



Index of Landscape Disharmony (ILDH) as a new tool combining the aesthetic and ecological approach to landscape assessment



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ABSTRACT

The term “landscape harmony” (LH) is relatively rarely used in literature. Semantically similar expressions, such as landscape coherence, unity, or sparse integrity are used more frequently. The LH index has been applied in the scope of the following concepts: (1) scenic beauty analysis, where LH describes the characteristic of perceived landscape; and (2) the ecological aspect, where LH refers to the mutual relationship between various abiotic and biotic landscape components. The objective of this paper is to introduce a new quantitative index describing LH combining both of the concepts. The basis for the index development is the assumption that landscape is harmonious by nature, both from the visual and ecological point of view. Therefore, any indicator attempting to reflect landscape harmony in fact measures the level of its disharmony. That is why the manuscript presents the Index of Landscape Disharmony (ILDH) measuring the impact of different factors (elements) affecting the unity of landscape. The index ranged from 0 to 3 (ILDH = 0 means fully harmonious landscape and ILDH = 3 means extremely disharmonious landscape). It involves the following three variables: (1) land type; (2) shape of objects; and (3) form and colour harmony. The index was applied in relation to 24 test areas representing different types of landscape scenes. The study results showed that the level of anthropogenic transformation does not have to negatively affect landscape harmony. Its impact depends on the coherence with landscape type and quality of man-made objects. The study also shows that LH, even if an indicator is applied, cannot be fully presented in an objective manner. The novelty of the research derives from the fact that this is the first index to be introduced combining aesthetic and ecological assessment of LH, possible to be calculated for natural, rural, and built up areas.

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1. Introduction

1.1. Concept of landscape harmony

The term “landscape harmony” (LH) is relatively rarely used in the literature. Semantically similar expressions such as landscape coherence, unity, or sparse integrity are used more frequently (Appendix A). The majority of studies consider all those expressions analogous. They are not synonymous, although to some extent they reflect the same landscape characteristic. For example, Coeterier (1996) points out that unity differs from coherence in that the latter is an attribute of parts, whereas unity is a new attribute not possessed by such parts.

The analysis of the concept of landscape harmony (or similar constructs) permits distinguishing two general approaches. The first one, used more frequently, is derived from the analysis of

scenic beauty, where landscape harmony refers to a perceived landscape characteristic. It indicates whether individual scene elements seen in a view seem to blend together in time and space into some visual landscape totality (Clay and Smidt, 2004; Krause, 2001) and the landscape is easy to organize and structure (Jagt et al., 2014; Stamps, 2004). Kaplan et al. (1989) emphasised coherence, and Coeterier (1996) unity, as one of the basic qualities of determination of landscape perception and evaluation in different regions. Next to complexity, legibility, and mystery, coherence is often applied as one of the four predictors of visual landscape preferences. Above variables are used to assess scenic beauty by indicating which natural and/or human elements in a scene are crucial to visual harmony. Some authors also claimed that harmony reflects the character of the relationship between anthropogenic and natural elements of landscape, e.g. whether the artificial elements of landscape are concordant with the surrounding landscape (Chen and Wu, 2009; Han et al., 2011). Apart from the detailed definitions, visual landscape harmony is considered to be “the key to place identity”, a characteristic which creates the atmosphere of a given place (Antrop,

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2005; Kim and Kang, 2008). The analysis of scenic beauty is predominantly based on public opinion studies. Some examples of case studies are those conducted by Bulut and Yilmaz (2009), who used harmony as one of variables to assess landscape preferences based on photographs, or by Clay and Smidt (2004), where unity was used to assess scenic quality along roads. Kim and Kang (2008) adopted disharmonious/harmonious as one of practical evaluation adjectives in the aesthetic evaluation of coastal landscape. The level of harmony may also be used to assess the impact of human activities on a given area, such as the construction of new objects, or the implementation of a given policy. An example is the work by Kuo and Chiu (2009), where harmony of natural landscape is used as an indicator for assessing the impact of the agritourism policy. Important part of visual approach to assess landscape harmony constituting the studies focusing on the relationship between colour and aesthetics. The literature, however, provides no general consensus regarding colour harmony, although the negative effect of an object of disharmonious colour on the general perception of a landscape is emphasised by a number of authors (O'Connor, 2010).

In the second approach, harmony is understood in ecological terms. For example, according to Phipps (1984), order in landscape refers to the relationship between soil conditions and land cover. Kuiper (1998) defines coherence as the horizontal relationship between elements such as hydrology, ecology, and structure. According to Tveit et al. (2006), coherence means a reflection of the correspondence between land use and natural conditions in an area. Mander et al. (2010) define coherence as the similarity between soil pattern (potential landscape) and land use intensity (actual landscape). The attempt to combine both of the approaches – aesthetic and ecological – was undertaken by Van Mansvelt et al. (1998) who divided landscape coherence into three groups: vertical (between biodiversity and local abiotic environmental conditions), horizontal (functional and visual), and the coherence of colours and forms. Zhang et al. (2013) similarly specified unity of scene and land use suitability as synonymous to coherence.

There is no agreement of opinion among researchers whether landscape harmony (or a similar concept) can be subject to objective measurement, or it is only a subjective concept. The study conducted by Rosley and Rahman (2013) revealed that coherence is perceived in the same way by different subgroups, and therefore is not affected by demographic factors. This suggests the usefulness of such an indicator for research on aesthetic values. According to Swanwick (2002), harmony is a subjective characteristic of landscape depending on a personal opinion, influenced by certain factors of perception by different senses, such as noisiness or tranquillity. Jagt et al. (2014) also suggests that opinions on landscape harmony may vary for different people. Summarising the considerations on coherence, the author stated that “from an artistic, compositional point of view, the same scene can be judged to ‘hang together’ perfectly well” (p. 3). This suggests the accuracy of the assumption that the majority of people perceive landscape harmony in the same way (to a certain extent).

1.2. Landscape harmony indicators

From the historical point of view, the implementation of landscape indicators are derived from models referring to sustainability (e.g. DEFRA, 2009; International Institute for Sustainable Development, 1999; UNCSD, 2001) and environmental quality (EEA, 2001; OECD, 2003). Over the years, different schemes have been developed, but only some of them included the aspect of aesthetic values of landscape. For example, the scenic values of farmlands are included in the set of indicators elaborated by the European Environment Agency or the European Centre for Nature Conservation. Landscape harmony indicators are also applied to protected areas. For instance, the harmony of forms, colour, and

texture, called “scenic integrity”, is used in the USA to assess the scenic values of protected areas and areas of “outstanding beauty” (USDA, 1995). In USDA, harmony is related to unity. It demonstrates a pleasant arrangement of landscape attributes contributing to the uniqueness of a landscape. Harmony and unity affect the “balance” understood as “a state equilibrium that creates a sense of well-being and permanence” (USDA, p. 51). Harmony consists of pleasing repetitions and figurations of line, form, colour, or texture. In Great Britain, the implementation of Landscape Character Assessment (LCH) allowed to take a more objective approach (Swanwick, 2002). Aesthetic aspects are based on ten variables: scale, enclosure, diversity, texture, form, line, colour, balance, movement, and pattern. Most of them have a great impact on landscape harmony. The LCH suggests that balance and proportion may be judged by relative quantities of different elements within the view, such as a 1/3 to 2/3 relationship. According to the review by Cassatella and Peano (2011), in the traditions of implementation of visual landscape indicators in planning, descriptive parameters have been generally used, such as pattern, texture, and structure (features of land patches). The quantitative approach is relatively rarely applied, and only in relation to selected elements. For example, Moon and Spencer (1994) calculated colour harmony as the result of division of the number of elements of order by the number of elements of complexity. Ding et al. (2014) used the Human-Water Harmony Index to assess the human-water relationship. An attempt to assess harmony as a whole was presented by Han et al. (2011) in reference to a Natural Heritage Site. The index generally reflects the intensity of human activities. It is expressed by the proportion between the harmonious and disharmonious amount, area, or length of artificial landscape type.

In sum, indicators combining aesthetic and ecological concept of landscape harmony hardly exists. The existing ones only refer to a certain landscape type. Moreover, the majority of sets of indices used nowadays involve mostly subjective, descriptive variables. Filling the gap requires, the author set yourself a task to developed an indicator which: (1) combine ecological and visual sphere of LH; (2) is of objective character; (3) can be applied to various landscape types.

2. Material and methods

2.1. Methodological assumptions

The basis for the index development is the assumption that landscape is harmonious by nature, both from the visual and ecological point of view. The former has been proved by many social preferences studies. In non-transformed areas, all components are consistent with landscape type. The latter derives from the fact that the structure of natural landscape has not been disturbed, e.g. it functions in accordance with natural conditions. Therefore, any indicator attempting to reflect landscape harmony in fact measures the level of its disharmony. That is why the manuscript presents the Index of Landscape Disharmony (ILDH) rather than of Landscape Harmony. It attempts to combine a visual and ecological approach of LH assessment and measures the impact of different factors (elements) affecting the unity of landscape.

2.2. Construction of the Index of Landscape Disharmony (ILDH)

The Index of Landscape Disharmony (ILDH) involves three variables: (1) Land Type Disharmony Index (LTDHI); (2) Shape Disharmony Index (SDHI); and (3) Form and Colour Disharmony Index (FCDHI). The structure of used formulas results from: (1) methodological assumptions; (2) the unification of weights: weights of all variables are equal—they range from 0 to 1. The higher

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