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ASSESSING THE VALUE OF LANDSCAPE SHAPED BY THE MINING INDUSTRY – A CASE STUDY OF THE TOWN OF RYDUŁTOWY, POLAND

The article presents an assessment of the value of the post-industrial landscape in the town of Rydułtowy using a comprehensive approach. It includes: 1) Defining the scope of the study taking into account regional context; 2) Inventory of mining facilities; 3) Desk study; 4) Field research and interviews; 5) Value assessment and guidelines. For assessing the value of the post-mining landscape the Architectural-Landscape Units & Interiors method was selected. The usefulness of the proposed method for the post-industrial landscape assessment was demonstrated using the case of Rydułtowy, a mining town. This article also describes the history of the mining activities in the town of Rydułtowy. The significance of the more than 200 years of mining on the growth and expansion of the town as well as its identity is reviewed. Special attention is given to the history and the present state of the most prominent element of the landscape, namely the cone-shaped landfill – Szarlota. The guidelines resulting from applying the proposed landscape value assessment are useful for a number of stakeholders and future activities planned for both the cone heaps and the mining plant.

Keywords: hard coal mine, Rydułtowy, conical heaps, landscape valorisation, identity, revitalisation

1. Introduction

The landscape in and around the towns and areas where mineral resources have been mined is shaped by specific anthropogenic structures and infrastructure indispensable to resource extraction and processing. Some of them, as in the case of processing plants, machine halls, office buildings and worker colonies meld into the townscape, often making for an attractive urban design. Other elements of mining infrastructure such as shaft towers, chimneys and landfills are ubiquitous and tower over towns and regions, lending a specific character to the landscape.

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Amongst the major anthropogenic structures – landmarks, mining landfills are the ones most receptive to alteration. The location and the technical parameters of these sites are, however, influenced by a variety of factors such as the relative accessibility of the area, the extent of the efforts to minimize the space taken up by the waste, the disposal method, the type of waste material being disposed, legal standards governing waste management, and the safety and security issues (especially the need to ensure slope stability). Thus, in step with the progress of disposal technologies and ever more rigorous environmental regulations, the shape of mining heaps has changed over time. Heaps built up until the 1990s were cone-shaped and very tall. In subsequent years, they have tended to be more spread out and varied, forming what in effect resembles a naturally undulating landscape.

The key inspiration for preparing this article was the involvement of its authors in the EU-funded MIN-NOVATION project, which ran from 2011 to 2013 and was dedicated to the topic of mining waste management. The project was an excellent opportunity to discover various approaches to this subject, both in Poland and in other European countries (Germany, Sweden, Norway, Estonia, Finland). These experiences have made it abundantly clear that despite great technological advances in waste prevention and recovery, extraction and processing in the mining industry continues to generate considerable amounts of waste and by-products. Landfills have naturally become an inseparable part of the cultural landscape of many European towns and regions. They, in many cases, help define their uniqueness and identity, and are in and of themselves local magnets because they provide the right environment for a variety of recreational activities.

In this way, landfills have become an important element of modern day management of post-industrial spaces; what is more, because many heaps (especially historical ones) contain useful secondary raw materials, these can be extracted and sold in the marketplace. A consequence of this is that conflicts can, and do, arise between those who favour a pro-growth approach which involves recovering secondary raw materials, and those who favour a conservation approach, focused on protecting the industrial heritage and other non-economic uses of landscape (Cała ed., 2013). This then underscores the importance of this subject and reinforces the need to develop methodologies for assessing the value of mining landscapes, including landfills, in order to optimise decisions about their eventual revitalisation. Any decision or action with respect to waste heaps requires a careful assessment beforehand, not only of their economical or social utility, but also of their historical significance and influence on the dynamics of the transformation process shaping the landscape of the town or even region (coal basin) in question. Given that landfills can be protected as elements of mining heritage and the cultural landscape, it is advisable to carry out an assessment of those structures by considering them as an integral part of the mining facility. How they are redeveloped in the future should by the same token be based on an assessment of the value of the cultural and natural resources which they represent.

For more than 40 years, a method for analysing the landscape, putting a value on it and formulating guidelines on how to re-use or re-invent it has been the Architectural-Landscape Units and Architectural-Landscape Interiors method (ALU-ALI). The foundations for this method were laid by J. Bogdanowski and the subsequent advancements in applying this method have been made by the research team at the Institute of Architecture of the Kraków University of Technology (Bogdanowski, 1994; Myczkowski et al., 2010). The method has been used for assessing both elements of the natural and the cultural heritage in landscapes e.g. (post-)industrial areas (Ostręga, 2004). The rationale for developing the ALU-ALI method is linked to the need to protect different types of landscapes, of which the industrial landscape is the most challenging

to protect. In post-industrial societies, industrial facilities are often demolished after being deemed unnecessary, or commercialized but usually at the cost of destroying their architectural value. This is why reliable information about the state, the value and the possible adaptation of pathways can be an important argument presented to the decision-makers (Myczkowski et al., 2010). Because of its holistic approach to the (post-)mining cultural landscape, the authors deem the ALU-ALI method more suitable than any others referred to in the subject literature, and the most appropriate for assessing the landscape in question. Its merits lie in: structuring the landscape by separating out elementary parts of a given landscape, assessing their value, defining recommendations for preserving the landscape and guidelines for repurposing it (Myczkowski et al., 2010).

Other methods reviewed (Scenic Beauty Estimation, Landscape Frame, WNET, Wejchert Emotion Curve, Landscape Character Assessment) contain a variety of limitations with reference to the subject or the scope of the analysis (Daniel & Boster, 1976; Kepes, 1995; Filova et al., 2015; Litwin et al., 2009; Van den Berg & Koole, 2006; Tudor, 2014). Listed methods are concerned with assessing the value of the landscape only on the basis of photographic documentation, or on the basis of whether landscape has natural or close to natural elements. In the case of cultural landscape, methods based on photographs and perceptions are not sufficient, since history and traditions of the sites, as well as social or economic factors should also play an important role in the decision-making process which can lead to possible transformation or enhanced protection of elements of the landscape. In reference to research presented in this article, it is worth to emphasise a particularly valuable feature of the Landscape Character Assessment method which involves engaging people and their relationships with a landscape resulting from an individual's own experiences, memories and history (Tudor, 2014). It can be especially important in the case of cities or regions with long-term traditions in mining.

2. The subject and aim of the study

The subject of this study is the Rydułtowy town along with elements of the mining industry, in particular – the Szarlota waste rock landscape next to the Rydułtowy Hard Coal Mine (HCM). Szarlota (also called landscape structure or cone no. 1) is made up of a cone-shaped heap. Previous activities within the mining plant refer to the legal protection of two buildings and cone no. 1 as well as elaborating the concept of revitalisation for historical and a newly built landscape structures. However there is no comprehensive revitalisation plan for the (post)mining areas in Rydułtowy, what can lead to random decisions in the future. There is also no plan for managing the mining legacy spread around the town and surrounding areas.

In this regard, the aim of the study is to estimate previously mentioned activities made by mining company and the town's authorities and then to make recommendations for future activities regarding both the Cone no. 1 as well as mining plant and other heritage constituting the town's history and landscape.

3. Method

The procedure (demolition or protection) and the future functions of post-mining facilities depend on many factors, which are characterised through e.g. document analysis, field research, interviews or questionnaires, as well as valorisation of natural and cultural resources

(Ostręga, 2004). However, the revitalisation of a post-mining facility located in a mining region cannot be considered without taking into account such a context. Therefore, the valorisation was preceded by stages relevant to the subject of the study, what is a comprehensive and new approach to landscape assessment and revitalisation. The stages are as follow:

[1] Defining the scope of the study. In the case of mining heritage it was necessary to present it in the context of the municipality and region (coal basin), where the mine is located. Economic relevance of the landfill and historical value of heritage have been evaluated with these contexts in mind.

[2] Inventory. The mining facilities responsible for creating specific landscape formations were identified, those in the coal basin (region) on a more general level, and mining infrastructure in the town of Rydułtowy in more detail.

[3] Desk study. The source material is archival and the current documents concern the mining plant and the cone-shaped heap. They formed the basis for the analysis of the mining facilities in the context of: the historical and economic worth, landscape and natural value.

[4] Field research and interviews. Important primary and secondary sources of information were observation, photographic documentation and interviews.

[5] Value assessment and guidelines. The Architectural-Landscape Units and Interiors (ALU-ALI) method was used to assess the value of the Szarlota landscape structure, together with the mine site. The results of the assessment were the basis for outlining the guidelines, which optimize the decision-making process with respect to the mode of (re)development.

In the case of absence of inventory and guidelines for the management of post-mining facilities in the country (e.g. as in Spain) or region (e.g. as in Nord-pas de Calais, France) (Ostręga, 2013), a wider context (municipality, region) should be taken into account while planning revitalisation. Occurrence of other (similar) post-mining facilities in the region, meaning for the town's identity and attitude of local people has an impact on the valorisation of cone no. 1 and mining plant in Rydułtowy.

The essence of the ALU-ALI method lies in the division of the area to be assessed (and eventually revitalised) into units, interiors and interior sections. On a landscape scale, the borderlines of the units are defined by the shape and the cover of the area as well as by the historical changes that it has undergone. On the architectural scale, the borders of the interiors are defined by e.g. compact walls of the buildings, walls of the excavated area, slopes of the landfills (this and the previous two are examples of what is referred to as a specific boundary), tree lanes (objective boundary), individual trees, chimney stacks or paths (subjective boundaries). On the urban scale, it is standard practice to use interior sections (Bogdanowski, 1994). The division of the area in question into architectural-landscape interiors and interior sections is presented on a basemap providing geospatial information. Individual fields include labels which reflect the cultural and the natural assets present there, as well as the following scale values (Myczkowski et al., 2008):

- **historical value**[1] (state, clarity and homogeneity of the arrangement), marked *Hi*, where *i* is on a 1 to 4 scale with 1 representing the highest value and 4 the lowest value;

[1] Historical value – is a weighted average of the following rated factors: state of the arrangement (good, neglected, incomplete, devastated); clarity of the arrangement (clear, clear with transformation, mostly unclear, unclear) as well as homogeneity of the arrangement (uniform, stratified).

- **contemporary value**[2] (function standard, form standard, natural value and landscape capacity), marked *Ci*, where *i* is on a 1 to 4 scale with 1 representing the highest value and 4 the lowest value.

Assessing the value of the mining landscape represented graphically provides a synthesis of visual information about the geographical distribution of units, which are valuable and threatened, which in turn makes it possible to define guidelines for further actions. Depending on the value and the degree of degradation, individual interiors or interior sections may require: conservation, integration, reconstruction or recomposition (Tab. 1; Myczkowski et al., 2008). They may also require establishing protection zones, of which there are several categories: strict conservation (A), partial conservation (B), element and/or exhibit protection (E), protection of basic landscape features (K) (Bogdanowski, 1994). Adapting individual interiors or interior sections will, depending on their features, be compatible with such ideological directions of adaptation as verism, didacticism, subjectivism or utilitarianism, which influence the method of adaptation chosen, whether it is isolation, accessibility, exposition, adaptation, application or induction (Tab. 1; Myczkowski et al., 2008). An additional table can be included in the drawing, which contains extra information on specific interior sections in the context of resources, assessing the value as well as the guidelines and the direction for adaptation. The advantage of this method is the development of a comprehensive and simultaneously rapid means of gathering categorised, essential information about engineered landscape forms such as post-mining landscapes.

TABLE 1

Possible actions for landscape units (*Source:* Myczkowski et al., 2008)

Conservation guidelines	Ideological directions of adaptation	Standard of usage	Methods of adaptation
1	2	3	4
Conservation – all the activities whose aim is maintaining the present state of the interior with elements made more complete and legible.	**Verism** – maintaining strict scientific and cognitive values, by preserving authenticity with minimum modern addition or interference.	**Stay** – fulfilling conditions allowing for lengthy (for many hours or whole day) stay of people – visitors and staff – within a given interior.	**Isolation** – creating conditions not allowing the visitors to pass through or stay inside for reasons of their safety, the safety of nature or the monument. It also involves ensuring the possibility of observing from outside and erecting barriers effectively prohibiting access.
Integration – combining old and new substance, joining broken up or blurred arrangements.	**Didacticism** – it is primacy of facilitating the message and making it legible, also by way of modern additions and complementing, using the means affecting mostly intellect.	**Visit** – fulfilling conditions allowing for staying there no longer than about 1 hour.	**Accessibility** – creating indispensable, simple conditions facilitating the sightseeing. Displaying – introduction of elements enhancing the didactic value of the landscape and its objects (signposts, information boards, lighting), but only to improve the presentation of the mentioned objects.

[2] Contemporary value is a weighted average of the following rated factors: function standard (modern day utility in reference to its current use); form standard (aesthetic value); natural value as well as landscape capacity (the degree to which modern developments can be made in the landscape without causing harm to the entire view).

1	2	3	4
Reconstruction – recreating non-existent elements and complexes according to historical data.	**Subjectivism** – emphasising, sublimation and making certain landscape features legible (memorial, scenic, religious, natural) using the means affecting mostly emotional sphere; an activity deepening certain aspects of landscape expression.	**Passage** – fulfilling conditions allowing for sightseeing the interior during a several-minute passage through it.	**Exposition** – introduction of elements enhancing the didactic value of the landscape and its objects (signposts, information boards, lighting), but only to improve the presentation of the mentioned objects.
Recomposition – creating new values with the use of emphasising the relics of former arrangements.	**Utilitarianism** – fulfilling basic utility needs connected with safety, accessibility and conditions of residence.	**Passive** – possibility of observing the interior only from a distance, without letting the visitors go inside.	**Adaptation** – introduction of modern facilities improving the functional standard, and also small scale investment adapting the architectural-landscape interior to new functions, mostly connected with tourism.
			Application – large investments, introducing new functions of high standard and high requirements into old structures, e.g. culinary, hotel or cultural functions (amphitheatre), but without introducing additional new cubic capacity. It is the highest level and the most expensive activity introduced into old structures.
			Induction – introduction of new functions into a given architectural-landscape interior, conditioned by the introduction of a new, significant structure. In protected areas, in strategic landscape it frequently means re-creating in new substance of the destroyed object, or even introducing new volume into historic places.

4. Case study analysis in regional and local context

4.1. The Upper Silesian Coal Basin

Rydułtowy is a town located in the westernmost corner of the Upper Silesian Coal Basin (USCB), currently part of the Silesian Voivodship (Fig. 1). USCB has abundant deposits of hard coal. The oldest mine in the USCB is the Murcki Hard Coal Mine (HCM) in Katowice, with mining activity dating back to 1657. After merging with the Staszic Hard Coal Mine, it continues to operate today, along with 21[3] other mines in the region. The Murcki-Staszic HCM, which is a combination of the oldest and one of the youngest mines in the region, deserves, according to the authors, to be preserved as a heritage of the mining industry.

[3] Additional Hard Coal Mine "Lubelski Węgiel" is located in the Lublin Coal Basin.

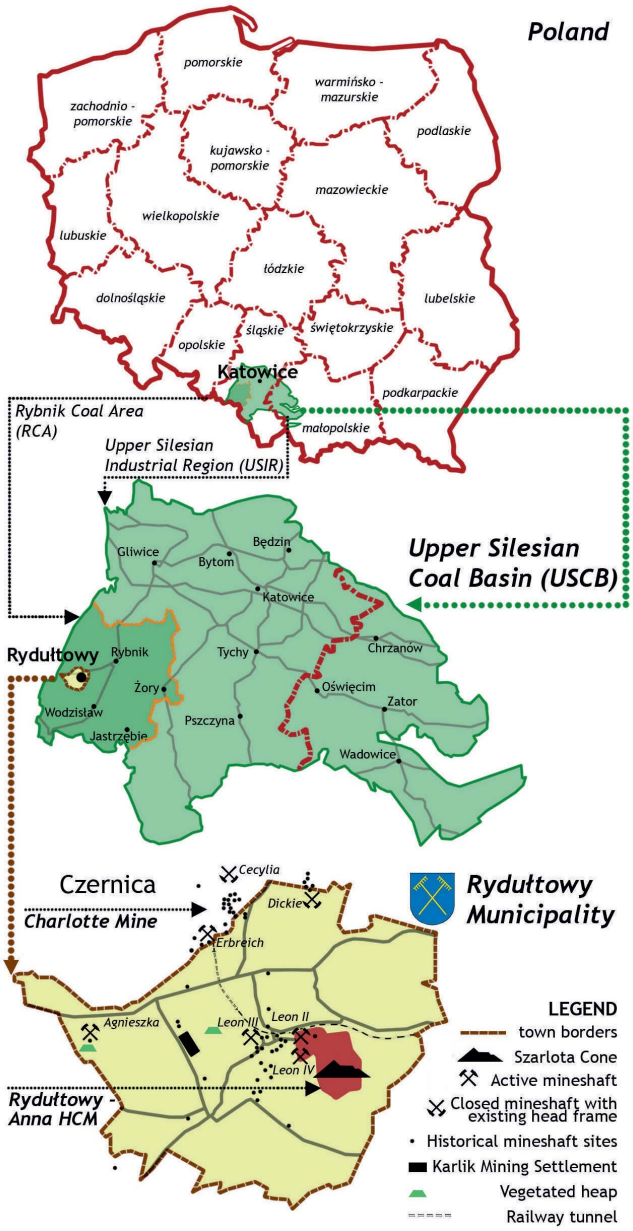

Fig. 1. Location of the town of Rydułtowy in the Upper Silesian Coal Basin and Poland (own study on the basis of Adamczyk 2011, 2012, 2015)

Dozens of mines as well as the technical infrastructures, landfills and workers' settlements which have sprung up around them have had a defining impact on many a townscape in the coal basin. Apart from the head frames and chimneys, some 150 waste heaps dominate the horizon

today. They cover an area of 3,892 ha, and the deposited waste has a volume of over 300 million m^3. Among 101 Silesian waste dumps, for which a reclamation method was identified, as many as 79 (78%) were reclaimed for forestry, 10% for recreation, 12% for industrial use, including waste recovery (Łączny et al., 2012).

It follows that, on the one hand, the shape of most landfills has changed during the reclamation process. In the context of the rational use of mineral resources, the recovery of waste from landfills should be a priority. However, among the hundreds of such objects in the region, one can choose those that will commemorate the centuries-old history of mining. Heaps which are the highest and having characteristic shapes should fulfill this role. Szarlota meets these conditions.

The Industrial Monuments Route, an initiative which has been run since 2006 by the Marshall's Office of the Silesia Voivodship, and brings together 42 sites, including 16 connected with mining, is a token of the growing appreciation for preserving past achievements in industrial culture and a driver for identifying sites worth preserving and popularizing.

4.2. Town of Rydułtowy and Rydułtowy Hard Coal Mine

Rydułtowy is proud of its 200+ years history of hard coal mining, which began in the 18th century with the discovery of rich deposits of hard coal. With the opening of new mines, the little farming village became a town with a population of 21,700 (1,452 persons/km^2) (Statistics Poland, 2018).

The first mine in Rydułtowy was Hoym HCM, opened in 1792. The oldest existing coal mine is the Rydułtowy HCM, started operating in 1806 when it was named Charlotte and located in the hamlet of Czernica, right outside the boundaries of present-day Rydułtowy (Fig. 1). Over the course of almost two centuries, new shafts and mines were added to the Charlotte HCM. A very rich history of a mine continues to serve the local community to this day (Adamczyk, 2011, 2012, 2015). Starting in the 1850s, settlements were built for miners and management staff working in the mine. Immediately after the end of World War II, the Charlotte Mine was renamed Rydułtowy, then Rydułtowy-Anna (Adamczyk, 2015). Several decades and organizational changes later it continues to operate, and is now known as the Rydułtowy Division and is a part of the Polish Mining Group Ltd. Currently documented operative resources of hard coal will allow for HCM Rydułtowy to operate until 2040 (the current concession ends in 2019). Careful planning of the extraction of the deposits could extend the life of the mine until around 2065 (Polish Mining Group, 2018).

Overall, several dozen shafts and a few landfills and mining settlements existed within the bounds of the town (Fig. 1). Today, the mining industry is present in the townscape via:

- The Rydułtowy HCM with several facilities under protection (namely cone-shaped waste heap no. 1, a building dating from 1906 which housed the weighing station with entrance gates leading to the mine).
- Ventilation shaft no. III built between 1907 and 1914 on the grounds of the former Dicke Verwandtschaft mine.
- The Erbreich Peripheral Shaft dating back to 1900, and located in the former hamlet of Czernica.
- Parts of the Karol (Karlik) mining colony.
- A railway tunnel built between 1854 and 1858 under the 'Rydułtowy mountain' for coal transport (the longest in the Silesian Voivodship – 727 m, and the oldest extant tunnel in Poland).

- Radlik Villa – built for the director of the Charlotte mine.
- The water reservoir resulting from the subsidence of the area.

The industrial landscape is complemented by pockets of waste landfills, some of which are covered with vegetation and blend into the surrounding area whilst others dominate their surroundings by the virtue of their shape and height. The mining legacy is an intimate part of the identity of the town, its main attraction and a key to its further development, which takes on an additional meaning when one considers the area lacks other tourist attractions (Rydułtowy, 2018).

4.3. Landscape structure

The waste by-product of the extraction and the processing of bituminous coal at the Rydułtowy HCM was initially stored in a quarry adjacent to the mine. After the quarry was filled, waste continued to be disposed of there, and layer by layer, eventually, pyramid-shaped structures began to form (Fig. 2).

The end-result were three cone-shaped heaps visible in the photograph from the late 1960s/early 1970s below (Fig. 3, left).

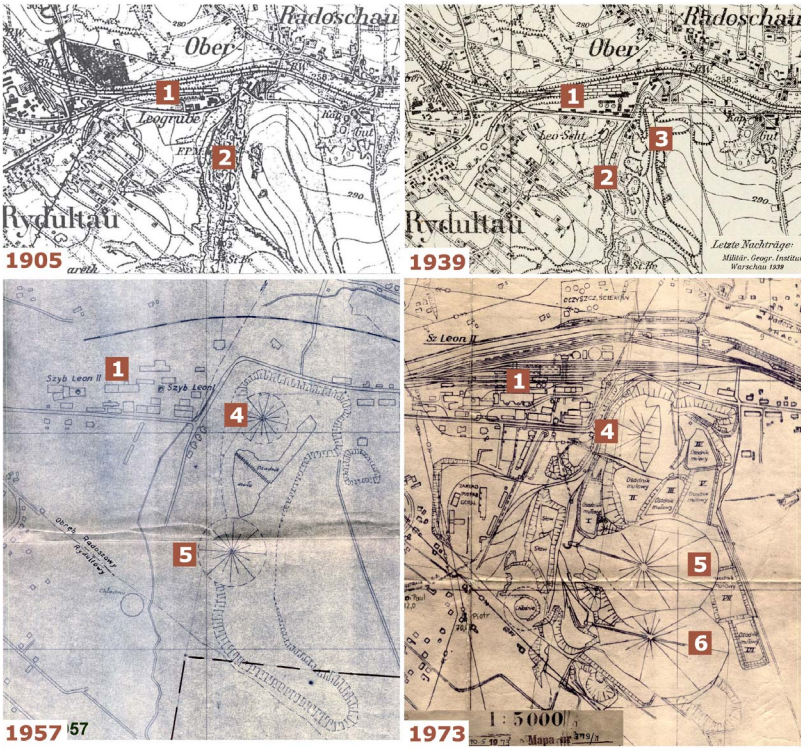

Fig. 2. Landscape transformation as a result of mining activity: 1 – Mining Plant Rydułtowy, 2 – Quarry, 3 – Quarry filled with waste rocks, 4 – The oldest cone in the process of being used for waste recovery purposes – today settling ponds, 5 – Cone no. 1, 6 – Cone no. 2 covered by waste rocks – today flat embankment (elaborated on the basis of maps and information from A. Adamczyk)

Over time, the coal content in the deposited material initiated thermal processes. As a result of these processes, endogenic fires took place, and the shale on the heaps was partially burnt, becoming an economically valuable product. The oldest of the heaps was subject to recovery operations (as can be seen in figure 3, photo on the right) and today in its place one can find settling ponds. A similar path of action was planned with respect to the other, tallest, heap – today designated as no. 1. The business owner's interest in recovering secondary raw materials was, however, met with protests of the local community.

Fig. 3. Waste heaps next to the Rydułtowy HCM: Photograph on the left: 3 cone-shaped heaps – starting from the right, the oldest one in the process of being used for waste recovery purposes, next Cone no. 1 and cone no. 2 (view from east), 1960/1970s (photo by A. Wawrzyńczyk); Photograph on the right: cone no. 1 and flat embankment covering cone no. 2 (view from south-east) – 2012 (photo by Rydułtowy HCM)

The shape and the height of the heap are the effect of the disposal and layering technology (so-called 'cone heap' method). Waste was transported in carriages equipped with a terrain-rope drive to the top of the cone, whereupon the waste was released. As it rolled down, the waste rock in effect underwent self-segregation, in that the smallest part of the waste rocks stopped in the upper parts of the slope, whilst the coarser fractions rolled down to the bottom of the slope. This in turn gave rise to the steep slopes of the landfills with an inclination equal to the angle of internal friction (approx. 36^{o}-20^{o}). This technology was discontinued in the 1990s, which means that heaps using this technology will never again be formed (information from Rydułtowy Hard Coal Mine). Cone no. 1, despite the difficulties in recultivating the site because of steep slopes and lack of adequate soil cover, has been partially grown over with vegetation as a result of natural succession. This structure is 140 m tall AGL (406 m ASL). Settling ponds, which are used in processing operations are located on the northern side of cone no. 1. In 2007, cone no. 1 was named Szarlota, harkening back to Charlotte – the name of the first mine in Rydułtowy (the name was polonised to Szarlota) (Adamczyk, 2015). In the local land use plan a 'protection zone for the cultural landscape of the cone no. 1', with a ban on any changes to its height or slope was set up.

The cone no. 2 and the area lying between the cone heaps was covered over with waste rock material and currently has the form of a flat heap (Fig. 3; photograph on the right) (as per official documents of the Rydułtowy HCM). The inspiration for designing the new structure in the adjacent area comes from the historical Szarlota Cone and the production of the mining waste. The further expansion of the landscape structure is at the same time the storage of useless materials and part and parcel of the revitalisation process. According to the design, the waste material from the current production is used to raise a new cone on the flat heap, thereby creating a counterbalance to the existing Cone no. 1 (Fig. 4). The new cone is being built using state-of-

the-art technologies and will be a structure in the shape of terraced segments from decarbonified waste rock, transported by track and then compacted using bulldozers and vibratory rollers, with a slope incline equal to 50°. The target height of the structure is 190 m AGL (460 m ASL). This will make it the highest structure of its kind in Europe. The historical Cone no. 1 will be separated from the new structure by the means of a protective screen. The time it takes to raise the new structure is correlated to the period during which the mine will be in operation, i.e. during which waste rock will be generated (as per official documents of the Rydułtowy HCM).

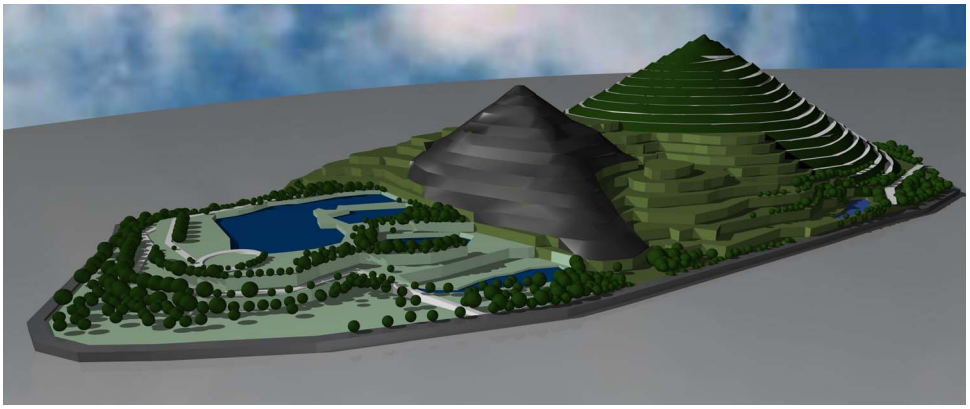

Fig. 4. The most prominent element of the Rydułtowy townscape – the Szarlota landscape structure – existing and designed cone (*Source:* Rydułtowy HCM, report by ISAR Design Office)

Once the landscape structure has reached its target shape, it will be almost in its entirety repurposed as a green area (the exception being the historical cone which is to be left intact), with parks, gardens and footpaths as well as bike trails. This structure covers an area of approx. 45 ha. Settling ponds will be sealed and converted into fish ponds surrounded by green space and trails. The presented concept creates new value inspired by older forms.

4.4. Perception of landscape structure by the local community

In order to learn about the attitude of the local community to cone no. 1 the interviews were conducted. In total, 36 interviews with the representatives of the local government, the staff of the mining plant as well as community members were carried out. Interviewees were asked what the cone-shape heap stood for to them: a) environmental or landscape damage? b) a monument to the history of local industry and a landmark? c) a potential recreational site? Answers and comments indicated that the Szarlota Cone is a monument to the history of local industry and a landmark for the vast majority of interviewees (n = 32). Residents consider the heap as ‘their pyramid’, ‘something, which makes the town stand out’, ‘a symbol’, ‘an icon’, ‘heritage’ etc. They cannot imagine the town without this particular waste heap, and they are very proud to have one of the tallest such heaps in Europe[4]. Some interviewees (n = 21) besides appreciating the historical

[4] Only Hesse and Mansfeld-Südharz in Germany and Nord-Pas de Calais in France have taller heaps – 250, 145 and 146 m AGL, respectively.

meaning regarded the heap as a place of recreation that could accommodate the space for a ski slope, walking paths and a viewpoint. Nobody regarded the heap as symbolic of damage to the environment or landscape, although a few responders admitted that in the times when endogenic fires used to occur, they treated the landfill as a source of environmental pollution.

Besides, the municipality uses the Szarlota landscape structure (pieces of stone, pictures etc.) for the town's promotion.

5. Assessing the value of the mining landscape by the ALU-ALI method and recommendations

In order to explore the cultural and the natural values of the mining facilities, a multi-variable value assessment was carried out. The properties in question were entirely broken up into Architectural-Landscape Units (ALU) and Architectural-Landscape Interior Sections (ALIS), then color-coded to represent different sections of value of cultural and natural assets, both historical and contemporary (Fig. 5). Two architectural-landscape units clearly stand out:

- I ALU – the mining plant together with the side-track and with the interior walls defined by the infrastructure.
- II ALU – the landscape structure with the adjoining storage yard and settling ponds, where the interior walls are defined by the shape of the terrain.

The map of value assessment reflects the dynamics of the changes that have taken place in the mine facility that has been in operation for over 100 years. Many years in operation usually means that the original facility layout is no longer discernible because of the removal of the technical infrastructure and the introduction of newer solutions (i.e. the overlapping of objects from different periods). Mining grounds, which do not have any elements of infrastructure left are subject to the ecological succession processes. Due to this, the origin of the majority of the design groups is "cultural-natural".

The highest rated historical values relate to interior sections which are dominated by original heritage items – 100+ year old historical buildings, headframe, chimney stack and the Szarlota Cone (I/2 and II/3). Activities recommended for these ALIS should aim to stop or slow down the process of destruction of the valuable historical resources (conservation). The adaptation of the Leon II mineshaft with its office space (I/2) should be done so as to emphasize the historical forms and functions (didacticism). It is also possible to introduce new functions into older structures e.g. museum and cultural spaces (application) which will make it possible for people to remain on site for longer than 1 hour (visit). Meanwhile, the adaptation of the Szarlota cone (II/3) should be carried out in such a way as to ensure maximum commitment to preserving the *status quo* and respecting the scientific values (verism). Effective barriers to access (isolation) should be developed while maintaining and ensuring that the cone structure can be observed from a distance (passive). This is justified on account of the dangers associated with spending time on the cone (the possibility of landslides) and the need to protect it as an element of the landscape, which is a responsibility mandated by law.

The historical values of the lower level of the remaining interior sections stem mainly from the transformations which occurred during the original land use by the mining company (I/3, II/4) or from the absence of objects of historical value (I/1, I/4, II/1, II/2). Nonetheless, the fact that

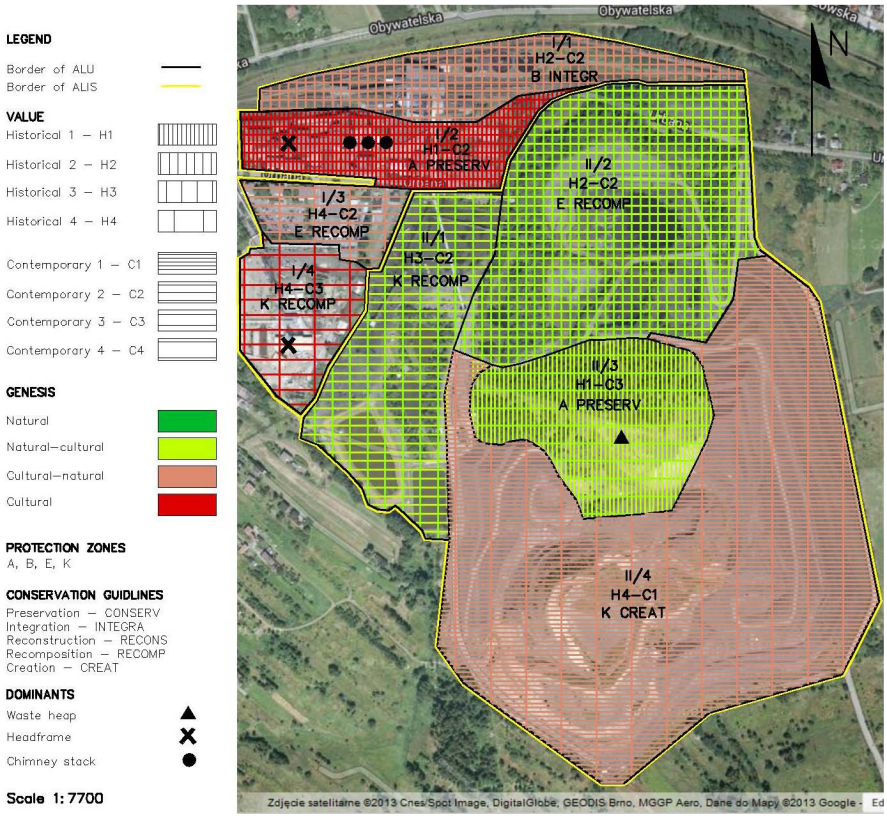

Fig. 5. Value assessment of the Rydułtowy Mine using architectural-landscape units and interiors method (*Source:* own study). Roman numeral means ALU, Arabic numeral means ALIS

such sections lie adjacent to the sections with high historical value leads to conservation activities such as integration and recomposition. Integration involves connecting preserved, but isolated, historical elements into one whole (I/1), whilst recomposition entails creating new value linked to a given historical state (I/3, I/4, II/1, II/4). Compared with their low historical importance, these ALIS exhibit high contemporary value, primarily C1 and C2, with the ALIS forming the newly constructed structure (II/4) having the greatest value. This is due on the one hand to the fact that the structure fulfils the function for which it was designed in a safe and aesthetic form, and on the other hand because of the high degree of the absorption of the landscape[5]. Interior sections I/1, I/3, I/4 and II/1 can – without any harm or damage to the historical and natural resources present – be adapted and converted to serve contemporary functions which rely on the available spatial, technical and structural dynamics (utilitarianism).

Both areas with the incomplete infrastructure (induction) and the existing historical structures (application) can be used to introduce new functions. The approach to managing these ALIS should ensure the possibility of longer stays (multi-hour or full day) (I/3, I/4) or shorter visits

[5] The absorption of the landscape is to be understood as the ability to introduce new elements or to extend existing ones without disturbing the harmony of the landscape.

(more than 1 hour) (I/1, I/2, II/1, II/2). Both, the new structure (II/4) and the settling ponds (II/2) can be objects which make it possible for people to visit or pass through (passage).

Given the actions already undertaken to protect and revitalise the Szarlota landscape structure, it is recommended to also develop a revitalisation plan for the Rydułtowy Hard Coal Mine. The plan should take into account the architectural value of the infrastructure and its importance in strengthening the visibility of this form of heritage. In order to give the overall concept the necessary comprehensiveness and landscape dimension, it should include all remaining elements of the mine and the social infrastructure, and refer in a distinct way to the place where the Charlotte Shaft was once dug.

6. Discussion

The revitalisation of towns with an industrial pasts is a challenge. Even though each situation has to be judged on its own merits, the guidelines for development and re-development of mining towns and regions should be preceded by a thorough inventory and the valorisation of the extant heritage, so as to be able to select the areas and sites which have the largest worth and which best reflect on the regional history and landscape.

In case of Rydułtowy, a map of value assessment was the basis for outlining the guidelines for landscape protection, conservation, ideological directions of adaptation and the optimal methods of adaptation as well as the standards of use for the individual architectural-landscape interior sections, both for the Szarlota structure and the mining plant. They should be included in further conceptual and adaptive work. The method of revitalisation of the mine's infrastructure should diversify the Industrial Monuments Route, without duplicating its existing functions. There are no such typical mining facilities on the Route as heaps.

Apart from Szarlota in Rydułtowy, cases of "celebrating" the conical shape of heaps in the Silesia region are not known. On a large scale, this takes place in Nord-Pas de Calais and Cornwall, where conical heaps have been recognized as valuable elements of the landscape of mining regions and placed on the UNESCO list[6]. Interesting in this context is the research conducted in Estonia's Ida-Viru County on the public perception of the post-mining landscapes, where for nearly 100 years, oil shale has been exploited (Metsaots et al., 2011). A survey performed in 2011-2012 involved local residents and people from outside the county, for a total of 255 respondents. The vast majority of those surveyed offered the same answer to the question: 'What Makes the Landscapes of Ida-Viru County Unique?', namely: 'artificial hills' (n = 247) (Metsaots et al., 2015).

Thinking ahead about the ultimate shape and the form of the revitalisation and the incorporating resource valorisation in the process will ensure that the individual characteristics of the mining facility are preserved and made more prominent. By the same token, incorporating these key characteristics in an integrated process of shaping a post-mining landscape will define their identity over the long run. Forward-oriented thinking about the optimal form of management is also justified in a situation where individual segments of the mine facility are successively shut down and demolition or preservation works are undertaken, which could as well lead to some faulty and irreversible decisions, were valorisation not included.

[6] For example, in the landscape of the French Nord-Pas de Calais mining region 200 landfills remained, 51 of which were inscribed on the UNESCO list (Ostręga 2013).

7. Conclusion

The subject of this study – the mining town of Rydułtowy and its landmark – the Szarlota waste rock landscape, together with the Rydułtowy Hard Coal Mine have undergone valorisation using the Architectural-Landscape Units and Interiors method. The cultural and natural values (historical and contemporary) were analysed and constituted the basis for formulating the guidelines for conservation and adaptation. The valorisation was preceded by a multi-aspect resource analysis and gathering opinions from the community. The regional context has been included as well. HCM Rydułtowy is one of the oldest mines, and the Szarlota Cone is the highest cone in this region. The conclusions of the research are as follows:

- The Rydułtowy town has been associated with the exploitation of hard coal for over 200 years, its landscape has been shaped by mining activity and its inhabitants are emotionally connected with the history of mining.
- The Szarlota Cone is one of 150 waste heaps in the Silesian Region, but as it is preserved in its original condition and as it is the highest in the region, is the subject of "celebration" and pride for the residents.
- The results of the valorisation indicate that the activities undertaken by the mine and the municipality authorities, related to the protection of the historical Szarlota Cone, and the construction of twin cone, but much higher with materials from current operations are very much appropriate. The concept for the landscape structure reflects the philosophy of subjectivism, and this is the dominant conceptual approach for the ALIS located around the Szarlota Cone. The opinion of the authors is that incorporating an industrial icon in a newly designed landscape is a form of preservation of the local identity and a bridge between the past and the future.
- A revitalisation plan taking into account the architectural value of the infrastructure should be elaborated for the Rydułtowy Hard Coal Mine and be connected with all remaining elements of the mines and the social infrastructure.
- The protection of the historical cone, its expansion and revitalisation as the Szarlota landscape structure may enrich the experience of the Industrial Monuments Route in which runs through the Silesian Region and distinguish Rydułtowy from other mining towns. The concept presented in this article also refers back to the trends observed in Europe's mining regions in terms of the methods for managing waste heaps, and hence is a component of Europe's cultural heritage, contributing thus to the consolidation of Europe's identity.

To sum up, the optimal situation is when the mining region has an inventory of industrial heritage and the most valuable are designated for protection and adaptation. In the opposite situation, designers should consider the appropriate geographical scope and methods for valorisation of different resources.

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References

Adamczyk A., 2011. *Kopalnia Węgla Kamiennego Hoym Ignacy 1792-1967-2011*. VERBINUM, Warszawa, 1-113 (in Polish).

Adamczyk A., 2012. *Dzieje Kopalni Węgla Kamiennego Rydułtowy-Anna. Kopalnia Charlotte 1806-1945*. Art Kruk s.c. Rydułtowy, 1-112 (in Polish).

Adamczyk A., 2015. *Kopalnia Węgla Kamiennego Rydułtowy-Anna 1945-2014*. Art. Kruk s.c. Rydułtowy, 1-144 (in Polish).

Bogdanowski J., 1994. *Metoda jednostek i wnętrz architektoniczno-krajobrazowych (JARK-WAK) w studiach i projektowaniu: (podstawowe wiadomości)*. Wydawnictwo Politechnika Krakowska, 1-36 (in Polish).

Cała M. (ed.), 2013. *Mining Waste Management in the Baltic Sea Region*. Min-Novation project. AGH press, 1-264, Available from Internet: www.min-novation.agh.edu.pl

Statistics Poland, 2018. http://www.stat.gov.pl (cited 23 November 2018).

Daniel Terry C., Boster Ron S., 1976. *Measuring landscape esthetics: the scenic beauty estimation method*. Res. Pap. RM-RP-167. U.S. Department of Agriculture, Forest Service, Rocky Mountain Range and Experiment Station, 66.

Filova L., Vojar J., Svobodova K., Sklenicka P., 2015. *The effect of landscape type and landscape elements on public visual preferences: ways to use knowledge in the context of landscape planning*. Journal of Environmental Planning and Management **58**, 11, 2037-2055.

Kepes G., 1995. *Language of Vision*. New York, Dover Publications.

Litwin U., Bacior S., Piech I., 2009. *Metodyka waloryzacji i oceny krajobrazu*. Geodezia, Kartografija i Aerofotoznimannija **71**, 14-25 (in Polish).

Łączny J., Bondaruk J., Janik A., (ed.), 2012. *Problematyka przywracania terenów zwałowisk odpadów powęglowych do obiegu gospodarczo-społecznego*. GIG Katowice, 13-32 (in Polish).

Metsaots K., Printsmann A., Sepp K., 2015. *Public Opinions on Oil Shale Mining Heritage and its Tourism Potential*. Scandinavian Journal of Hospitality and Tourism **15**, 4, Baltic Tourism, 380-399.

Metsaots K., Sepp K., Roose A., 2011. *Evaluation of Oil Shale Mining Heritage in Estonia*. In: Brebbia C.A., Beriatos E. (ed.) Sustainable Development and Planning V. WIT Press, Southhampton, UK, 453-468.

Myczkowski Z., Forczek-Brataniec U., Środulska-Wielgus J., Wielgus K., Rymsza-Mazur W., Chajdys K., 2010. *JARK-WAK 2000 +. Metoda Jednostek i Wnętrz Architektoniczno-Krajobrazowych w realiach XXI wieku* (JARK-WAK 2000 + The Method of Landscape Architectural Units and Interiors on the background of researches In XXI cent.). Conference materials (in Polish).

Myczkowski Z., Wielgus K., Środulska-Wielgus J., Rymsza-Mazur W., Chajdys K., 2008. *Registration of strategic landscape as the basis for revitalising old fortresses*. Conservation News, 28, 36-57. Available from Internet: https://suw.biblos.pk.edu.pl/resources/i4/i8/i3/i9/r4839/MyczkowskiZ_RejestracjaKrajobrazow.pdf (cited 16 December 2015).

Ostręga A., 2004. *Sposoby zagospodarowania wyrobisk i terenów po eksploatacji złóż surowców węglanowych na przykładzie Krzemionek Podgórskich w Krakowie*. Doctoral thesis. AGH UST, Cracow (in Polish).

Ostręga A., 2013. *Organizacyjno-finansowe modele rewitalizacji w regionach górniczych*. Wydawnictwa AGH. Seria rozprawy i monografie, No. 279 Kraków, p. 205 (in Polish).

Polish Mining Group (Polska Grupa Górnicza): https://www.pgg.pl/en (cited 23 November 2018).

Rydułtowy: www.rydultowy.pl (cited 23 November 2018).

Tudor Ch., 2014. *An Approach to Landscape Character Assessment*. Natural England, 1-57.

Van den Berg A., Koole S.L., 2006. *New Wilderness in the Netherlands: An Investigation of Visual Preferences for Nature Development Landscapes*. Landscape and Urban Planning **78** (4), 362-372.