Chapter 2

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Landscape Valorisation Methods and Sustainable Development

1. Introduction

Each spatial system in which two basic values (ecological and economic), are in opposition to each other and are deprived of a conscious or planned activity, will always enter into one of numerous "natural" relations of a predator-prey, competition or parasitism type. Although these relations are well-known in ecology, neither is beneficial for ecological value, and therefore, for the natural environment. Elementary factors to which spatial planning in Poland has been subordinated are natural factors such as environmental (ecological) and anthropogenic (mainly economic).

Both factors, ecological and anthropogenic, are reflected in the landscape and what we observe is a derivative of their proper planning in space. To make a preliminary analysis of the above thesis, one must answer the question whether the results of landscape valorisation within individual methods make it possible to draw conclusions about sustainable development.

2. Landscape

It is assumed that the word 'landscape' (in Polish: *krajobraz*) appeared for the first time in the German literature as a two-word term: *landschaft* (Land – land, schaft – entirety, image). Translation of this term into Polish from German and then an attempt to translate equivalents of the word landscape expressed in other languages (English – *landscape*, Czech – *krajina*, Vietnamese - *cảnh quan*, Spanish – *paisaje*, Lithuanian – *peizažas*, Italian – *paesaggio)* led to various definitions of the term.

Schmithüsen (1949) understands landscape as a complex system of interrelations unifying all forms of the matter. These forms include all levels of human existence, organic and inorganic conditions. This definition perceives landscape as a dynamic phenomenon. It is concise and renders the essence of the reality according to heuristic guidelines, demanding a comprehensive and systematic approach to phenomena. The dynamic character of the landscape can be seen by the fact that a change to one component of the system has a direct or indirect effect on the status of its other components (Przewoźniak 1984).

Armand (1980) defines landscape as a natural complex based on the thesis that its existence is determined by interrelations between at least two components which are defined as parts of the nature of a uniform aggregation composition or the presence (or lack) of life. The areas demonstrating relative uniformity of components are, in fact, landscapes.

For Solon (2003), landscape is a full, though heterogenic entirety, functioning according to the laws of nature, endowed with the ability to self-regulate and revealing certain individual characteristics.

Ostaszewska (2002) presents a landscape as a system of mutually connected natural components, created on and near the Earth's surface. As emphasized by Senetra (2010), this definition emphasizes natural components as abiotic and biotic elements and soils (a bridge between those two groups). This refers to both components in their natural state and those transformed by man. In space characterized by significant anthropopressure, the landscape is made up of elements that are the result of human activity; modifying or determining the status of natural components. The connections between the components can be considered in two ways: statically – as their correct coexistence, or dynamically – as functional dependence. Most definitions intuitively refer to the "comprehensiveness" of nature and processes occurring in it. The divisions into components (elements) of the landscape are avoided (Senetra 2010).

Bajerowski *et al.* (2000) claim that landscape is an external (visual) expression of the current (analysed) condition of the geographical environment, in which the occurring processes create characteristic features determining their kind, condition and type.

An analysis of the presented landscape definitions shows that each of the quoted authors perceives a vertically and horizontally limited section of the geosphere in the notion of landscape. The differences emerge in the composition of landscape elements

We suggest distinguishing the following landscape component elements:

- qualities of the lithosphere (qualities of the relief, geological structure and its peculiarities);
- qualities of the hydrosphere (rivers, streams, lakes, seas);
- qualities of the phytosphere (species structure and ecological character of forests and their availability, size, floristic richness and farmlands);
- qualities of the zoosphere (animal world, where species diversity is the measure, abundance with game or its lack);
- qualities of the anthroposphere (urbanized areas in particular).

3. The notion of sustainable development

The notion of sustainable development originates from forestry and it was created by Hans Carl von Carlowitz. Initially, it meant a forest management method consisting in cutting only the number of trees that would allow it to grow back, so that the forest could always be reconstructed.

The concept of sustainability was promoted at the beginning of the 19th century by all German Higher Schools of Forestry. German forestry at that time enjoyed a good reputation all over the world, and consequently, this notion was adopted by many researchers from other European countries. The term was translated into English, in the phrase "Sustained Yield Forestry". The word "sustainable" was later adopted by ecological movements and in the 1980s reintroduced to the political debate. Currently, the definition of sustainable development is not limited only to the domain of forestry (http://www.naukowy.pl/encyklopedia/Zrównoważony_rozwój).

On 1st March 2005, the United Nations proclaimed the Decade of Education for **Sustainable Development**, entrusting UNESCO with the mission of promoting and coordinating activities for integration of principles, values and practices aiming at respecting human dignity, observing biodiversity and protection of the natural environment and resources of the Earth. The aim of implementing those ideas is to support a change of behaviour towards creating space that would be more friendly to man, consisting in: natural integrity (1), economic vitality (2), social activity for needs of current and future generations (3) (Brelik 2010).

After Kozłowski (2005), it can be claimed that two ideas are of crucial importance for proper understanding of what sustainable development is: the concept of basic needs and the idea of limited possibly, particularly as regards the durability of the global ecosystem. The definition combining the above listed notions reads as follows:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and
- the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."

The notion of sustainable development, set forth in Art. 3 point 50 of the Environmental Protection Law Act of 27 April 2001, reads as follows "such social and economic development in which the process of integrating political, economic and social activities occurs, preserving the natural balance and sustainability of basic natural processes, in order to ensure the possibility of satisfying basic needs of individual communities or citizens, of both the present-day and future generations. Sustainable development, thus defined, contains two basic elements, which allows us to construct an appropriate mathematical model. Development means that the value (in a broad meaning) of the modelled phenomenon must grow – the maintenance of the existing, initial, status is not development.

Sustainability means that the factors conditioning the development phenomenon must remain in interrelations (in functional dependency), leading to their stabilisation – balance. The basic factors to which spatial planning is subordinated are natural factors – environmental (ecological) and anthropogenic (mainly economic) factors (Cymerman et al., 2005). The former generate ecological value, and the latter generate the broadly-understood economic value of the planning space. To date, both of them remain (have remained) in mutual opposition: while increasing the ecological value of space, we usually agree to a decrease in its economic value and (much more frequently) by increasing the economic value of space, we reduce its ecological quality.

4. Selected methods of landscape valorisation

In the opinion of Litwin *et al.* (2009), landscape valuation depends on having at one's disposal such information resources to make it possible to regionalize (divide into zones) the area under analysis. A starting point is therefore to make an assessment and valuation of the landscape as well as its regionalization, which will result in determining homogenous areas in terms of landscape values. The aim of zoning imposes the choice of its underlying landscape features. The choice of the zoning variant is not a characteristic of the environment; it depends only on its authors.

In the literature, two trends of landscape perception and assessment prevail. On one hand, landscape is assessed as an inseparable entirety built of multiple components (water, vegetation, topography, infrastructure, buildings, etc.). On the other hand, the assessment is based on an analysis of those components (Senetra 2010). Romiszewski (1983) claims that "assessment of components is insufficient, because with the interrelation of natural phenomena, the entirety does not mean their sum. Separation of natural complexes of various sizes results from systems produced by a combination of overlapping elements of the environment which determines the landscape variety". We apply a different approach to the landscape structure when we analyse the spatial organization, a different one when we are interested in nature functioning, and yet another one when we examine the relations between its elements (Krzymowska-Kostrowicka, 1997).

Bajerowski's value matrix method

This method assumes the use of information included in the map content which is commonly accessible (Bajerowski 1991). This generally means an analysis of topographic maps and land register maps. The aesthetic value of the landscape results from a specific configuration of spatial features. Many of those characteristics can be identified and catalogued using desktop methods: by analysing the content of cartographic materials. The cartographic research method, among its various ways of application, contains a mathematical and statistical map, which consists, e.g. in examining the phenomena with the use of the so-called grids of basic assessment squares to collect information. Each basic square can be assigned a number determining the aesthetic value of the landscape resulting from the above-mentioned configuration of spatial features occurring in the area covered by this basic field. The application of the grid of basic squares on the map of the examined area, enables, in effect, construction of an isarithmic map illustrating the intensity of a given phenomenon. It can be assumed that this value is inversely proportional to the degree of landscape devastation (Litwin *et al.* 2009).

Wejchert's impression curve method

The bonitation method described by Wejchert was adjusted to the assessment of open landscape. This is a graphical presentation of the impressions of the observer moving through a space-time sequence. The observer records images at time intervals, related to the route arrangement (Senetra and Cieślak, 2004). Despite subjective experiences and assessments of spatial arrangements by various observers, it can be assumed that there is a clear group similarly responding to the images seen, and the graph showing deviation from the average reaction will be similar to the normal distribution curve. No unit of measure can be determined for the impression curve. This is only a means used for comparing individual fragments of space. Therefore, graphical representation of the tension of impressions and emotional experiences which occur during the movement along the space-time sequence is only a conventional and relative comparison of the effect of subsequent images (Litwin *et al.* 2009). The attraction assessment of individual sites applies the methodological principles included in Table 1.

The bonitation value of landscape ranges from 0 to 12. The scale is proportionally divided into three categories of landscape attraction:
I category (9–12) – attractive;
II category (5–8) – of average attraction;
III category (0–4) –unattractive.

Direct comparison method

An observer assessing the landscape marks on a diagram the points at which, in his opinion, the landscape was of less, more or a similar value as compared to the current observation point. This is a comparison of object pairs in all possible combinations ("each with each"). This eliminates the difficulty in describing the value of the landscape on an arbitrarily adopted scale. A mathematical analysis of observation results makes the assessment possible (Bajerowski, Sanetra and Szczepańska, 2000).

In case of ten-site itineraries (n = 10), the total score for the diagram is 90. The bonitation value of the landscape at a given site ranges from 0 (a site that is less valuable than all the others) to 18 points (a site that is more valuable than all the others). As in Wejchert's impression curve method, a scale is proportionally divided into three categories of landscape attraction:
I category (13-18) – attractive;
II category (6-12) - of average attraction;

III category (0-5) – unattractive (Senetra 2010).

Table 1

Criteria for assessing aesthetic values of rural landscape

Score	Landscape assessment parameters			
	Biodiversity level	Devastation level	Saturation with infrastructure	Harmony of composition
1	2	3	4	5
0	monotonous, uniform	over 50% of devastated area	infrastructure elements within sight occupy more than 50% of the view	no harmony
1	monotonous with single enlivening elements	destroyed elements occupy 10–50%	single elements of infrastructure, which occupy 10-50% of the area within sight	some elements make a good composition, while others do not, e.g. elements fit into the relief, no composition with the plant cover
2	great variety in landscape; many single trees, bush clusters	destroyed areas occupy less than 10%	single elements of infrastructure within sight occupy less than 10% of the view	a larger share of elements make a good composition, only single ones require repair
3	the greatest variety in landscape; many single trees, bush clusters	landscape is not devastated	no infrastructure	all elements make good composition; infrastructure incorporated into the relief and plant cover

Source: Cymerman et al. (1988)

The WIT-Litwin method

The WIT indicator is determined for three basic functions: agricultural, non-agricultural and recreation. This indicator assesses the "value" of each of the distinguished areas (villages) and types of activity, taking into consideration an adopted set of features. A proper choice of features underlies the accurate calculation of the "values" of the landscape. WIT indicators calculated on the basis of the features will also make it possible to answer questions about the universality of applying an identical initial set for various landscapes in Poland.

For each of the areas under consideration, WIT was determined as the sum:

$$WITa = a_1 z_1 x_1 + a_2 z_2 x_2 + a_n z_n x_n \quad (1)$$

where:
$x_1 ... x_n$ - a set of standardized features of areas,
$a_1 … a_n$ - a set of "profitability" weights determined on the basis of the experts' test,
$z_1 … z_n$ – "significance" factors determining the importance of individual features.

Each of the features is assigned a weight, specifying its effect on usefulness of the area for particular economic functions and a factor determining the "significance" of a given feature with reference to other features (a profitable feature ... an unprofitable feature) and degree of its "significance" (significant feature ... insignificant feature) (Litwin 2004).

"Profitability" of a feature means a positive/negative effect of a given feature on the usefulness of the area under consideration for a certain activity (e.g. a high quality assessment of soil is, obviously, a profitable feature for farming activity). "Significance" is the importance of a feature for a specific activity in the examined area for the area potential (e.g. although a large number of relatively new buildings within the village is a profitable feature, yet it is not as important for agricultural use as medium quality class of soil in this village).

"Profitability" weights can be determined through an expert test in which specialists in spatial development, environmental protection, agriculture and non-agriculture activity complete a questionnaire covering all features (Litwin 1997).

5. Conclusions

It is a certain paradox that in spite of an increasing number of publications concerning sustainable development, as well as generally understood development processes, there are no satisfactory answers to the question concerning the possibility of assessing sustainable development.

Sustainable development means the coexistence of two elements: development and sustainability. The development of a given space is related to changes which do not disturb the balance. If we assume that space includes anthropogenic and biological elements, we should remember during the development process about maintaining the balance between those elements. A lack of changes is the domain of stagnation and not development.

As Brelik (2010) rightly claimed, the concept based on the idea of "sustainable development" focused in its initial stadium on ecological threats, to finally assume that the aim of sustainable development should be to increase the well-being of the society, perceived not only from the perspective of consumption, but also of ecological living conditions. Sadowski (2006) observes that the modern market economy should combine features of the free market which triggers self-regulation tendencies with conscious activities, on the scale of individual states and internationally, to weaken the self-destructive tendencies as a consequence of increasing ecological and social threats.

It can be observed that the methods of landscape valorisation are consistent in regard to landscape assessment factors. All methods place particular emphasis on the occurrence of biotic elements in the landscape, while the occurrence of anthropogenic elements lowers the assessment result. A significant difference between methods consists in the method of obtaining data for the analysis. In the case of Bajerowski's method it is a map background, while the direct comparison method involves the application of landscape images (pictures), and the other two methods, i.e. the Wejchert and WIT-Litwin methods use both (above-mentioned) data sources about the landscape.

As for the question of whether the results of landscape valorisation within individual methods can determine the degree of sustainable development, it should be stated that the assessment of one of two (ecological) values of space through landscape valorisation with the use of the described methods can only partially refer to principles of sustainability, which includes the sustainable development of anthropogenic and biotic elements. With the methods presented above, we cannot directly determine the development rate of anthropogenic elements. One of the attempts to assess sustainable development is to reach average (desirable) values of landscape valorisation, with the assumption that biotic elements increase the landscape value, while the anthropogenic components reduce it. Such interpretation of results can lead to wrong conclusions, since a low assessment score can result from the monotony of the landscape evaluated and not from the occurrence of anthropogenic elements.

Adaptation of landscape valorisation methods to draw conclusions about sustainability requires the introduction of changes in the unit scoring system and in the weighting system within individual methods.

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