



Visual preferences for physical attributes of mining and post-mining landscapes with respect to the sociodemographic characteristics of respondents

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ABSTRACT

Our study presents a method for assessing the visual quality of post-mining landscapes, empowering the residents of these areas, or a wider range of experts, to take part in the design of new landscapes. The goal of this study was to evaluate respondents' visual perception of selected relevant physical attributes of mining and post-mining landscapes and to determine the influence of certain sociodemographic characteristics of the respondents on their visual preferences. Based on a spatial image analysis of ground photographs of landscapes included in a questionnaire determining the respondents' visual preferences, we found that active, non-reclaimed mines contributed fundamentally to a negative evaluation of whole landscape scenes. Built-up areas, another form of human impact on the landscape, did not significantly lower the respondents' ratings for the scenes. The study confirmed a major positive influence of reclamations in post-mining areas, including those in early successional stages. This effect was increased in reclamations containing mature woody communities. The most important sociodemographic factor proved to be the professional field or study focus of the respondents, which significantly influenced their evaluation of most of the selected physical attributes of the landscape. Visual preferences were also significantly affected by the respondents' gender and education.

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1. Introduction

Surface coal mining does not only affect the landscape in which it takes place. Because of its large scale, this industry also leaves traces in adjacent landscapes. Apart from dust and noise pollution, the adjacent landscapes also suffer from negative visual impacts of surface mining and related activities (Simpson, 1979; Ramos and Panagopoulos, 2004).

After the termination of mining activities, it is necessary to mitigate their impacts and to restore the post-mining landscape and all its functions. Reclamation, as a tool for restoring these landscapes, aims not only to restore the geomorphological, hydric and ecological balance of the landscape (Hancock et al., 2003; Hendrychová, 2008), but also to restore or create its aesthetic value (Simpson, 1979; Sklenicka and Kasparova, 2008).

In the Czech Republic, as in most European countries, mining companies are legally required to create a remediation and reclamation plan before they start mining activities. This plan addresses

the landscaping of the area, taking into account its future use. With regard to the multi-functionality of post-mining landscapes, the reclamation project should contain both a land use plan and the requirements for the appearance of the future landscape, based on the needs of the government, the mining companies and the public (Kaplan, 1979a; Dentoni and Massacci, 2007). Accordingly, a survey of the visual preferences of the landscape's inhabitants should be a significant part of the process of creating a project for the reclamation of a post-mining landscape.

1.1. Landscape perception

Humans are better adapted for perceiving visual stimuli than for absorbing other types of information. Visual stimuli are also effective in conjuring associated information (Kaplan and Kaplan, 1989). Landscape scenic beauty can therefore be seen as a significant natural resource, indispensable for a full human life (Denker, 2004).

The mental resources of each individual include an aesthetic stance, i.e. the ability to perceive the environment aesthetically (Zuska, 2001). Just as there are psychological, physical and socio-economic differences between people, there are differences in their visual preferences in landscape perception (Fujita, 2001; Sevenant

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and Antrop, 2010). On the other hand, landscape contains visual values and elements which are generally accepted as aesthetic by the public (Angileri and Toccolini, 1993; Vorel, 1999). This suggests a dual approach to the aesthetic perception of landscape – the sensory approach and the psychological approach (Newby, 1971; Valenta, 2008). The sensory approach is based on the current state of the landscape and of the observer, and is determined by conscious psychological processes. The cognitive approach is affected by the previous cultural and personal experience of the observer, and is based largely on unconscious, phylogenetically determined chains of thought (Jung, 1997; Löw and Michal, 2003). It is because of the effect of these cognitive motives that the visual preferences of people coming from very different environments often prove to coincide (e.g. Webster and Kruglanski, 1994). On the other hand, previous studies have shown that the personal characteristics of the observer or of a whole social group (e.g. their age, education, place of residence and profession) significantly influence visual preferences and the perception of landscape in general (see e.g. Misgav, 2000; Sklenicka and Molnarova, 2010).

1.2. Evaluating the visual quality of landscapes

Approaches to evaluating the visual quality of landscapes vary in their attitude to public participation. The expert approach, where the visual quality of a landscape is assessed by one or more experts, does not take into account the opinion of the public in the evaluation process (Brown and Itami, 1982). On the other hand, the participative approach evaluates the visual qualities of the landscape by means of a study of the visual preferences of the public (Bulut and Yilmaz, 2007; Conrad et al., 2011).

Studies focusing on the visual preferences of the population usually use questionnaires to assess landscape perception (e.g. Simonič, 2003; Roth, 2006). However, they vary in the goal of the research, the sample tested, and the form of the research. Two main types of studies can be differentiated according to the means of determining visual preferences: those that use verbal questions, and those based on visual stimuli. Tahvanainen et al. (2001), who compared these methods, point out a higher impact of prejudice and other background characteristics in studies using verbal questioning. By contrast, assessment through visual stimuli was found to be more accurate.

There are also a range of perceptual visual stimuli. The visual quality of a landscape can be assessed directly on site or it can be assessed indirectly, using static or dynamic presentations of the landscape (Stewart et al., 1984). Visual presentation of landscapes was utilized, e.g. by Oh (1994), who studied preferences on the basis of an evaluation of pictures of virtual landscapes presented on a computer screen. Morgan and Williams (1999) evaluate perceptions on the basis of video panoramas of landscapes, and Van den Berg and Koole (2006) and Simonič (2003) use photographs of landscapes in digital or printed form. Photographs of landscape are the most frequently used perceptual stimulus, and many studies have shown that photographs are a valid and adequate stimulus for aesthetic evaluation of a landscape (e.g. Shuttleworth, 1980; Palmer and Hoffman, 2001). On the other hand, some authors consider the use of landscape photographs to be inadequate (e.g. Zube et al., 1974; Kroh and Gimblett, 1992).

Since the end of the 20th century, the use of the Internet has been on the increase, both in experimental research and in research on the visual quality of the landscape. Bishop (1997) has shown that the Internet can provide a convenient medium for undertaking experiments in perception studies. Wherett (1999) notes that use of the Internet in perception studies causes significant difficulties, especially by limiting the sample of respondents to people

who can access the Internet. The sample composition also often becomes less predictable and balanced. On the other hand, use of the Internet brings many advantages, e.g. accessibility of the research to the broader public, connected with a higher level of research transparency, as well as a wide sample of respondents with a broad span of demographic characteristics (Reips, 2002; Roth, 2006). Moreover, Lindhjem and Navrud (2011), who compared Internet-based surveys with face-to-face interviews, found that the preferences established by these two methods were similar. Roth (2006) concludes that the scenic quality categories of visual beauty, naturalness and also overall scenic quality can be validly recorded on the Internet.

A number of studies using photographs to evaluate visual preferences undertake an analysis of selected elements directly in the landscape, or on maps or aerial photographs. These studies use photographs only as a representation of a previously analyzed landscape (e.g. De la Fuente De Val et al., 2006). Only a few studies have evaluated landscape elements directly in photographs (e.g. Arriaza et al., 2004).

Evaluations of visual preferences in mining and post-mining landscapes with the aid of photographs are rarely found in the literature – so far, this approach has only been utilized by Sklenicka and Molnarova (2010) in a study of habitat types used in reclamation.

1.3. Attributes affecting visual landscape preferences

Landscape attributes that create the landscape scene can be identified and used in the assessment of visual landscape preferences (Strumse, 1994; Cañas et al., 2009). Although many studies have focused on preferences for various landscape attributes, it is not easy to decide which attributes affect landscape preferences and how significant each attribute is in determining the overall landscape perception (Williams et al., 2007). The character and the presence of landscape attributes in the landscape scene are to a high degree determined by the type of landscape in which the assessed landscape scene is situated (Bulut and Yilmaz, 2007).

Several studies have focused on physical elements and on their role in the assessment of visual qualities of the landscape. Ulrich (1986) and Misgav (2000) emphasize the positive influence of vegetation, especially of woody plants, on the visual perception of landscapes. The presence of a water feature has also been shown to have a positive influence (Bergen et al., 1995; Arriaza et al., 2004; Bulut and Yilmaz, 2007), as well as distinctive topography or the presence of mountains (Hammit et al., 1994; Bulut and Yilmaz, 2007). According to Van den Berg and Koole (2006), natural settings are preferred to managed settings. The presence of wilderness features in the landscape is also valued, especially in agricultural landscapes (Arriaza et al., 2004). The important role of the degree of human influence on visual preferences was also confirmed by Van den Berg et al. (2006). Man-made elements such as objects of vernacular architecture, vistas, etc., are evaluated positively (Arriaza et al., 2004), while, e.g. urban and suburban development, industrial areas and roads tend to be perceived negatively (Strumse, 1994; Purcell et al., 1994).

Visual preferences are influenced not only by the presence of natural elements in the landscape, but also by their configuration, especially by the diversity and richness of these elements, by contrasts in their color and form, and by their spatial structure (De la Fuente De Val et al., 2006; Tveit et al., 2006). According to Hands and Brown (2002), respondents prefer higher color contrast, as well as higher contrast in the form and diversity of landscape elements (Cañas et al., 2009).

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