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MAREK MARCISZ[1], ŁUKASZ GAWOR[2], MALWINA KOBYLAŃSKA[3]

Valorization of geotourist and geoheritage objects in the region of Mikołów (USCB, southern Poland)

Introduction

The reasons why geotourism in post-mining facilities has invariably high development potential include, among others, the development of modern tourism products and services of this type that strongly engage visitors and abandon the traditional division into regions predestined for the development of tourism and other regions, as well as increasing emphasis on the cognitive and educational functions of tourism (Migoń 2012).

The Upper Silesian Coal Basin (USCB) represents unique a region with diversity of geotourist and geoheritage attractions. More than 200 years of coal mining and metallurgy development has borne fruit in the form of origin of many interesting industrial objects. Complex geological composition is visible in the terrain as numerous landforms which create paleo-landscapes of different age and genesis (Sikorska-Maykowska 2001).

✉ Corresponding Author: Marek Marcisz; e-mail: marek.marcisz@polsl.pl
[1] Silesian University of Technology, Gliwice, Poland; ORCID iD: 0000-0002-8178-880X; e-mail: marek.marcisz@polsl.pl
[2] Silesian University of Technology, Gliwice, Poland; ORCID iD: 0000-0002-2244-9322; e-mail: lukasz.gawor@polsl.pl
[3] Cuprum Ltd. Research & Development Centre, Wrocław, Poland; e-mail: m.kobylanska@cuprum.wroc.pl

The purpose of this article is to present selected geological, geomorphological and anthropogenic objects in the vicinity of Mikołów (central part of the USCB). The selection was based on the unique and characteristic features of the objects which are connected with their significance on the regional scale. A valorization of different objects was performed which included geotourist, mining heritage and geoheritage sites, particularly quarries, and also unique Quaternary landforms like a moraine ridge from Odra glaciation and lime kilns, linking geology and industry. The issues of the environmental impact of the analyzed objects and sites (Szczepańska and Twardowska 1999), as well as their significance for the post-industrial development of the region and their didactic role are also discussed.

1. Study area

1.1. Situation

The study area is located in the south-western part of the Silesian voivodeship, in Mikołów County (Figure 1). Geographically, the described area is located in Silesian Upland, in the

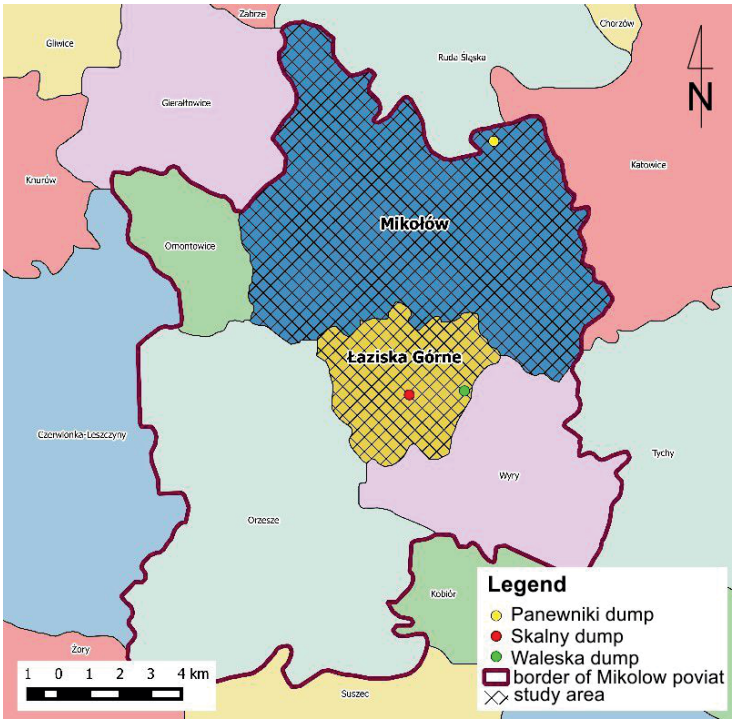

Fig. 1. Location of the study area (self-study)

Rys. 1. Lokalizacja obszaru badań (opracowanie własne)

mesoregion of Katowice Upland. The upland is situated at altitudes approx. 250–300 m a.s.l. The highest acclivity is an outlier of Middle Triassic Brink – St. Dorothea Mountain – 382 m a.s.l., Wanda Hill in Katowice – 357 m a.s.l. and St. Lawrence Mountain in Orzesze – 355 m a.s.l. The Katowice upland is strongly crossed by tectonic faults, there are numerous hummocks, hills and plateaus divided by hollow basins. The main parts forming the terrain of the upland are: Bytom–Katowice Plateau, Mikołów Hummock, Mysłowice Basin and Wysoczyzny Przywyżynne (Kondracki 1998; Buszman B. and Buszman J. 2006).

1.2. Geological composition

The Upper Silesian Coal Basin (USCB, Polish: Górnośląskie Zagłębie Węglowe, GZW) is a coal basin in Silesia, situated in the southern part of Poland and also partly in the Czech Republic (the Ostrava–Karvina Coal Basin) (Figure 2). It is a triangle-shaped synclinal form with an area of about 6,100–7,400 km^2 (Probierz et al. 2012).

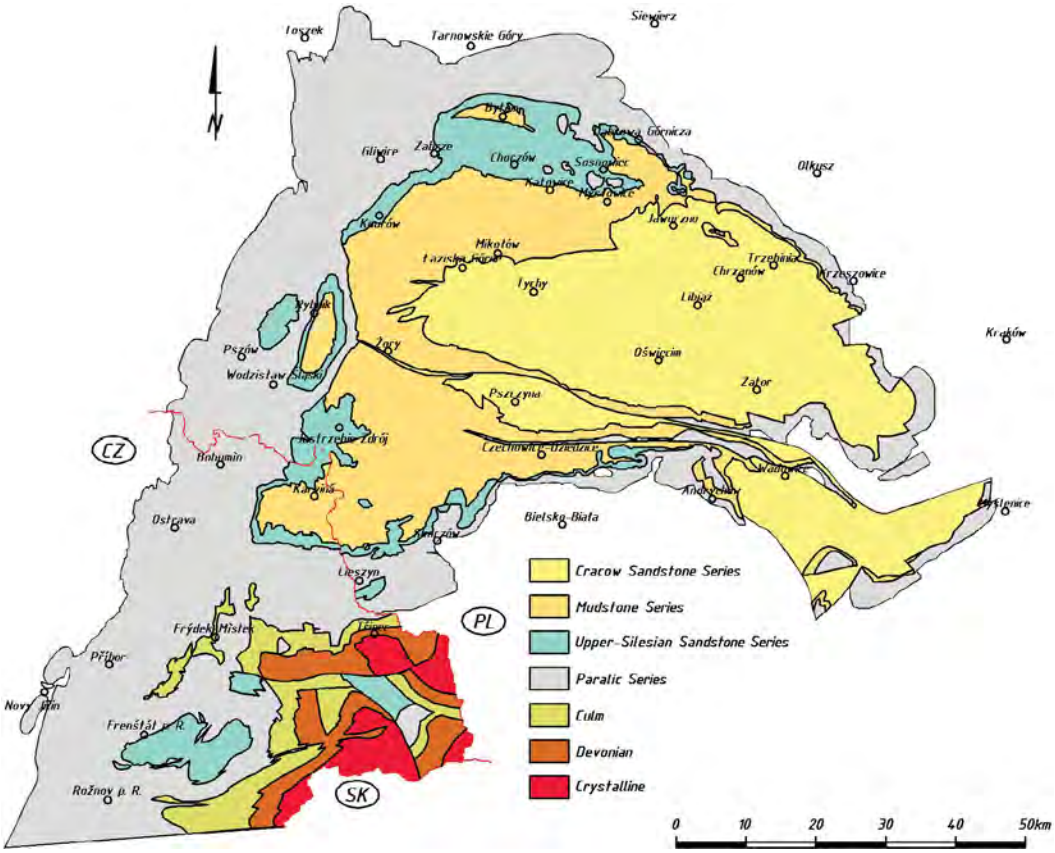

Fig. 2. Geological composition of USCB; after: Probierz et al. 2012

Rys. 2. Budowa geologiczna GZW

The geological structure of the USCB shows a lot of similarities to mountainous and limnic coal basins of the Variscian age in western Europe. The Carboniferous mudstone and sandstone complex with numerous coal seams has a thickness of up to 8,000 meters. The most favorable conditions for coal exploitation occur in the north and southwest of the basin where tectonic uplifting has taken, exposing a part of the Upper Carboniferous coal-bearing formation. There is a great number of mining waste dumps in the USCB, as is also the case in the Ruhr District (Cabała et al. 2004; Gawor 2004).

Carboniferous sedimentary rocks occur on the whole area of the Mikołów county region. They are characterized by their significant thickness, frequently occurring coal seams and high lithological diversification. The Upper Carboniferous system, also known as productive carbon, is represented by paralic deposits (in the lower part) and limnic deposits (in the upper part). In the Upper Carboniferous area, coal-bearing formations are distinguished by the following litostratigraphical series:

- Paralic Series – built of alternately arranged claystones, mudstones and sandstones;
- Upper Silesian Sandstone Series – consisting mainly of sandstones and conglomerates with thick coal seams;
- Siltstone Series – characterized by the dominance of claystones and mudstones over sandstones;
- Cracow Sandstone Series – built of sandstones, conglomeratic sandstones and conglomerates with claystone and mudstone intercalations and small coal seams.

Outcrops of carboniferous rocks can be observed mainly on the hills in the southern and northern part of the city. According to this, in the past, coal was extracted in bootleg mines, using surface methods and short shafts. Traces of these activities can still be found on the area of the town in the form of craters and spoil tips (Gabzdyl and Gorol 2008).

1.3. Geomorphology and hydrology

The contemporary morphology of the USCB is similar to the relief from the pre-mining period. From the geomorphological point of view, the study area represents the Bulge of Mikołów (Polish name Garb Mikołowski). On the elevations of the Mikołów ridge, there is occurrence of outcrops of carboniferous sandstones and Triassic limestones, dolomites and marbles. The tectonic faults are highlighted in the relief in the form of slopes with high inclinations (Dulias 2016; Duda and Szendera 1998).

Katowice Upland is divided by the main watershed of Poland into drainage basins of the Vistula and Oder. Tributaries of Oder are, for example Kłodnica with Bytomka, Chudowski Stream, Promna and Jamna, which flows next to the tip Panewniki. To the Vistula basin belong Biała Przemsza and Czarna Przemsza along with Brynica and Rawa (Dulias and Hibszer 2004).

2. Methodology

The sampling comprised a collection of sedimentary rocks (limestones, dolomites) as well as drilling using a tubular drill (Quaternary deposits – sands, clays). The samples have been described in a way of classical petrographic description.

During the research, an analysis of maps and satellite images of the study area was performed. In order to prepare geomorphological profiles, datasets of the digital elevation model publicly provided by the Centre of Geodetical and Cartographical Documentation were used. Downloaded data was converted using SAGA GIS (2.12) to the SDAT format, which allows further processing. In the next step, prepared data was imported to the QGIS 2.12 Lyon program as a raster layer. Using the profile tool plugin, the altitudinal data was generated along the selected line.

Low-level aerial photographs were also taken (using UAV DJI Go Phantom 4 Pro) in order to determine the precise boundaries of the tips, quarries, landforms and to assess the state of reclamation.

Field studies were carried out in February and June 2021, the collected data and wider observations formed the basis for the geotourist valorization of the visited area. Objects with geoeducational importance were selected for the geotourist valuation in conjunction with the chosen method of valorization and assessment from the point of view of an academic teacher (didactic assets). The valorization method was used for the needs of various types of recipients, taking into account the visual, cognitive, functional and investment value of a given geotourist object (Doktor et al. 2015). This is distinguished by the type of recipient (tourist, educator or investor) and the importance of given assessment criteria (cognitive value, use value, investment conditions and needs) and their components. The methodology was selected due to the purpose of the research, as well as the different perception of geotourist objects by different recipients, which seems to be crucial in terms of meeting their specific needs. In this valorization method, the type of recipient is the educator, and their type – the academic teacher.

3. Geotourist objects

3.1. Carboniferous sandstone quarry in Łaziska

The quarry situated in Łaziska (a small town situated SW of Mikołów) represents Carboniferous sandstones (Figure 3). The inclination of the rock layers is ca. 20°. The inactive quarry of Carboniferous sandstones is an oval pit with steep locally vertical walls reaching around 10 meters high. The exposed sandstones and conglomerates are hard and compact. The sandstones and conglomerates are well-bedded with the domination of cross-bedding. All these features indicate mass, cyclic deposition related to river floods. Vertical fractures

Fig. 3. Carboniferous sandstone quarry in Łaziska (photo by M. Kobylańska)

Rys. 3. Kamieniołom piaskowca karbońskiego w Łaziskach (fot. M. Kobylańska)

can be observed on the walls without displacements of layers, which are interpreted as evidences of tectonic uplift of the Mikołów Bulge. It should be emphasized that the significance of the object is based on different aspects of geology concerning mineralogy, petrography, tectonics and mining.

A petrographic description was compiled of the sandstones of the quarry:

- color – yellowish;
- structure – psammite fraction; degree of encirclement – weak; degree of sorting – multi-grained;
- texture – dense and directional;
- mineral composition – quartz, feldspar, muscovite, irony binder;
- name of the rock – Carboniferous sandstone.

Fig. 4. Carboniferous sandstone – rock sample (photo by Ł. Gawor)

Rys. 4. Piaskowiec karboński – próbka skalna (fot. Ł. Gawor)

3.2. Triassic limestone quarry in Mikołów Mokre

The quarries of limestones, dolomites and marls of gogolin beds are situated in the so-called Fiołkowa Góra area. One of the largest quarries is exposed for tourists (Figure 5). The rocks in the quarry are lower Triassic (243–230 million years BP). The limestones and dolomites are of different thicknesses; marl limestones appear in the upper part of the quarry. The inclination of the rock layers is around 20°. A dense system of cracks makes the rocks well separated (so-called block separation) which was used during the exploitation.

Fig. 5. Quarry of gogolin beds (limestones, dolomites and marls) in Mikołów Mokre – quarry wall and low level aerial photo (photo by Ł. Gawor)
a petrographic description of the limestones of the quarry was made (Fig. 5 left):
color – light yellow; structure – biomorphic; texture – dense and disorderly;
mineral composition – calcite, aragonite; name of the rock – Triassic limestone of gogolin beds

Rys. 5. Kamieniołom formacji gogolińskich (wapienie, dolomity i margle) w Mikołowie Mokrem – ściana kamieniołomu i zdjęcie lotnicze z niskiego pułapu (fot. Ł. Gawor)

Fig. 6. Triassic limestone – rock sample (photo by Ł. Gawor)

Rys. 6. Wapień triasowy – próbka skalna (fot. Ł. Gawor)

Fossils can be found in the limestones – fragments of shells, teeth, bones and scales. This object links interesting issues of mineralogy, petrography, paleontology and mining. In the direct vicinity there is a botanical garden, so there are also botanic didactic paths describing issues of natural succession and connections between lithology and plants (Kojs et al. 2009).

3.3. Quaternary moraine ridge in the Promna Valley

The quaternary moraine ridge is situated in the valley of Promna, a left tributary of Kłodnica. This landform represents a unique relict of Odra (Middle-Polish) glaciation, 300–230 ka BP, which belong to post-glacial landforms that were remodelled by later morphogenetic processes. The described moraine ridge (Figure 7) has undergone strong erosion processes, which results in a morphometry of around 67 meters long and up to 2 meters high. This is a unique glacial landform, very rare in the Upper Silesian Coal Basin and of regional significance. The geological composition has been described during field works after drilling and is presented in Table 1.

Fig. 7. Eroded moraine ridge from Odra glaciation in the valley of Promna (photo by Ł. Gawor)

Rys. 7. Zerodowany grzbiet morenowy ze zlodowacenia Odry w dolinie Promny (fot. Ł. Gawor)

4. Geoheritage and mining heritage objects

4.1. Lime kilns in Mikołów Mokre

Numerous objects related to the former industrial production in Mikołów Mokre area are the lime kilns, which for about 200 years were used for burning limestone in order to obtain quicklime from limestone and dolomite rocks exploited in nearby quarries. This is the largest group of former lime kilns in Poland (Hibszer 2021). The oldest of the furnaces come

Table 1. Geological composition of examined moraine ridge in the Promna Valley (self-study)

Tabela 1. Budowa geologiczna badanego grzbietu morenowego w dolinie Promny (opracowanie własne)

Lithological profile [m]		Depth [m]	Description of lithology	Symb.	Layer	Hum.	Type	Number of rolling	St.	Carb class
			Soil	S	I	w				
		0,18	Sandy clay	Sc	II	w	c	1	hpl	I
- 0,5		0,3	Sandy clay	Sc	III	w	c	1	hpl	I
- 1		0,76	Loamy sand	Ls	IV	d	nc	0		I
- 1,5										

from the end of the 18th and early 19th century, while the latest comes from the beginning of the 20th century (Grzesiak and Trzepierczyński 2015). Two lime kilns have been renovated and incorporated into the Natural Path on the outskirts of the Silesian Botanical Garden in 2003. The lime kilns in a very good way show the connection between open-pit mining and the use of local material for construction purposes and for local entrepreneurship. Currently, as many as fourteen of these types of objects can be found in the Mikołów Mokre area. They significantly differ by size, shape, technical condition and the state of preservation (Figure 8).

Fig. 8. Diversity of lime kilns in Mikołów Mokre (photo by M. Kobylańska)

Rys. 8. Różnorodność wapienników w Mikołowie Mokrem (fot. M. Kobylańska)

5. Valorization of geological and anthropogenic objects

The geotourist valorisation of selected geological and anthropogenic objects was performed on the basis of a methodology that includes a set of evaluations, taking into account the visual, cognitive, utility and investment needs of the given geotourist area. In the used valorization method, the type of recipient is an educator and their type is an academic teacher. The averaged results of the two independent geotourist valorizations of four selected objects/sites conducted by the authors are presented in Tables 2–5. The valorization research was conducted for the twelve lime kilns that had not been the subject of renovation works. They can be considered as one possible post-industrial attraction in the form of, for example, the lime kilns route.

Conclusions

According to the valorization methodology used, the primary evaluation criteria for educators are the cognitive and functional values of the objects/sites, and the visual values of

the facility is the secondary criterion (Doktor et al. 2015). The highest result of the overall performed valorization of the analyzed objects from the point of view of the recipient (the academic teacher) was obtained by the Triassic limestone quarry in Mikołów Mokre (67.6% of possible points), and the lowest by the moraine ridge in the Promna Valley (31.1%). The carboniferous sandstone quarry in Łaziska and the unrevitalized lime kilns in Mikołów Mokre obtained 37.2% and 35.8%, respectively. The scores also indicate high visual (81% on average) and cognitive values of the objects (49.3%), especially in terms of geodiversity, the dominant element and cultural links. The quarry in Mikołów Mokre has the highest visual value (100%), the lime kilns in this town has 83% and the quarry in Łaziska, 75%. The quarry in Mikołów Mokre also obtained the highest cognitive value (72%), followed by the lime kilns (48%). Low ratings of the functional (37.8% on average) and investment (only 23.78% on average) values of the objects result mainly from the state of preservation, the lack of tourist infrastructure and the lack of their promotion as an important part of the industrial and cultural heritage of the region. In case of the unrevitalized lime kilns, this is also the result of negligence with regard to the proper fast and proper protection of deteriorated facilities.

Recognition of the values of the remains of all changes that mining and other industries has brought to a given region (environmental, spatial, economic, social changes) is the basis for appreciating and maintaining the diversity of tangible and intangible cultural heritage for future generations (Kobylańska and Gawor 2017). In this aspect, as confirmed by the research results (e.g. the assessment of the cognitive value of the moraine ridge – 25% and the lime kilns – 28%), major shortcomings should be indicated in the access to detailed historical and technical information about the analyzed objects.

Due to the superiority of the didactic process (geotouristic assets), educators prefer facilities with high geoeducational values and cultural links (Słomka and Mayer 2010), and the analyzed facilities undoubtedly fit these criteria. This is evidenced by the visual and cognitive values of the quarries and the lime kilns (cultural landscape architecture). The dominant problem of the assessed area is the poor condition of the objects and their insufficient security and protection as well as the lack of tourist infrastructure (benches, toilets) and the insufficient number and content of information panels. According to the authors, investment in a viewpoint in one of the lime kilns with the inside exhibition of artifacts about the industrial history of the region would also significantly increase its educational and cognitive value.

The quality of the educational process carried out in the former mining facilities of the region may also be increased by combining objects of high cognitive value into one thematic walking route with clearer signage. This would make it possible to structure and increase the possibility of transferring knowledge during field teaching, and any other form of sightseeing, regardless of the type of recipient, because the high historical value and the nature of the relics of old mining works allow the coverage of all thematic areas related to industry in the Mikołów region.

Table 2. Results of geotourism valorization of Carboniferous sandstone quarry in Łaziska

Tabela 2. Wyniki waloryzacji geoturystycznej kamieniołomu piaskowca karbońskiego w Łaziskach

1. Visual values (sum: 4.5/6 pt)	1.1. Prominence in the landscape (distinct: 1 pt)		
	1.2. Dominating element (2.5/3 pt.)	size (distinct: 0.5 pt)	
		shape (distinct: 1 pt)	
		color (distinct: 1 pt)	
	1.3. Naturalness of landscape (undeveloped area: 1 pt)		
	1.4. Outlook (absent: 0 pt)		
2. Cognitive values (sum: 11/30 pt)	2.1. Geodiversity (10/20 pt)	number of readable features (geomorphology, mineralogy, paleontology, petrography, sedimentology, stratigraphy, tectonics, recent geological processes: 8 pt)	
		preservation (partly visible: 1 pt)	
		uniqueness (local scale: 0 pt)	
		representativeness (yes: 1 pt)	
		appearance in the literature (0/3 pt)	scientific, international (no: 0 pt)
			scientific, domestic (no: 0 pt)
			popular science (no: 0 pt)
	2.2. Cultural links (1/5 pt)	geomithology (legends, cults, cult sites) (absent: 0 pt)	
		historical/archeological importance (absent: 0 pt)	
		mining, industrial, technical heritage (present: 0.5 pt)	
		industrial stones in construction and architecture (present: 0.5 pt)	
		others (artistic, cultural landscape, history of science) (absent: 0 pt)	
	2.3. Additional values (0/5 pt)	specific fauna/flora habitat (absent: 0 pt)	
		form of domestic legal protection (0/3 pt)	site protection (absent: 0 pt)
			areal protection (absent: 0 pt)
			cultural monument (absent: 0 pt)
		international appreciation (absent: 0 pt)	
3. Functional values (sum: 8.5/22 pt)	3.1. Accessibility (5.5/7 pt)	availability (limited: 0.5)	
		transport modes (less than 100 m from the object) (2/3 pkt.)	public transport (absent: 0 pt)
			private transport (present: 1 pt)
			bike trail (present: 1 pt)
		pedestrian access (below 0.5 km distance to object: 1 pt)	
		trail difficulty rating (easy: 2 pt)	
	3.2. Location of other tourism objects (up to 1 km) (1/3 pt)	natura objects (undeveloped: 0.5 pt)	
		cultural objects (undeveloped: 0.5)	
		settlement with services (absent: 0 pt)	

3. Functional values (sum: 8.5/22 pt)	3.3. trip hazards (present/absent: 0.5 pt)		
	3.4. Tourism infrastructure (1/5 pt)	parking lot (present: 1 pt)	
		technical and sanitation infrastructure (picnic sites, toilets, litter bins) (absent: 0 pt)	
		gastronomic facilities on site (absent: 0 pt)	
		accommodation (within 1 km distance) (absent: 0 pt)	
		blazed trails in the vicinity (tourist, thematic, etc.) (absent: 0 pt)	
	3.5. Blazing (0/2 pt)	blazed access to the object e.g. maintained and blazed route or trail (present: 0.5 pt)	
		information on site e.g. information panels (absent: 0 pt)	
	3.6. Information about the object (0.5/4 pt)	general information materials	available on site e.g. contents of information panels (absent: 0 pt)
			available outside the object e.g., webpages, leaflets (present: 0.5 pt)
		geoeducational information materials (popular science)	available on site e.g. contents of information panels (absent: 0 pt)
			available outside the object e.g., webpages, folders (absent: 0 pt)
4. Investment values (conditions and needs) (sum: 3.5/16 pt)	4.1. Tourist flow e.g. Defert indicator (low: 0 pt)		
	4.2. Form of ownership (private: 0 pt)		
	4.3. Protection regime (no protection: 0)		
	4.4. Development level (3.5/10 pt)	road infrastructure	paved road (unnecessary: 1 pt)
			pathway (necessary: 0.5 pt)
		range of maintenance works	conservational (low: 1 pt)
			protective (moderate: 0.5 pt)
		blazing	connection routes e.g., blazed pathway, tourist trail (necessary: 0 pt)
			within object e.g. information panels, blazed trails within the areal object (necessary: 0 pt)
		tourism infrastructure facilities	gastronomic facilities on site (necessary: 0 pt)
			accommodation within 1 km distance from the object (necessary: 0 pt)
			parking lot (necessary: 0.5 pt)
			technical and sanitation facilities e.g., toilets, litter bins, picnic sites (necessary: 0 pt)
	4.5. Geotourism information (0/3 pt)	information panels (necessary: 0 pt)	
		printed materials (necessary: 0 pt)	
		virtual materials (internet) (necessary: 0 pt)	

Own study on the base of Doktor et al. 2015.

Table 3. Results of geotourism valorization of Triassic limestone quarry in Mikołów Mokre

Tabela 3. Wyniki waloryzacji geoturystycznej kamieniołomu wapienia triasowego w Mikołowie Mokrem

1. Visual values (sum: 6/6 pt)	prominence in the landscape (distinct: 1 pt)		
	1.2. Dominating element (3/3 pt.)	size (distinct: 1 pt)	
		shape (distinct: 1 pt)	
		color (distinct: 1 pt)	
	1.3. naturalness of landscape (undeveloped area: 1 pt)		
	1.4. outlook (present: 1 pt)		
2. Cognitive values (sum: 21.5/30 pt)	2.1. Geodiversity (15.5/20 pt)	number of readable features (geomorphology, hydrology, mineralogy, paleontology, pedology, petrography, sedimentology, stratigraphy, tectonics, recent geological processes: 9.5 pt)	
		preservation (distinct: 2 pt)	
		uniqueness (local scale: 0 pt)	
		representativeness (yes: 1 pt)	
		appearance in the literature (3/3 pt)	scientific, international (yes: 1 pt)
			scientific, domestic (yes: 1 pt)
			popular science (yes: 1 pt)
	2.2. Cultural links (4/5 pt)	geomithology (legends, cults, cult sites) (present: 0.5 pt)	
		historical/archeological importance (present: 1 pt)	
		mining, industrial, technical heritage (present: 1 pt)	
		industrial stones in construction and architecture (present: 0.5 pt)	
		others (artistic, cultural landscape, history of science) (present: 1 pt)	
	2.3. Additional values (2/5 pt)	specific fauna/flora habitat (absent: 0 pt)	
		form of domestic legal protection (2/3 pt)	site protection (present: 1 pt)
			areal protection (present: 1 pt)
			cultural monument (absent: 0 pt)
		international appreciation (absent: 0 pt)	
3. Functional values (sum: 13/22 pt)	3.1. Accessibility (4.5/7 pt)	availability (full: 1)	
		transport modes (less than 100 m from the object) (1/3 pkt.)	public transport (absent: 0 pt)
			private transport (absent: 0 pt)
			bike trail (present: 1 pt)
		pedestrian access (over 0.5 km distance to object: 0.5 pt)	
		trail difficulty rating (easy: 2 pt)	
	3.2. Location of other tourism objects (up to 1 km) (1.5/3 pt)	natura objects (developed: 0.5 pt)	
		cultural objects (developed: 1 pt)	
		settlement with services (absent: 0 pt)	

3. Functional values (sum: 13/22 pt)	3.3. trip hazards (present: 0 pt)		
	3.4. Tourism infrastructure (1/5 pt)	parking lot (absent: 0 pt)	
		technical and sanitation infrastructure (picnic sites, toilets, litter bins) (absent: 0 pt)	
		gastronomic facilities on site (absent: 0 pt)	
		accommodation (within 1 km distance) (absent: 0 pt)	
		blazed trails in the vicinity (tourist, thematic, etc.) (present: 1 pt)	
	3.5. Blazing (2/2 pt)	blazed access to the object e.g. maintained and blazed route or trail (present: 1 pt)	
		information on site e.g. information panels (present: 1 pt)	
	3.6. Information about the object (4/4 pt)	general information materials	available on site e.g. contents of information panels (present: 1 pt)
			available outside the object e.g., webpages, leaflets (present: 1 pt)
		geoeducational information materials (popular science)	available on site e.g. contents of information panels (present: 1 pt)
			available outside the object e.g., webpages, folders (present: 1 pt)
4. Investment values (conditions and needs) (sum: 9.5/16 pt)	4.1. Tourist flow e.g. Defert indicator (medium: 0.5 pt)		
	4.2. Form of ownership (state: 1 pt)		
	4.3. Protection regime (low: 0)		
	4.4. Development level (5.5/10 pt)	road infrastructure	paved road (unnecessary: 1 pt)
			pathway (unnecessary: 1 pt)
		range of maintenance works	conservational (low: 1 pt)
			protective (high: 0 pt)
		blazing	connection routes e.g., blazed pathway, tourist trail (unnecessary: 1 pt)
			within object e.g. information panels, blazed trails within the areal object (unnecessary: 1 pt)
		tourism infrastructure facilities	gastronomic facilities on site (necessary: 0 pt)
			accommodation within 1 km distance from the object (necessary: 0 pt)
			parking lot (necessary: 0.5 pt)
			technical and sanitation facilities e.g., toilets, litter bins, picnic sites (necessary: 0 pt)
	4.5. Geotourism information (2.5/3 pt)	information panels (unnecessary: 1 pt)	
		printed materials (unnecessary: 1 pt)	
		virtual materials (internet) (necessary: 0.5 pt)	

Own study on the base of Doktor et al. 2015.

Table 4. Results of geotourism valorization of moraine ridge in the Promna Valley

Tabela 4. Wyniki waloryzacji geoturystycznej grzbietu morenowego w dolinie Promny

1. Visual values (sum: 4/6 pt)	prominence in the landscape (distinct: 1 pt)		
	1.2. Dominating element (2/3 pt.)	size (distinct: 1 pt)	
		shape (distinct: 1 pt)	
		color (distinct: 0 pt)	
	1.3. naturalness of landscape (undeveloped area: 1 pt)		
	1.4. outlook (absent: 0 pt)		
2. Cognitive values (sum: 12/30 pt)	2.1. Geodiversity (12/20 pt)	number of readable features (geomorphology, mineralogy, paleontology, pedology, petrography, sedimentology, stratigraphy, tectonics: 8 pt)	
		preservation (partly visible: 1 pt)	
		uniqueness (country scale: 1 pt)	
		representativeness (yes: 1 pt)	
		appearance in the literature (1/3 pt)	scientific, international (no: 0 pt)
			scientific, domestic (no: 0 pt)
			popular science (yes: 1 pt)
	2.2. Cultural links (0/5 pt)	geomithology (legends, cults, cult sites) (absent: 0 pt)	
		historical/archeological importance (absent: 0 pt)	
		mining, industrial, technical heritage (absent: 0 pt)	
		industrial stones in construction and architecture (absent: 0 pt)	
		others (artistic, cultural landscape, history of science) (absent: 0 pt)	
	2.3. Additional values (0/5 pt)	specific fauna/flora habitat (absent: 0 pt)	
		form of domestic legal protection (0/3 pt)	site protection (absent: 0 pt)
			areal protection (absent: 0 pt)
			cultural monument (absent: 0 pt)
		international appreciation (absent: 0 pt)	
3. Functional values (sum: 5.5/22 pt)	3.1. Accessibility (3/7 pt)	availability (full: 1)	
		transport modes (less than 100 m from the object) (1/3 pkt.)	public transport (absent: 0 pt)
			private transport (absent: 0 pt)
			bike trail (present: 1 pt)
		pedestrian access (no pathway: 0 pt)	
		trail difficulty rating (moderate: 1 pt)	
	3.2. Location of other tourism objects (up to 1 km) (1/3 pt)	natura objects (no: 0 pt)	
		cultural objects (developed: 0.5 pt)	
		settlement with services (present: 0.5 pt)	

3. Functional values (sum: 5.5/22 pt)	3.3. trip hazards (absent: 1 pt)		
	3.4. Tourism infrastructure (0.5/5 pt)	parking lot (absent: 0 pt)	
		technical and sanitation infrastructure (picnic sites, toilets, litter bins) (absent: 0 pt)	
		gastronomic facilities on site (absent: 0 pt)	
		accommodation (within 1 km distance) (absent: 0 pt)	
		blazed trails in the vicinity (tourist, thematic, etc.) (present: 0.5 pt)	
	3.5. Blazing 0/2 pt)	blazed access to the object e.g. maintained and blazed route or trail (absent: 0 pt)	
		information on site e.g. information panels (absent: 0 pt)	
	3.6. Information about the object (0/4 pt)	general information materials	available on site e.g. contents of information panels (absent: 0 pt)
			available outside the object e.g., webpages, leaflets (absent: 0 pt)
		geoeducational information materials (popular science)	available on site e.g. contents of information panels (absent: 0 pt)
			available outside the object e.g., webpages, folders (absent: 0 pt)
4. Investment values (conditions and needs) (sum: 1.5/16 pt)	4.1. Tourist flow e.g. Defert indicator (low: 0 pt)		
	4.2. Form of ownership (private: 0 pt)		
	4.3. Protection regime (no protection: 0 pt)		
	4.4. Development level (1.5/10 pt)	road infrastructure	paved road (necessary: 0 pt)
			pathway (necessary: 0 pt)
		range of maintenance works	conservational (low: 1 pt)
			protective (moderate: 0.5 pt)
		blazing	connection routes e.g., blazed pathway, tourist trail (necessary: 0 pt)
			within object e.g. information panels, blazed trails within the areal object (necessary: 0 pt)
		tourism infrastructure facilities	gastronomic facilities on site (necessary: 0 pt)
			accommodation within 1 km distance from the object (necessary: 0 pt)
			parking lot (necessary: 0 pt)
			technical and sanitation facilities e.g., toilets, litter bins, picnic sites (necessary: 0 pt)
	4.5. Geotourism information (0/3 pt)	information panels (necessary: 0 pt)	
		printed materials (necessary: 0 pt)	
		virtual materials (internet) (necessary: 0 pt)	

Own study on the base of Doktor et al. 2015.

Table 5. Results of geotourism valorization of 12 lime kilns in Mikołów Mokre

Tabela 5. Wyniki waloryzacji geoturystycznej 12 wapienników w Mikołowie Mokrem

1. Visual values (sum: 5/6 pt)	prominence in the landscape (distinct: 1 pt)		
	1.2. Dominating element (3/3 pt.)	size (distinct: 1 pt)	
		shape (distinct: 1 pt)	
		color (distinct: 1 pt)	
	1.3. naturalness of landscape (scattered settlement: 0.5 pt)		
	1.4. outlook (present: 0.5 pt)		
2. Cognitive values (sum: 14.5/30 pt)	2.1. Geodiversity (7.5/20 pt)	number of readable features (others: 2.5 pt)	
		preservation (partly visible: 1 pt)	
		uniqueness (local scale/country scale: 0.5 pt)	
		representativeness (yes: 1 pt)	
		appearance in the literature (2.5/3 pt)	scientific, international (yes: 0.5 pt)
			scientific, domestic (yes: 1 pt)
			popular science (yes: 1 pt)
	2.2. Cultural links (4.5/5 pt)	geomithology (legends, cults, cult sites) (present: 0.5 pt)	
		historical/archeological importance (present: 1 pt)	
		mining, industrial, technical heritage (present: 1 pt)	
		industrial stones in construction and architecture (present: 1 pt)	
		others (artistic, cultural landscape, history of science) (present: 1 pt)	
	2.3. Additional values (2.5/5 pt)	specific fauna/flora habitat (absent: 0 pt)	
		form of domestic legal protection (2.5/3 pt)	site protection (present: 1 pt)
			areal protection (present: 0.5 pt)
			cultural monument (present: 1 pt)
		international appreciation (absent: 0 pt)	
3. Functional values (sum: 6.25/22 pt)	3.1. Accessibility (1.75/7 pt)	availability (limited: 0.5)	
		transport modes (less than 100 m from the object) (0.5/3 pkt.)	public transport (absent: 0 pt)
			private transport (absent: 0 pt)
			bike trail (present: 0.5 pt)
		pedestrian access (no pathway/over 0.5 km distance to object: 0.25 pt)	
		trail difficulty rating (difficult/moderate: 0.5 pt)	
	3.2. Location of other tourism objects (up to 1 km) (2/3 pt)	natura objects (undeveloped/developed: 0.75 pt)	
		cultural objects (undeveloped/developed: 0.75 pt)	
		settlement with services (absent/present: 0.5 pt)	
	3.3. trip hazards (present: 0 pt)		

3. Functional values (sum: 6.25/22 pt)	3.4. Tourism infrastructure (0.5/5 pt)	parking lot (absent: 0 pt)	
		technical and sanitation infrastructure (picnic sites, toilets, litter bins) (absent: 0 pt)	
		gastronomic facilities on site (absent: 0 pt)	
		accommodation (within 1 km distance) (absent: 0 pt)	
		blazed trails in the vicinity (tourist, thematic, etc.) (present: 0.5 pt)	
	3.5. Blazing (0.5/2 pt)	blazed access to the object e.g. maintained and blazed route or trail (present: 0.25 pt)	
		information on site e.g. information panels (present: 0.25 pt)	
	3.6. Information about the object (1.5/4 pt)	general information materials	available on site e.g. contents of information panels (present: 0.5 pt)
			available outside the object e.g., webpages, leaflets (present: 0.5 pt)
		geoeducational information materials (popular science)	available on site e.g. contents of information panels (present: 0.25 pt)
			available outside the object e.g., webpages, folders (present: 0.25 pt)
4. Investment values (conditions and needs) (sum: 0.75/16 pt)	4.1. Tourist flow e.g. Defert indicator (low: 0 pt)		
	4.2. Form of ownership (private: 0 pt)		
	4.3. Protection regime (no protection/low: 0)		
	4.4. Development level (0.75/10 pt)	road infrastructure	paved road (necessary: 0 pt)
			pathway (necessary: 0 pt)
		range of maintenance works	conservational (high: 0 pt)
			protective (high: 0 pt)
		blazing	connection routes e.g., blazed pathway, tourist trail (necessary: 0 pt)
			within object e.g. information panels, blazed trails within the areal object (necessary: 0.25 pt)
		tourism infrastructure facilities	gastronomic facilities on site (necessary: 0 pt)
			accommodation within 1 km distance from the object (necessary: 0 pt)
			parking lot (necessary: 0.5 pt)
			technical and sanitation facilities e.g., toilets, litter bins, picnic sites (necessary: 0 pt)
	4.5. Geotourism information (0/3 pt)	information panels (necessary: 0 pt)	
		printed materials (necessary: 0 pt)	
		virtual materials (internet) (necessary: 0 pt)	

Own study on the base of Doktor et al. 2015.

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VALORIZATION OF GEOTOURIST AND GEOHERITAGE OBJECTS IN THE REGION OF MIKOŁÓW (USCB, SOUTHERN POLAND)

Keywords

USCB, geotourist valorization, geoheritage, mining heritage, Mikołów

Abstract

Skilful preservation of the cultural landscape on the basis of post-industrial facilities, including post-mining facilities and geoheritage objects, may contribute to a positive change in the functionality of abandoned or degraded sites. The article presents selected geological, geomorphological and anthropogenic objects in the vicinity of Mikołów (central part of the USCB, southern Poland). Their evaluation in the context of being the part of unique cultural landscape created by historical mining activities was carried out. The detailed geotourist valorisation of 4 selected geoheritage and mining heritage objects/sites was carried out in the scope of their current state, potential and the level of preparation for possible fulfilling the educational functions. The research outputs and valorization results presented in the article allowed to draw conclusions and formulate recommendations for the development of the analyzed geotourist objects and sites in terms of the implementation of the didactic process, characterised by specific requirements. As a result of the performed valorization of the analyzed objects, from the point of view of the recipient (academic teacher), the best result was obtained by the Triassic limestone quarry in Mikołów Mokre, and the lowest moraine ridge in the Promna Valley. The obtained results also showed high visual and cognitive values of the objects, especially in terms of geodiversity, the dominant element and cultural connections, where the Mikołów quarry also showed the highest value. Low ratings of the utility and investment values of these objects result mainly from the state of preservation, the lack of tourist infrastructure and the lack of their promotion as an important part of the industrial and cultural heritage of the region.

WALORYZACJA OBIEKTÓW GEOTURYSTYCZNYCH I DZIEDZICTWA GEOLOGICZNEGO W REJONIE MIKOŁOWA (GZW, POŁUDNIOWA POLSKA)

Słowa kluczowe

GZW, waloryzacja geoturystyczna, dziedzictwo geologiczne, dziedzictwo górnicze, Mikołów

Streszczenie

Umiejętne zachowanie krajobrazu kulturowego na bazie obiektów poprzemysłowych, w tym obiektów pogórniczych i obiektów dziedzictwa geologicznego, może przyczynić się do pozytywnej zmiany funkcjonalności obszarów opuszczonych lub zdegradowanych. W artykule przedstawiono wybrane obiekty geologiczne, geomorfologiczne i antropogeniczne w okolicach Mikołowa (centralna część GZW, południowa Polska). Dokonano ich oceny w kontekście przynależności do unikatowego krajobrazu kulturowego utworzonego przez historyczną działalność górniczą. Przeprowadzono

szczegółową waloryzację geoturystyczną 4 wybranych obiektów/obszarów dziedzictwa geologicznego oraz górniczego w zakresie ich stanu obecnego, potencjału oraz stopnia przygotowania do ewentualnego pełnienia funkcji edukacyjnych. Zaprezentowane w artykule wyniki badań i waloryzacji pozwoliły na wyciągnięcie wniosków i sformułowanie rekomendacji dla zagospodarowania analizowanych obiektów i stanowisk geoturystycznych pod kątem realizacji procesu dydaktycznego, charakteryzującego się określonymi wymaganiami. W rezultacie przeprowadzonej waloryzacji analizowanych obiektów, z punktu widzenia odbiorcy (nauczyciela akademickiego), najlepszy wynik uzyskał triasowy kamieniołom wapienia w Mikołowie Mokrem, natomiast najniższy grzbiet morenowy w Dolinie Promnej. Uzyskane efekty wykazały również wysokie walory wizualne i poznawcze obiektów, zwłaszcza w zakresie georóżnorodności, elementu dominującego i powiązań kulturowych, gdzie najwyższą wartość wykazał również mikołowski kamieniołom. Niskie oceny walorów użytkowych i inwestycyjnych badanych obiektów wynikają głównie ze stanu zachowania, braku infrastruktury turystycznej oraz braku ich promocji jako ważnej części dziedzictwa przemysłowego i kulturowego regionu.