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AESTHETIC ASSESSMENT OF A MAN-MADE LANDSCAPE: THE PÉCS URBAN AREA, HUNGARY

ABSTRACT: GYENIZSE P., NAGYVÁRADI L., PIRKHOFFER E. & RONCZYK, L., *Aesthetic assessment of a man-made landscape: the Pécs urban area, Hungary*. (IT ISSN 1724-4757, 2007).

Subjectivity is a major problem in the assessment of landscape visual qualities, especially in built up areas. This paper field-tests a quantitative method for visual quality assessment which is based on social survey results, used to define a weighted visual quality scale, which is then calculated and cumulated for each pixel covering land deemed visible from a particular lookout point and converted into map format through a GIS system. This case study of the visual quality in the neighbourhoods of the city of Pécs suggested a north to south decline in the visual quality the the urban landscape. However, different modes of calculation produce widely different results and the approach awaits both refinement and ground-truthing.

KEY WORDS: Aesthetic value, Urban landscape, Visual preference, GIS, Pécs (Hungary).

INTRODUCTION

Many methods are available for land evaluation for a wide range and these techniques have been applied to a wide range of socioeconomic purposes both within and outside Hungary (Leser, 1976, 1986; Drdoš & *alii*, 1980; Mezősi, 1982; Douglas, 1983; Owens, 1991; Lóczy & Szalai, 1995, 1999; Lóczy & Tózsa, 1982; Nagyváradi 1993, 1998; Gyenizse, 2003). Environmental evaluation and mapping technologies are also developing rapidly (Pécsi & Rétvári, 1981; Csorba 1989; Wilhelm, 1995; Pietrzak, 1998; Elekes, 1999; Lóczy & Kopári, 2001; Ronczyk & Wilhelm, 2006).

However, progress is being impeded by the problem of subjectivity, which derives from the inclusion of factors that are not readily quantifiable (Lóczy, 1989, 2002). Visual obstruction, a primary component of visual quality (aesthetic or scenic value) of the landscape, is a good example. Its influence on socioeconomic life may be indirect but its significance is undeniable. It is also important to the concept of landscape. In many European languages, landscape is defined as the view from a single lookout point (Keisteri, 1990; Lóczy, 2002).

Several methods have been elaborated for the analysis of the visual landscape quality, which include techniques for the quantitative assessment of photographs, sociological survey of public opinion and ecological investigations (Mezősi, 1991). However, the emergence of Geographical Information Systems technologies and their application in land evaluation has brought about fundamental changes in methodology and approach.

OBJECTIVES

This paper explores a technique based on the analysis of remote sensing imagery and data processing in a GIS, which is applied to the assessment of the aesthetic value in a mixed landscape. The goal of the investigation was the production of an automated output map that shows the relative values of urban neighbourhoods through rating the visual quality of the view opening up from their characteristic lookout points. The contrasts with much earlier work that addresses individual landscape elements or aims to distinguish between valuable and valueless visual objects.

The study area is the county city of Pécs and its region, a major urban area in SW-Hungary. This city has grown up, equally, on parts of the dissected southern slopes of Mecsek Mountains and the swampy foreland of the Pécs Basin to the south. The city exhibits a wide range of built-up areas and, its environs, a great variety of land use forms.

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AESTHETIC VALUE BASED ON VISUAL PREFERENCE ANALYSIS

Visual landscape quality is a highly elusive value and not easily quantifiable. A pleasant view and a broad panorama may have a positive psychological influence on individuals. However, the extent of visibility itself does not automatically mean high visual quality. A vista dominated by industrial plants or waste piles in urgent need of reclamation is not, usually, considered positively. However, the issue of what actually constitutes high visual quality is much affected by fashion and culture. This quality is not inherent in the landscape but belongs to the observer, who forms their own subjective picture (Muir, 1999). However, the cumulative scoring of opinions from a wide range of respondents can be used to create a more objective and quantified consensus rating of visual quality.

In the autumn of 2005 a series of photographic slides were created showing different areas of Pécs (with various degrees of building density) and the encircling agricultural lands. A set of 31 slides was selected representing all aspects of the study area: recently built high-rise prefabricated blocks of flats; brick blocks constructed earlier; now popular residential parks and terraces; old houses in the city centre as well as forests, meadows and arable fields. The slides were shown to 58 students in the first year at the University of Pécs, who were asked to rate the quality of the view on a range from 1 (best) to 5 (worst). Calculating the number of votes multiplied by the score value gives a theoretical range of scores from 178 to 870, which is too great for GIS analysis, so the scores were related to the possible maximum, 178 (i.e. best score from all 58 respondents) and weighting factors established (table 1).

The residential areas and other environmental types thus assessed were mapped by analogue and digital techniques. Homogeneous units were delimited partly based on personal experience and fieldwork and partly using the orthophoto atlas of Pécs of 1 m resolution (Székely, 2001). The resulting map of land use and housing types is shown as fig. 1.

TABLE 1 - Weighted visual quality scores of neighbourhoods and rural areas of various type (by P. Gyenizse)

	type of area in view	weight
1.	new prefabricated block of flats	1.7
2.	brick blocks constructed earlier	2.6
3.	residential park and terraces	3.1
4.	historical city centre, middle-class housing	2.4
5.	neglected residential area in need of rehabilitation	1.7
6.	industrial areas, shopping centres	1.6
7.	family homes in higher building density	2.9
8.	zone with summer houses	3.8
9.	major road, railway	1.7
10.	arable, meadow, grassland close to residential area	3.9
11.	forest	3.9

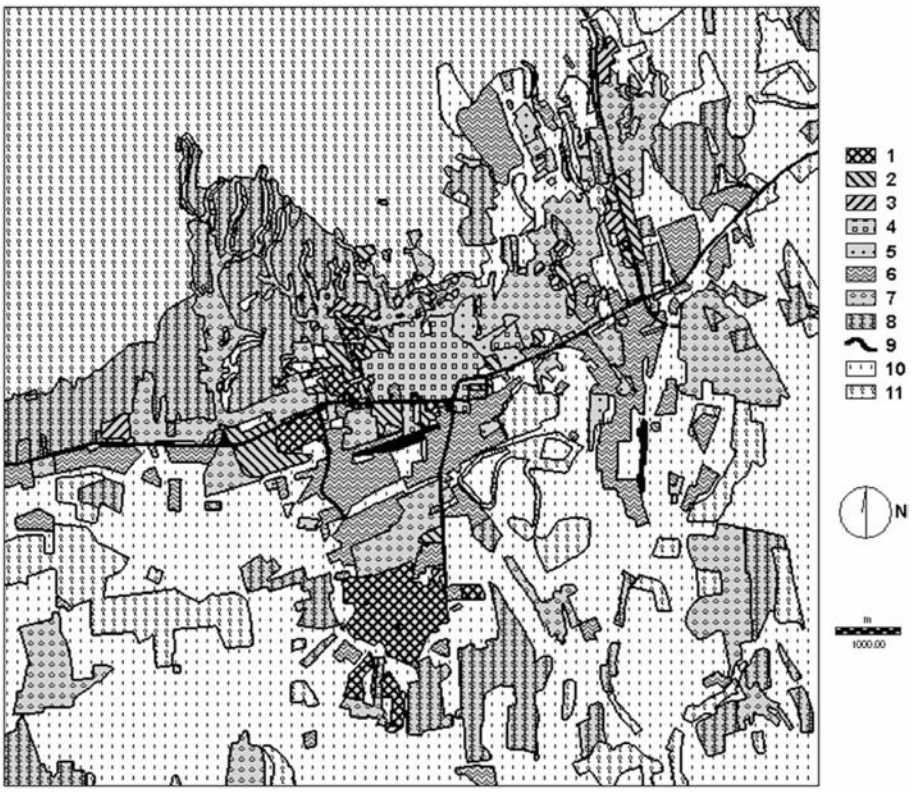

FIG. 1 - Map of units with different housing character in Pécs and its environs (by P. Gyenizse). Legend numbering is the same as in table 1.

After a conversion to grid format the numbered classes of housing were reclassified according to the weighted scores. This layer is already suitable to assess visual quality.

COMPUTING AESTHETIC VALUES BY GIS

These data are converted into a visual quality score by the VIEWSHED module of IDRISI. First, a Digital Elevation Model (DEM) is prepared from the vectorized and interpolated contour lines of the local 1:25,000 scale topographic map. Then, the DEM is converted to a grid format, lookout points are identified and their visibility areas computed. Finally, each of the individual areas is composed in grid format as a separate overlay.

Of course, the selection of suitable lookout points is a critical part of this process. These points have to include the sites that are most frequently visited, places where people spend most time, i.e. within the built-up area of the city, and where the site has a «characteristic» view. Ideally, these lookout points should be located close together. However, using too fine a texture creates a data set that exceeds the computing capacities available. Here, as a compromise, 29 of the most critical viewpoints were selected, more in the more dissected, northern, part of the study area, fewer in the plain to the south. Each lookout point appears in a separate data overlay converted into a grid format.

When the IDRISI VIEWSHED module computes visibility from each lookout point, it creates partial outcome layers where the value 1 marks pixels within sight of the given point and the value 0 those which are not. Using these partial outcome layers as masks in module EXTRACT, the number of pixels in each visual quality class was counted summarized in a spreadsheet then multiplied by the class weighting. The sum for all the visible pixels was cumulated scores each of the 29 individual viewpoints recoded into database format (.dbf), exported to the IDRISI DATABASE WORKSHOP module, linked to the point overlay of vector format and used to generate thematic maps using proportional circles (fig. 2).

RESULTS AND DISCUSSION

Concerning the visual quality of the Pécs landscape, sites with the highest scores were usually located on top of hill ridges with a broad view, while the lowest scores, on the other hand, were typically found on narrow valley floors, where view is restricted. Naturally, the results differ greatly between the hilly northern and flat southern areas. In the foothills, both score and score variability are high, while there are more moderate values in the plains. These findings are better demonstrated visually as a «visual value surface» (fig. 3).

Of course, the mode of quantification biasses the results in favour of sites that offer large fields of vision. The larger field also helps some viewpoint sites overcome the

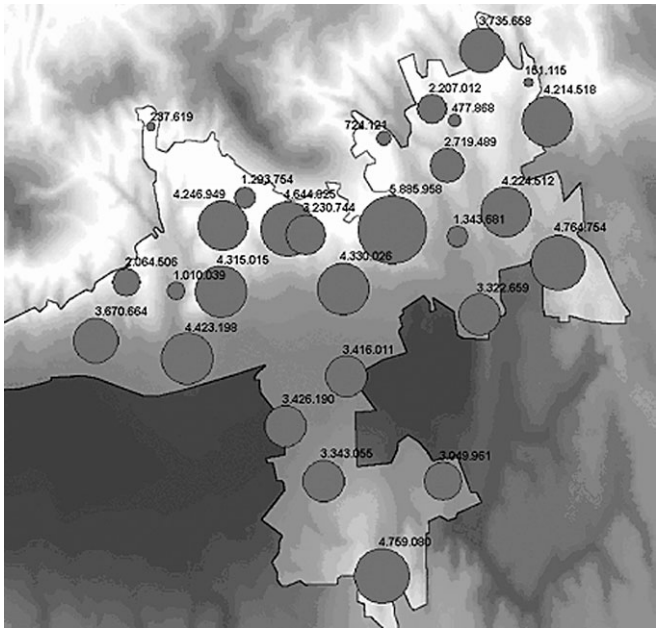

FIG. 2 - Map of total scores for the lookout points (by P. Gyenizse).

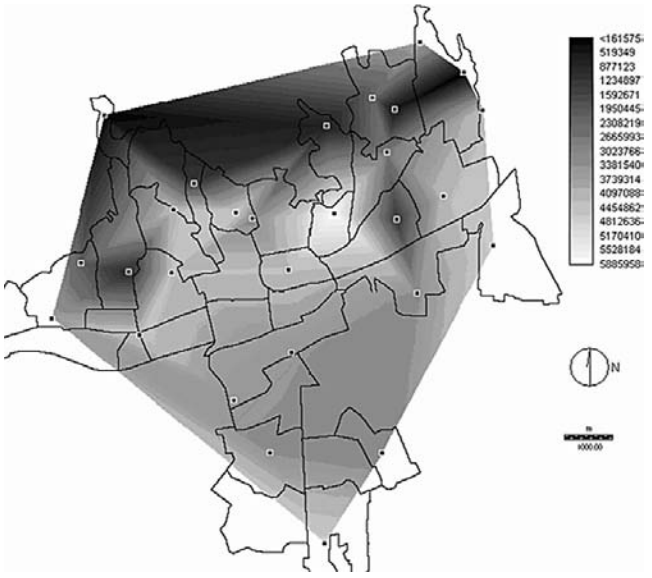

FIG. 3 - TIN surface fitted on lookout points (by P. Gyenizse). Legend shows visual quality scores.

low aesthetic values of their immediate environs or in some part of the whole scene, for example a particular visual blemish such as a rubbish dump. To compensate for this problem, average visual quality scores of the areas visible from the individual lookout points were also computed. The outcome is markedly different. Average visual quality scores are high in sites both on hilltops and on valley floors, indeed, wherever there is a good view of an undisturbed natural area. Low scores are found in areas

where there is little forest and where there is an outlook upon industrial plants. One refinement for this process might be to introduce differential weightings for foreground, mid-ground and background pixels, which are presently treated equally. Another might be to increase in the number of designated lookout points substantially. Equally, expanding the study area may also result in better opportunities for comparative evaluation of the this technique. Meanwhile, the whole exercise could be enhanced by a ground-truthing exercise that required individual observers to rank each designated vista in relative terms and by comparing these findings with those generated mechanically.

CONCLUSION

Built-up areas pose difficulties for aesthetic assessment because public opinions about the visual qualities of anthropogenic elements like high-rise buildings are variable. This paper attempts to create a quantified method for the evaluation of visual quality using a combination of a social survey of local aesthetic values combined with a Geographical Information System. This is applied to a comparative analysis of the visual quality in the neighbourhoods of the city of Pécs and its environs. A questionnaire survey of the perception of visual types was been conducted with first-year university students and a weighting of visual quality derived from their responses. Orthophotos were used to establish building density and delimit neighbourhoods. Visibility from 29 lookout points was computed using the IDRISI VIEWSHED module and the score for each pixel cumulated. The results suggest a north to south decline in the visual quality the urban landscape, which is explained by the setting of the city at the southern feet of Mecsek Mountains.

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