas with dominant green areas, areas with housing estates and green areas, areas with dominant built up areas, and areas with different types of built up areas with vegetation. Areas with natural and seminatural vegetation and built up areas were dominant in Brzesko. It was observed that areas with natural, seminatural vegetation, different types of green areas and housing estates with green areas were characteristic for Nitra. The total numer of spatial landscape units was 27 for Nitra and 45 for Brzesko (Table 2). Nature evaluation was performed using seven criteria of assesment such as diversity of green areas, degree of naturalness of vegetation, water elements occurring, active biological surface, density of built-up areas, number of ecological connections, and afforestation areas (Table 3). Both towns have potential in the recreational aspect because of valuable vegetation and different types of green areas such as parks, urban forests, and water elements occurring. The evaluation proved that areas with medium natural values were dominant in both towns. There were spatial-landscape units with different density of built up areas and also industrial areas with accompanying vegetation.

Table 2 Categorization of areas in Nitra and Brzesko

Category/town	Nitra (27 spatial-landscape units)	Brzesko (45 spatial-landscape units)
A – areas with very high natural values	3	7
B – areas with high natural values	7	6
C – areas with medium natural values	12	14
D – areas with low natural values	4	11



■ **Figure 2:** Types of spatial-landscape units in Nitra (A) and Brzesko (B) (scheme)
1 (a, b, c…) – spatial-landscape units with dominant natural and semi-natural vegetation; 2 (a, b, c…) – spatial-landscape units with dominant green areas; 3 (a, b, c...) – spatial-landscape units with housing estates and green areas; 4 (a, b, c…) – spatial-landscape units with dominant built up areas; 5 (a, b, c..) – spatial-landscape units with different types of built up areas with vegetation

Table 3 Results of natural evaluation in Nitra (a) and Brzesko (b)

a) Nitra

No of criteria/types of units	1							2						3						4			5				
	a	b	c	d	e	f	g	a	b	c	d	e	f	a	b	c	d	e	f	a	b	c	a	b	c	d	e
I	2	1	2	2	3	2	2	2	3	1	3	3	1	2	1	2	2	1	2	1	1	1	1	1	1	1	1
II	2	2	3	2	3	2	3	2	3	1	3	3	1	2	2	2	2	2	2	1	2	2	1	2	2	1	1
III	1	0	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IV	2	3	3	3	3	3	3	2	2	3	2	3	3	2	2	2	2	1	2	1	2	1	1	2	1	1	1
V	2	2	3	2	2	3	2	2	1	2	1	2	2	1	1	2	1	1	2	0	0	0	0	1	0	1	0
VI	2	0	3	3	2	2	3	1	2	2	2	3	0	2	0	1	0	1	2	0	1	2	1	1	1	1	3
VII	2	2	1	1	3	3	3	2	3	1	2	2	1	1	1	2	1	1	2	0	1	1	1	2	1	0	1
Sum	13	10	18	13	18	15	17	11	14	10	13	16	8	10	7	11	8	7	12	3	7	7	5	9	6	5	7
Category of natural values	B	C	A	B	A	B	A	C	B	C	B	B	C	C	C	C	C	C	B	D	C	C	D	C	D	D	D

* I – diversity of green areas, II – degree of naturalness of vegetation III – water elements occurring, IV – active biological surface, V – density of built-up areas VI – number of ecological connections VII – size of afforestration areas

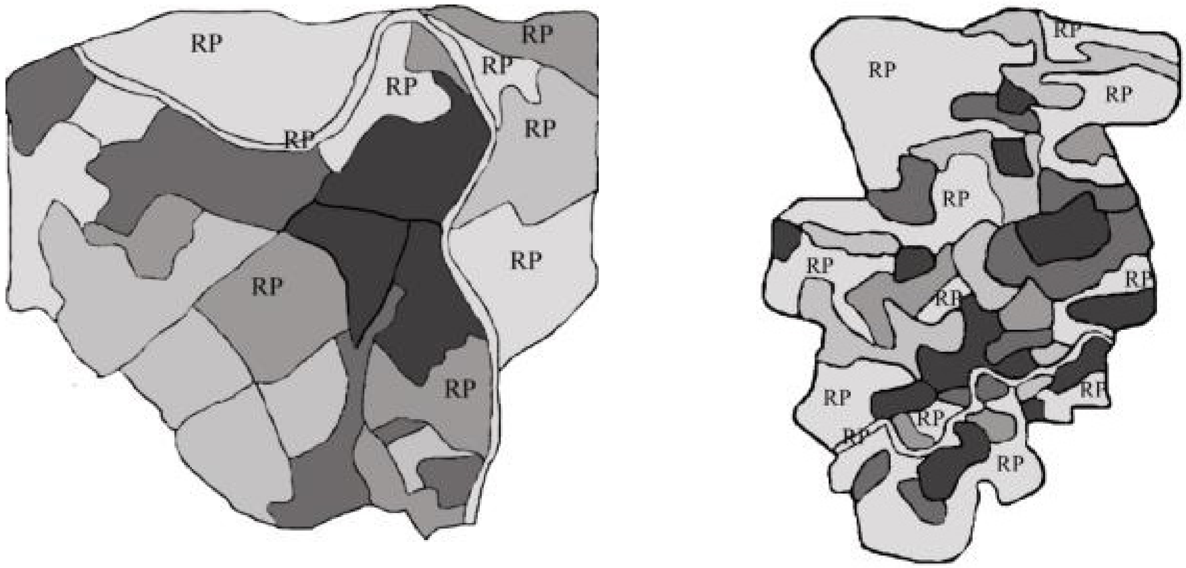
b) Brzesko

No of criteria/types of units	1													2				
	a	b	c	d	e	f	g	h	i	j	k	l	m	a	b	c	d	e
I	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	1
II	3	3	2	3	2	2	3	3	2	2	3	2	2	2	2	2	2	2
III	3	0	2	0	0	0	2	0	2	3	0	0	0	0	0	0	0	0
IV	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2
V	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2
VI	2	2	3	2	2	2	2	2	3	2	3	3	3	2	2	2	2	2
VII	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1
Sum	19	18	16	16	15	15	18	16	18	18	17	16	15	11	11	11	11	10
Category of natural values	A	A	B	B	B	B	A	B	A	A	A	B	A	C	C	C	C	C

No of criteria/types of units	3							4										
	a	b	c	d	e	f	g	a	b	c	d	e	f	g	h	i	j	k
I	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0
II	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1
III	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IV	2	2	2	2	2	2	2	2	2	1	2	1	2	1	1	2	2	2
V	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
VI	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1
VII	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sum	9	8	8	10	8	9	9	5	5	4	5	4	5	4	4	5	5	5
Category of natural values	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D

* I – diversity of green areas, II – degree of naturalness of vegetation III – water elements occurring, IV – active biological surface, V – density of built-up areas VI – number of ecological connections VII – size of afforestration areas

Categorization of spatial-landscape units: A – areas with very high natural values (from 17 to 21 points); B – areas with high natural values (from 12 to 16 points); C – areas with medium natural values (from 7 to 11 points); D – areas with low natural values (<6 points)



A – Nitra B – Brzesko

■ **Figure 3:** Areas with the highest potential for recreation (RP) in Nitra and Brzesko (scheme)
RP – areas with the recreational potential (spatial-landscape units with very high and high natural values)

4 Conclusions

The main benefit of the research for both towns was distinguishing the areas with high potential for recreation using the proper method of nature evaluation (Figure 3).

Benefits for the future: developing a model for shaping the natural system of Slovak and Polish towns for recreational purposes. It is planned to continue these researches in other towns in order to cooperate with local governments of the towns.

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