Environmental Interaction Elements in the Post-Mining Landscape of the Karviná District (Czech Republic) †

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Abstract: One of the actual environmental problems of the Karviná District is the loss of 'memory of place' among local inhabitants and the generally accepted preconception that the mining landscape of the Karviná District has 'nothing to offer'. Our article aims to present possible tools and methods that could contribute to solving this problem. One of them may be the elements of environmental interaction.

Keywords: post-mining landscape elements; environmental competence; environmental management; environmental interaction landscape elements

1. Introduction

The northern part of the Karviná District, especially between the cities of Orlová, Karviná and the municipality of Horní Suchá, has the character of a traditional post-mining landscape (P-ML). The Karviná District is located in the Moravian–Silesian Region (Czech Republic). This area is a part of the Upper Silesian Coal Basin, a smaller part of which, located in the Czech Republic, is called the Ostrava–Karviná Coal Basin [1–4]. Deep coal mining has been ongoing here for more than two centuries and the effects have had the greatest impact on the landscape in the Czech Republic [1,5]. Mining has thus imprinted itself indelibly on the landscape and is still perceived by the public in a controversial way [5].

The mining itself not only affected the natural components of the landscape, but also caused sudden changes in the number and composition of the population [6]. To illustrate, the original agricultural village of 'Karvinná', which had 3386 inhabitants in 1870, became a modern industrial town of 22,317 inhabitants in 1930 [6]. The 'original Karvinná' is practically non-existent today (the city centre has been moved and most of the original buildings have disappeared) [7]. The last remnant is only the urban district of Karviná–Doly, where only twenty permanent inhabitants live these days (according to the 2021 census) [6,8].

The Karviná District still faces several environmental problems, such as air pollution, soil contamination or the impact of deep mining on the hydrological regime [2,5,9,10]. This is also associated with social and economic problems, and not only in connection with the closing of coal mines (since 1990) [3,9,11]. One of the current environmental problems in the Karviná District, which is still only partially reflected, is the loss of 'local memory' among the inhabitants [12]. Our article aims to present the possible tools and methods for environmental management that could contribute to solving this problem.

2. Background

The P-ML can be defined as a landscape in which significant changes in relief caused by subsidence and spoil tips have been induced by the extraction of minerals from the earth's crust, and in which there are landscape elements of which the formation was conditioned by mining activities (mining towers, tailings dams, tailings ponds, etc.) [3,5]. In the case of the P-ML of the Karviná District, the surface effects of deep coal mining were so devastating that entire human settlements were destroyed [7]. Conversely, in areas with high groundwater levels, the P-ML of the Karviná District is subject to waterlogging of the resulting subsidence and the subsequent formation of aquiferous subsidence basins, thus creating subsidence lakes [13]. If left to natural succession, very valuable replacement wetlands and aquatic communities of organisms are gradually formed in their area, which find suitable conditions for reproduction and shelter, and at the same time, there is a rich food supply [3]. The resulting secondary habitats for plants and animals are important for nature and landscape conservation [14].

In the past, deep coal mining in the Karviná District was also connected with a sudden influx of people from the former Austro-Hungarian Empire, including Galicia (a historical and geographic region spanning what is now southeastern Poland and western Ukraine) and Upper Hungary (todays Slovak Republic), and later from other parts of the newly formed Czechoslovakia, i.e., people without deeper ties to the region [15,16]. We can therefore assume that the Karviná District, together with its population, is struggling with the alienation from the landscape that is occurring today in society as a whole. This alienation is caused not only by 'common' changes in the way of life, but also by other problems closely linked to life in the P-ML. These include, above all, the lack of historical continuity, the radical transformation of the landscape and the generally accepted preconception that the PM-L of the Karviná District has nothing to offer and that it lies completely outside the centre of all operations [11,16,17].

According to our philosophy, the local inhabitants' relationship to the PM-L (or to any landscape in general (the concept of a 'small homeland') can be positively influenced by developing their environmental competencies. For the purpose of our paper, it is appropriate to define 'environmental competence' as a set of interrelated knowledge, skills and attitudes that enable an individual to better perceive the landscape of their home, and to realize its important role in their lives. The significant contribution of coal mining to the region or the country in the past, setting trends in the development of mining technologies and, in essence, increasing geodiversity or biodiversity in the landscape (without neglecting the original destructive effects on native biocenoses), cannot be overlooked. The crucial role in the development of environmental competencies in the P-ML of the Karviná District can be seen in the use of elements of the PM-L as key places for changing the perception of the landscape of the Karviná District. Behind this approach is an effort to take it as comprehensive as possible not only to the issue of the P-ML of the Karviná District, but also changing its perception by its inhabitants.

3. Results

Based on the analyses performed, we propose to carry out a thorough passportisation of the P-ML elements to present the possibilities of developing the environmental competencies of the inhabitants of the Karviná District. For this purpose, a simple procedure was proposed as shown in the diagram below (see Figure 1). There are likely several different subjects (persons, organisations, etc.) in the area of interest that approach the P-ML elements individually and work with them at different levels (e.g., the POHO2030 programme led by the Moravian-Silesian Investment and Development Agency (MSID) or The National Heritage Institute). The key then is not only to bring together the results of the individual subjects and eventually make the data available to the wider public (ultimately not only to local inhabitants), but also to find ways to work with these elements further. In addition to an effective passport, we propose to work with the element as with an environmental interaction landscape element (EnILE).
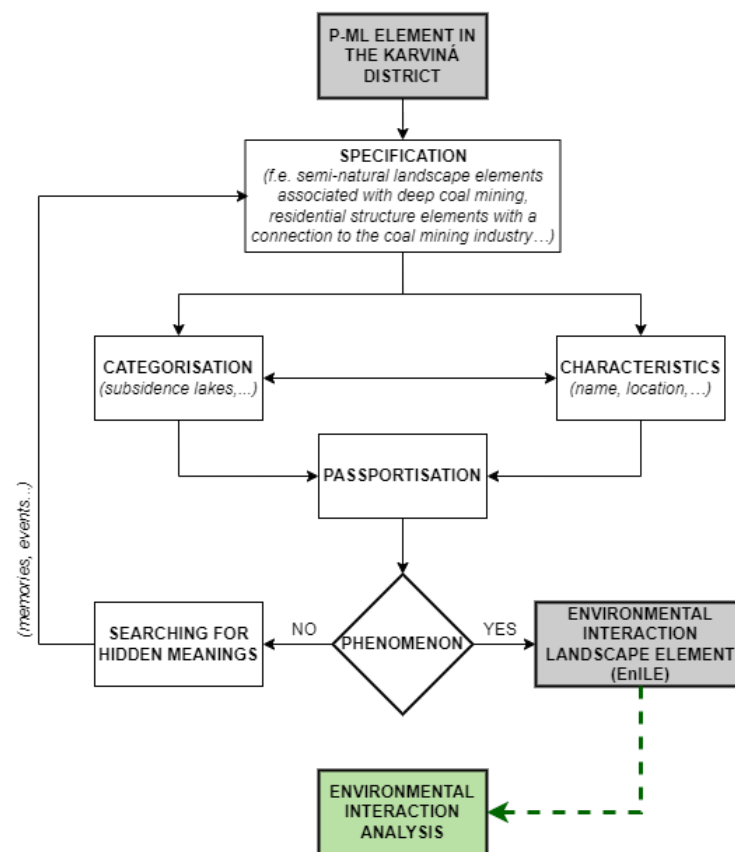
Figure 1. Diagram of the assessment workflow for P-ML elements of the Karviná District in terms of possible environmental interactions.

3.1. Categorisation and Characteristics of Landscape Elements

The diagram presents a simplified procedure for working with P-ML elements in the framework of increasing the environmental competencies of the inhabitants. The first step is the specification of the P-ML elements in terms of the landscape layer with subsequent categorisation. Examples are given in Table 1.

Table 1. An overview of specifications and categorisations of the P-ML elements.

Specifications in Terms of Landscape Layer	Categorisation Examples of P-ML Elements
semi-natural landscape elements associated with deep coal mining	subsidence lakes; reedbeds in wastewaters from coal preparation sites (tailing ponds), etc.
urban structure elements with a connection to the coal mining industry	buildings of mining operations such as mining towers or tailing ponds; mining colonies; religious monuments with a connection to mining; memorials, etc.
landscape elements of an intangible nature and interactions associated with mining	historical events; traditions; associations; projects; literature; mining-related films; subjectively coloured stories, etc.

The characteristics of a landscape element may include, for example, the exact name, location, description, photo documentation, list of relevant information sources or property rights. The structure of the description is adapted to the nature of each category (a subsidence lake requires a completely different characterisation than, for example, a description of a mining tradition). The output of the specification is a passport card as part of the database, which allows for a clear summary of all the information found about the landscape elements in the P-ML.

3.2. Working with Phenomena

For subsequent work with the P-ML elements for the development of environmental competencies, it is important to work with them as with phenomena. In our case, a phenomenon is not only seen in terms of potential or actual uniqueness, but a phenomenon can also mean what appears to a person without distinguishing whether it is a reality or an illusion [18]. For example, a waste dump can be perceived by some as a real 'waste dump' for someone else it can be a potential source of raw materials. For another, it can be an 'ulcer in the landscape' (healed or not), a natural laboratory or a place of which the use is still being explored. At the same time, for some, it is a place for relaxation or a place to experience real adventures and a place of discovery. In our case, the P-ML element under consideration must be found to be a phenomenon in the above sense. If it is not found at 'first sight', then it is necessary to look for the hidden meaning of the element and a more thorough passport. If the phenomenon has been found after a thorough search; then, the P-ML element can be viewed as an EnILE.

3.3. Environmental Interaction Design

For the purpose of the development of environmental competencies of the inhabitants of P-ML the Karviná District, we propose seven basic types of environmental interactions between humans and the landscape. These can also be seen as certain 'needs' of the landscape. The first four interactions have a general validity: observing, discovering, admiring and interpreting. The other three interactions are specific to those types of landscapes in which there has been a significant loss of memory (not necessarily only post-mining landscapes, but landscapes in general, e.g., the landscape of the Nízký Jeseník Mountains, marked by the deportation of the former inhabitants in 1945/46, etc.). In this case, it is mediation, networking and integration.

Applying this view analytically to the landscape elements of P-ML, we propose to speak of them as landscape elements of environmental interaction (EnILE), which can be uniformly processed for these purposes into overview cards (general name including possible motivational name, description of the phenomenon, analysis of the situation, examples of activities related to the development of environmental competences of the inhabitants, etc.).

3.4. Example of Working with Phenomena

In this section, an excerpt of specifications of selected landscape elements in the Karviná District and their phenomena as EnILE are presented to illustrate our approach. For these purposes, three elements of the P-ML were selected: the Church of St. Hedwig of Silesia in Doubrava village, the Kozinec subsidence lake in Doubrava village, and the 'Darkov sea' (or 'Karviná sea').

3.4.1. Church of St. Hedwig of Silesia in Doubrava Village

Characteristic: It was built at the end of the 19th century by the Roman Catholic Church. The land for the construction of the church was donated by baron Richard Mattencloit and designed by Eugen Fridrich Fulda, an important architect and builder from Teschen [19,20].

Phenomenon: The Church of St. Hedwig—the patron saint of Silesia—is an ornament of the square of the picturesque village of Doubrava, which has preserved partly its agricultural character and some elements of the original settlement buildings even in the P-ML of Karviná (see Figure 2A). However, the main thing is only discovered when entering the church. The mural on the Gospel side depicts two miners kneeling in front of St. Procopius, the patron saint of miners, with the mining tower towering in the background (see Figure 2B). This painting shows how mining was an important part of the life of the local people, that they had it projected onto the wall of the church in a spiritual image.
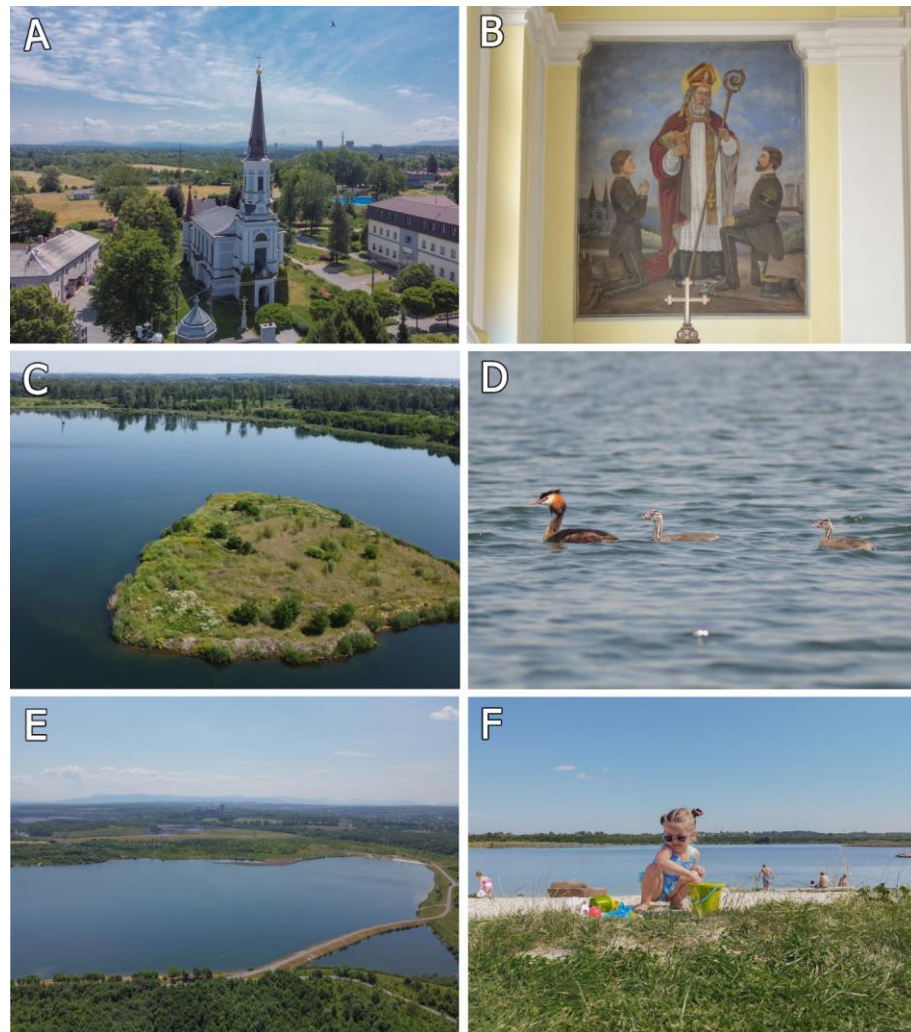
Figure 2. (**A**,**B**) Church of St. Hedwig of Silesia in Doubrava village: general view (**A**) and the mural on the Gospel side depicts two miners kneeling in front of St. Procopius (**B**); (**C**,**D**) Subsidence lake Kozinec in Doubrava village: a general view of its southern part with the artificial island (**C**), which is, among other things, a nesting site for specially protected bird species, such as the Great Crested Grebe (*Podiceps cristatus*) (**D**); (**E**,**F**) 'Darkov sea' (or 'Karviná sea')—overall view from bird's perspective (**E**), this site is used mainly for recreational purposes today and is not only used by young families (**F**) (author T. Chowaniecová).

3.4.2. Subsidence Lake Kozinec in Doubrava Village

Characteristic: It is an example of a semi-nature landscape element created by subsidence and subsequent waterlogging in the Doubrava–Kozinec area as a result of deep coal mining. It is located in the river terrace of the Olza River, and the northern part is bordered by the remains of an alluvial forest (see Figure 2C). Considering that intensive mining in this area started only in the late 1990s, the subsidence lake is relatively young. Its depth reaches up to about 12 metres.

Phenomenon: Several decades ago, the interesting and scientifically important nature reserve 'Loucké rybníky' was legally annulled due to mining activities in Louky nad Olší (todays Karviná–Louky). Today, the area has very little in common with its former state, although it still retains some importance (e.g., a stopover sites for many rare bird species, see Figure 2D). On the other hand, in the P-ML in the Karviná District, a similar process has led to the creation of the Kozinec lake, which is playing an increasingly important role in nature conservation, and it is possible that it may one day become a specially protected area.

3.4.2.1. 'Darkov Sea' (or 'Karviná Sea')

Characteristics: The area in the former village of Darkov has subsided as a result of deep coal mining and seepage of groundwater has created a roughly 32-hectare body of water called the 'Darkov sea' (or 'Karviná sea') (see Figure 2E). The lake is bordered by an asphalt circuit that makes the area accessible to cyclists or in-line skaters, and the well-maintained beaches allow visitors to use the lake for swimming or other water sports. The nearby mining towers of the Darkov Mine and the ČSM Mine, which remind us of the mining history of this place, are also a dominant feature of the site.

Phenomenon: This part of the landscape was traditionally used for fish farming, which mostly gave way to mining in the Czech part of the original Duchy of Teschen (1290–1918) but survived in the part that became part of Poland. If we go deeper into the past, there were originally numerous glacial lakes, some of which have survived into the modern era. The lake 'Darkov sea', which is becoming one of the most popular recreational sites in the P-ML of the Karviná District (see Figure 2F), is thus an integral part of P-ML of the Karviná District not only in its origin but also in its character.

4. Discussion

Within the framework of environmental care, management measures are introduced at various levels to contribute to the quality of life of the inhabitants (not only) in urban agglomerations and, of course, to protect and care for individual components of nature. It can be argued that much greater success is achieved in landscapes where local people are more connected to their history and are proud of their region. In places where people's relationship with their homeland is in decline, awareness-raising activities can take place, for example, in the Moravian–Silesian Region, the POHO2030 project is carrying out public events of various kinds to highlight the value of the P-ML of the Karviná District. The inhabitants who are more connected to their place of residence can therefore automatically assume that they need to behave responsibly towards the landscape or the environment. In the case of inhabitants of the P-ML with its specific problems as described above, a specific approach is needed. The methodological approach outlined shows one possible way forward. Although it is still the subject of our further research, it could become part of such management practices as waste sorting or water conservation. Thus, by analogy in this particular case, in the management aimed at building a responsible relationship between the inhabitants (or 'users') and the specific P-ML.

For a better understanding of this issue, it seems advantageous to introduce the concept of the 'landscape element of environmental interaction' as a focus point in the landscape to build this relationship. For this purpose, a diagram has been designed which is based primarily on the analysis of the P-ML elements of the Karviná District and their characteristics. The result of this step is to be a passport of all P-ML elements of the Karviná District. A subsequent and equally important step is the search for phenomena.

A P-ML element of the Karviná District becomes an EnILE if it is described in terms of the seven basic proposed types of environmental interaction between humans and the landscape, e.g., mediation, which we propose to define as an interaction that helps to (re)build the disturbed relationship of inhabitants to the landscape (offering a balanced approach), or integration, which is based for example on the implementation of landscape elements of environmental interaction in the school curriculum. It is beyond the scope of this article to provide a more detailed specification of environmental interactions and an evaluation of their level in the case of specific P-ML elements of the Karviná District, including the results of guided interviews with 'landscape users'. To illustrate, we present only specific examples of selected EnILE that can become or are becoming 'key places for changing the perception of the landscape' in the relationship of users to P-ML of the Karviná District. A follow-up step, which is closely related to the discussed issue, is the presentation of activities with different groups of local inhabitants, which are closely connected with EnILE in relation to the proposed scheme.

5. Conclusions

Although the P-ML of the Karviná District is often perceived negatively by the public and local inhabitants, and it is true that it has a number of environmental problems, this assessment is often related to a non-objective and one-sided presentation of the region, rather than the fact that this landscape has nothing else to offer except coal. For this reason, one possible solution is to work with the public (users and residents) in a way that is analogous to management in other parts of the environment. Not to be confused with the generally accepted environmental education and public awareness and environmental counselling as important preventive tools of environmental policy, since the P-ML of the Karviná District has its own specifics, which are also essential to consider.

For this purpose, a diagram of the assessment workflow for P-ML elements of the Karviná District is proposed, including their passports in relation to possible environmental interactions, search for phenomena and design of environmental interactions. Key places for changing the perception can be seen in the use of the so-called environmental interaction landscape elements (EnILE) in environmental management. We are working on this issue in our research activities and believe that this can contribute to changing the view of the Karviná District not only as a post-mining landscape (PM-L), but also a landscape with a loss of memory in general.

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