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REVIEW ARTICLES AND REPORTS

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THE ICONIC MODEL OF LANDSCAPE AESTHETIC VALUE

1. INTRODUCTION

Currently, the tools of modern information technology (e.g. Geographic Information System) give the possibility to create and analyse various kinds of models in written form, presentations or maps. The user can provide information about, for example, the division of geodetic ground and bicycle or tourist routes. They enable orientation in 3-D space of different districts or seeing the city altitude model on the layer of the city map. The basis for evaluation of existing spatial structures and for making decisions on development is a constant stream of data. Interruptions in access to data as well as incompleteness or low quality of data result in suboptimal evaluations and developmental decisions, which, in consequence, involves higher costs. Therefore, it is essential to secure constant creation and maintenance of databases, which are of fundamental importance for the functionality of GIS.

The aim of this research is to enrich GIS with an iconic model of landscape aesthetic value on the example of Olsztyn city. It is made by gathering, systematising and processing geodata that relate to city landscape aesthetics.

The aim is realised, among others, by determination of the way in which data is gathered to create an iconic model of landscape aesthetic value, and by using the methods of landscape evaluation and cartographic visualisations of the data gathered for GIS.

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2. SUBJECT MATTER AND BASIC SCOPE OF THE TASK

Olsztyn city is an industrial, educational and cultural centre of Warmia and Masuria. To a large extent, it functions as a recreational and tourist centre as well. The potential of the city brings the necessity to develop the latter. It is impossible to plan the optimal development without having proper geodata. Also, it is necessary to search for proper tools that allow tourism and recreation to be developed in Olsztyn. This article is an answer to those challenges.

The conducted research applies to areas within administrative limits of Olsztyn in 2008. The graphical landscape documentation of the city was made between April and June 2008, and it was the basis for further research. Thematic layers and the data of the EwMapa programme were used in the research, whereas the coordinates of the viewpoints for aesthetic landscape evaluation were determined by GPS. The visual maps and the ortophotomap of Olsztyn were additional sources of information.

In order to gather data for the analysis of Olsztyn landscape aesthetic values, a grid of basic valuation units was placed on the researched area (figure 2).

The choice of a basic evaluation unit is an important element in the process of evaluation and valorisation of space. Three basic ways of determining the shape and size of basic evaluation units can be distinguished (Bajerowski *et al*., 2007):

− determining basic evaluation units as natural units of surface (facies, physiotopes, ecotopes) acknowledged as homogeneous;

− determining administrative evaluation units, i.e. units with borders that are artificial and that coincide with the administrative division of a given area;

− determining artificial (geometrical) basic evaluation units of equal shape and size that are placed evenly and randomly on a map of a given area. The units may take shapes of squares, hexagons, triangles etc. (figure 1).

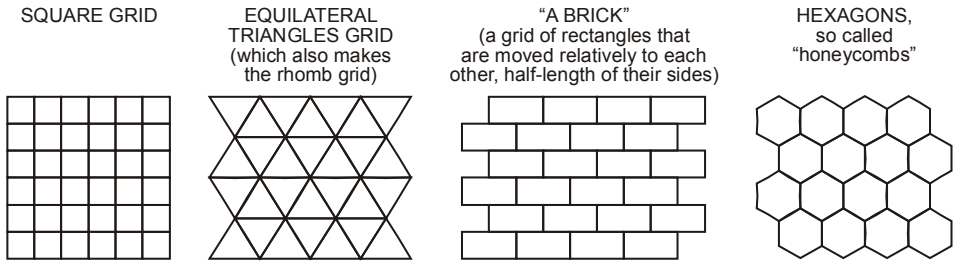

Fig. 1. Examples of geometrical shapes of basic units
Sources: authors' study on the basis of Senetra and Cieślak (2004)

The choice of the way in which basic evaluation units and their sizes are determined depends mostly on the aim of the evaluation and the researched area. The units consistent with the administrative division are mostly used in the research,

which is based on statistical information gathered in specified administrative units. In such a case it is easy to gather and process specified information. The problem lies in different sizes of the units, which make their surfaces incomparable, and in the changes of administrative borders of the units in time. The units based on natural borders ensure objectivity of the results, however, the results are difficult to compare. Moreover, it is not easy to adjust the methods of data gathering and processing (Bajerowski *et al.*, 2007 cited in Kowalczyk, 2009).

Geometric (regular) basic evaluation units are used in valorisation research (Senetra and Cieślak, 2004). While crossing their borders, the units do not coincide with statistical, administrative or natural units. The usage of these units makes it possible to compare them. It allows for convenient cartographic study (calculation of numerical values for given units), as well as convenient computer processing. Cartographic methods enable the construction of isarithmic maps that define the range of the researched phenomenon (Bajerowski *et al.*, 2007).

In the case of aesthetic evaluation of landscape, a regular grid is the most proper. It eliminates problems of interpolation, because the interpolar axes that link points of references do not cross and do not make squares. The vagueness of the borderlines of separate landscape zones makes it pointless to mark them precisely on the map; therefore, it eliminates the necessity of marking the grid for the second time. For the need of this study, a regular grid (bricks with 250-meter sides) has been used, which gives a basic valuation unit of 62,500 m^2. Overall, 1,533 basic valuation units have been marked (figure 2).

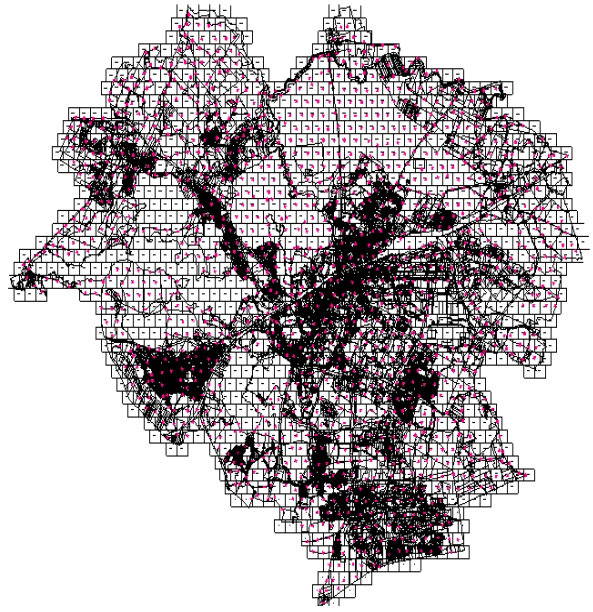

Fig. 2. A grid of basic evaluation units placed on the research area – Olsztyn city
Sources: authors' study

3. THE QUALITATIVE ANALYSIS OF OLSZYN LANDSCAPE

Aesthetically, landscape is the expression of environmental conditions, and as such, it is the basic criterion for the evaluation done both by a tourist – the exploring person, and the inhabitant of a given place. Their evaluation influences the aesthetic value ascribed to a landscape. Consequently, it decides whether a given place is eagerly visited, and if it measures up to aesthetical expectations.

For the purpose of Olsztyn landscape evaluation, 1,336 photographs have been taken. The photographs have been used for several reasons: quick recording, the possibility of instant assessment of their technical value and, if necessary, retaking the photos. Additionally, they enable a reliable (objective) evaluation of image (landscape). The photographer tried to capture the whole area of a specific basic unit to make the photo represent the area as accurately as possible. All pictures were taken in the same season, with similar weather conditions. After choosing the specific place of a given evaluation field, the photo of the landscape was taken with a digital camera and the evaluation unit was marked on the analogue map (in accordance with the number of the photo on the memory card). After that, the landscape valuation card (table 1) was filled in. The city landscape evaluation card is a logical complement of the evaluation. It assesses the condition of, inter alia, the elements of the atmosphere of a given place (such as noise, smell and aesthetics). Initially, the photos were appraised from a technical perspective. Subsequently, the photos were segregated according to the numbering of the basic units. Finally, 1,336 photos have been appraised.

Table 1. A completed city landscape evaluation card
(the assessment scale of particular elements – 5)

No.	The elements of the assessment of unit no. 582	Score
1	Aesthetics	0
2	Land development	0
3	Communication routes	3
4	Smell	0
5	Noise	0
6	Litter	3
7	Flora	3
8	Signs of vandalism	0
	Σ	9

Source: authors' study.

While assessing the photographs, their technical quality or the weather at the time they had been taken were not taken into consideration. Comparing the photographs, the attractiveness of a place was determined depending on the willingness to stay there (e.g. for tourism or leisure). The photographs have been assessed using the method of direct comparison by Bajerowski *et al.* (2007), as the modified impressions curve method. It was based on comparing each and every photo on a specially designed diagram, which had a form of a matrix (figure 3). In this method, for the purpose of the study, the collection of photos has been used as a space-time route.

The assessment of the photographs was conducted in several stages in the Selektor programme. Because of a very large number of photographs, they were grouped into thematically organised files (e.g. apartment blocks, family houses etc.). This operation was inevitable, as working with a single file (containing all photographs) would take much time; besides, the flaws of the programme eliminate such an option.

The next stage was to create a file of representative photographs, containing each photo from the remaining thematic files, and to carry out the evaluation in the Selektor programme. The third stage consisted of the assessment of the thematic files. An example of the landscape evaluation matrix is presented in figure 3.

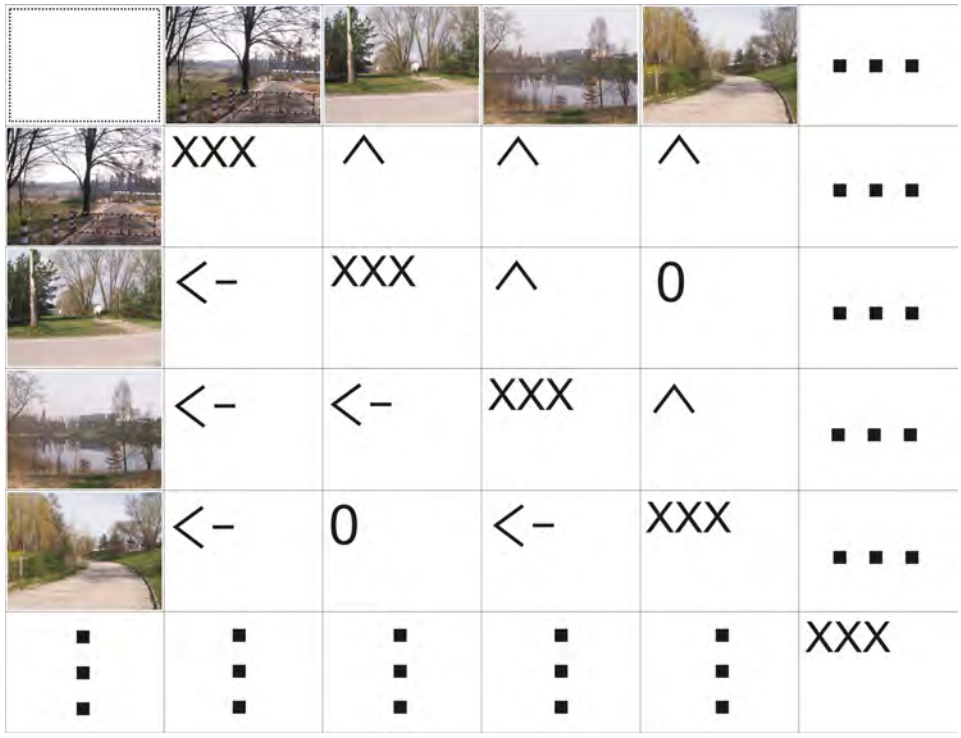

Fig. 3. Example of the landscape evaluation matrix
Sources: authors' study on the basis of Bajerowski (2000)

After each session the statistics were written in the Excel programme. As a consequence, matrixes of comparison with the statistics have been created. In the next stage, a list of the most and the least attractive places was made, and the score obtained during the evaluation was put in order in the Selektor programme. This set of points was used to work out the iconic model of the landscape aesthetic value. Additionally, it offered valuable information about the condition of landscape and its structure in the researched area.

Figures 4a and 4b present landscapes of the highest aesthetic value.

4a

4b

Fig. 4a–4b. Landscapes of the highest aesthetic value in the researched area of Olsztyn
Sources: photographs by A. Kowalczyk 2008

4. GRAPHICAL MODEL OF LANDSCAPE AESTHETIC VALUE

The choice of places that were about to be photographed and assessed was made during the visit in a given area.

The setting of the interpolar axis and the making of the interpolation (i.e. indicating the location of a chosen indirect value among two values of the reference points) were made in the 'Surfer 8' programme.

The inverse-square weighting method has been used for the study of the numerical model of landscape aesthetics of Olsztyn city. In the data obtained with this method, the mean mistake of the interpolation was the smallest (minimum 30.30, maximum 75.60). A mean mistake of a similar size appeared in the nearest neighbour method as well.

The iconic model of landscape aesthetics of Olsztyn city is shown in figure 5.

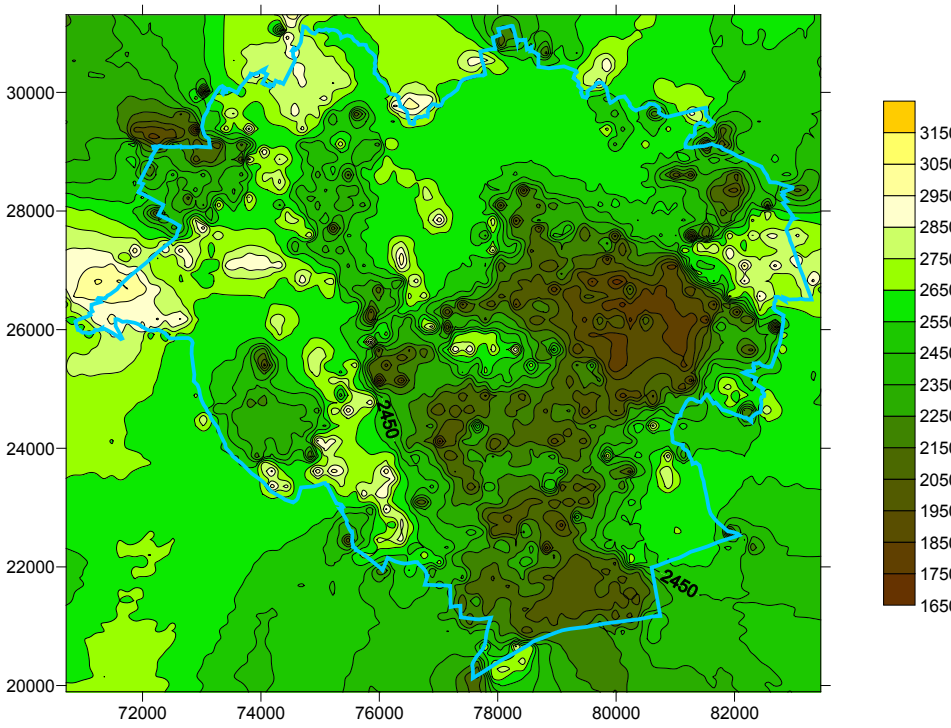

Fig. 5. Iconic model (of the actual isarithms – ViewLines) of Olsztyn landscape aesthetic values created in the 'Surfer8' programme. Interpolation in the inverse-square weighting method. Visualisation in the contour-map method. The scale of landscape aesthetic value ranges from 1,650 points – the lowest aesthetic value to 3,150 points – the highest aesthetic value
Source: Kowalczyk (2009)

As one can notice in the model, the highest aesthetic values of landscapes cumulate in the north-western and the western parts of the city. Such situation is caused by, inter alia, the presence of large amounts of greenery. The most attractive landscapes combine the harmonic presence of trees, lakes, rivers and architecture. The results of the analysis show that the most valuable landscapes are the open ones. The presented model shows the relation between the landscape and the existing architecture. The multi-family buildings close the space, which makes the landscape unattractive. Consequently, the darker colour on the model indicates the areas of intensive housing and industrial development.

5. CONCLUSIONS

As a result of the study, the author has collected, systematised and analysed the geodata of the aesthetic qualities of Olsztyn city landscape. A rich database of Olsztyn landscape values has been created. It consists not only of the results of a given value assessment, but also the photographs of landscapes that have their location coordinates. They can be ascribed to a specific place during the analysis of the landscape interior, and metadata can be added as well. Moreover, the databas includes the urban landscape valuation cards that were completed in the view points where the photos were taken and the location coordinates were registered. The cards consider the elements of the area's atmosphere, such as noise, smell or signs of vandalism. The obtained iconic model of city landscape aesthetic value combined with various thematic layers (e.g. the lie of the land, land development plans, tourist routes or communication) can provide very important information that is essential to further strategic planning of urban development. The collected data and the obtained model are a valuable source of information about:

− the continuity of landscape aesthetic value;
− the relationship between the aesthetic value and the estate price in the city;
− the need for protection of given landscapes in the city;
− the need for changes in specific landscapes and the places where they should be implemented;
− how tourist routes or educational trails should be planned so that they run through the places in the city that are unique;
− how to plan the space so as not to damage any valuable view points.

The created model should be an essential element in the process of analysis of various spatial relations and aspects of spatial development of the city. Therefore, it is a valuable source of information and it should be used for landscape information management in the process of spatial planning that promotes a fresh outlook on landscape values of cities.

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