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Post-Industrial Areas Management, Evaluation of the Area's Suitability for Redevelopment – Case Study

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INTRODUCTION

The phasing-out of many entities in the mining and metallurgical industry resulted in the abandonment of places where these activities were carried out. As a result, in developed urban areas, often in centers of cities or districts, extensive undeveloped, often degraded areas have emerged where no revitalization process has been carried out. Selling out single facilities or plots of land, unclear ownership structure prevent the implementation of a homogeneous, holistic program to give new functionality to many such areas.
The starting point for determining the direction of re-development of a degraded post-industrial area is to gather as complete knowledge about it as possible:

- the origin of the area and the type of activity carried out thereon,
- the causes of degradation, the effects of activities that are experienced to this day and may be experienced in the future, or that will come to light only in the future,
- the ways of neutralizing the negative impact of harmful or hazardous substances contained in the ground,
- the existing buildings or their remains,
- the road and rail infrastructure,
- the structures under the surface,
- the services in the area, access to a variety of energy utilities,
- the historic value of the structures,
- the specificity of the natural environment that may have developed on the degraded area, or the specificity of the environment surrounding the area,
- the geological specificity,
- the water specificity,
- the ownership structure of the land and the structures located thereon.

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KEY ASPECTS RELATED TO THE SELECTION OF LAND FOR REDEVELOPMENT

The process of selecting the area and bringing it to reuse is connected with consideration of the issues indicated in the introduction. The following are factors that may hinder or prevent this process.

1. Waste from the mining and processing of metal ores, collected on permanent dumping grounds or in settlement ponds, both during operation and after the end of the entity's activity, constantly threatens the environment – harmful or hazardous substances get into the soil and water. The inclusion of an area where solid or liquid waste is collected for use will be associated with an expensive and lengthy reclamation process (Hałdy Górnicze..., 2019).
2. The coal processing technologies used for many decades of the 20th century resulted in solid waste heaps receiving waste from coal refining processes (waste rock) not thoroughly cleaned of coal. As a result of the accumulation of flammable substances in the heaps, the pressure inside the heaps often resulted in spontaneous combustion of the heap. Extinguishing a heap on fire is extremely expensive.
3. Lack of infrastructure. The existence of road infrastructure, utility infrastructure, or access to energy and communication media may be important in the selection of land for planned investments. As mentioned above, post-industrial areas are generally located in highly urbanized areas, which provides relatively easy access to the necessary installations, but the heaps or settlers themselves may be completely deprived of such installations
4. Legal restrictions. Privatization transformations, land shredding and the sale of individual plots of land and buildings could lead to a situation where the ownership structure of the land is not clear. This may effectively deter investors interested in the convenient location of the selected area.
5. Incomplete data. Local spatial information systems provide good support in obtaining data on the selected area, but are not able to provide comprehensive information, which should then be supplemented with data from other sources (scientific studies, published analysis results, etc.), or data obtained from deliberately commissioned specialist studies and expert opinions.

CHARACTERISTICS OF THE AREA UNDER ANALYSIS

The technologies used to process non-ferrous metal ores such as zinc and lead over many decades of the 20th century have caused a number of negative effects on the surroundings of the plants involved in these activities. The impact of the ore processing, its shredding, associated dusting, waste generation and storage and the effects of all these elements have been piled up over the following decades of the operation of the plants. The disgraceful tendency to leave the land uncultivated after the end of the activity has resulted in the risk of

harmful effects on health and the environment becoming apparent many years later (Nieć, Salamon and Auguścik 2018).

On the area selected for analysis, a zinc ore processing activity was carried out for over 100 years.

The described area is located in Wełnowiec – a district of Katowice. The area is located between Korfantego Avenue and Konduktorska Street. It covers an area of 37 hectares. It housed Wełnowiec Zinc Works (Zakłady Cynkowe Wełnowiec), operating since 1870 (then called Hochenlohe, later Wełnowiec), until the 1980s. In 2005, the historic, although ruined, distillation furnace hall building was liquidated. In buildings stretched along the Korfantego Ave and in the buildings in the northern part of the area a number of companies have their headquarters.

Fig. 1 View of the area after the Wełnowiec Zinc Works: 1. Korfantego Avenue, 2. Konduktorska Street, 3. Headquarters of companies. 4. Place after the furnace hall, 5. Water reservoir, 6. Part of the Wełnowiec Heap (Hałda Wełnowiecka)

Source: based on (MSZ-KIIP, 2020)

The area to the west and north-west is limited by a sequence of buildings adapted to the needs of the entities operating here. On the northern side it is

adjacent to the “Pod Laurą” community garden. The south-eastern area is enclosed by a building which is the headquarters of many companies. The western part of the southern border is a part of Konduktorska Street. One hundred meters to the south-east of the area rises the reclaimed Wełnowiec Heap.

The analyzed area hides concrete foundations of once functioning buildings under the surface. The western and southern ends of the foundations of the demolished hall have the character of slopes, 2.5 m high. Due to the existence of these slopes, the height of the area is not uniform. The land falls are violent, running along the hall's foundation lines.

CASE STUDY

An exploratory analysis of the area after the Wełnowiec Zinc Works is presented in Tables 1 to 31. The analysis is based on selected parts of the post-industrial area assessment procedure developed by M. Pierściński and B. Białecka (Pierściński and Białecka, 2014).

Tables 1 to 4 contain information related to the location of the site.

Table 1 Proper name or brief description of the area

Area after the Wełnowiec Zinc Works.

Table 2 Code and location

Area code	Place:	Municipality:	Poviat:	Post code:	Street, no.:
-	**Katowice**	**Katowice**	**Bytom**	**40-145**	**Korfantego**

Table 3 GPS coordinates – outermost points

N 50° 28' 81,05" N 19° 02' 30,71" E	**E 50° 28' 64,71" N 19° 03' 05,46" E**	**S 50° 28' 02,20" N 19° 02' 12,90" E**	**W 50° 28' 02,20" N 19° 01' 88,01" E**

Source: own study based on (OnGeo Reports, 2020)

Table 4 Size of the area

37 ha

Table 5 lists the plot numbers.

Table 5 Post-industrial area registration plot numbers

1/14, 1/17, 4/91, 4/92, 4/383, 4/386, 4/454, 4/487, 4/495, 4/496, 4/487

Source: own development based on https://ongeo.pl/ (OnGeo Reports) and Urban Management System

Table 6 and Table 7 contain data on the legal status and forms of land ownership.

Table 6 Information on whether the legal status of the area is regulated

Yes	No	No data

Table 7 Ownership structure

Form of ownership	Share in ownership (in % of the land area)
State Treasury	27%
Local government unit (communal, county or voivodeship)	7%
Legal persons	66%
Natural persons	0%

The structure of ownership is illustrated in Figure 2.

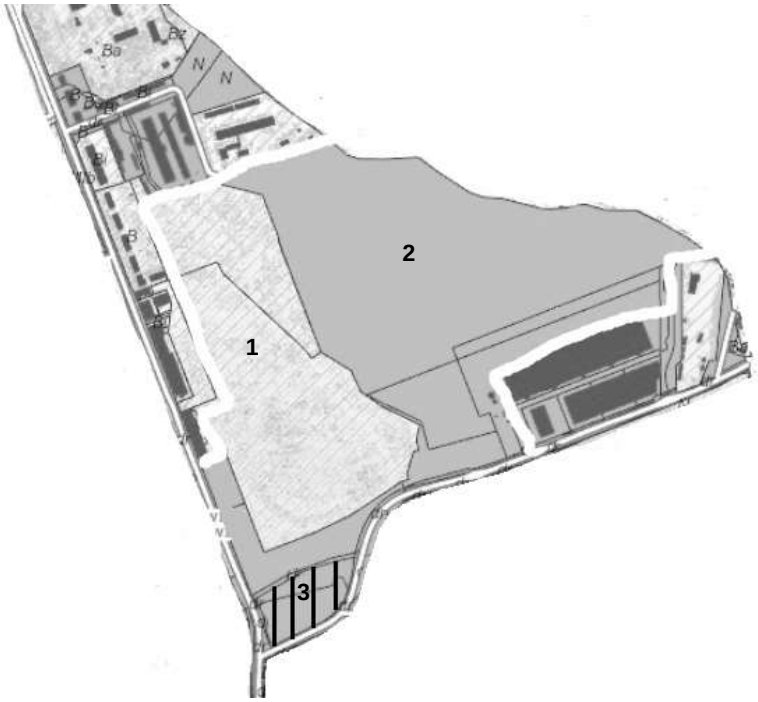

Fig. 2 Ownership structure of the area after the Wełnowiec Zinc Works:
1. Ownership by the State Treasury with perpetual usufruct,
2. Ownership or joint ownership by legal persons,
3. Ownership by the Municipality without perpetual usufruct

Table 8 Requirement for immediate intervention

Yes	**No**

Tables 9 to 13 show the infrastructure existing in the area: utilities and building status.

Table 9 Supply of the area with utilities (networks in the area)

Type	Yes	No
Electricity	**X**	
Water system	**X**	
Sanitary sewage system	**X**	
Combined sewage system	**X**	
Storm water drainage	**X**	
Gas	**X**	
Central heating		**X**
Telecommunications network	**X**	
Other (specify)	**Unidentified residues of former installations**	

Source: own study based on (MSZ–KIIP, 2020)

The area is equipped with installations from previous development. Gas, water supply and electrical installation is carried out from Korfantego Avenue and Konduktorska Street. A terrestrial power network is laid across the area, supporting itself on several poles.

Table 10 Presence of buildings

Built-up area	**Non-built-up area**	No data

Table 11 General description of existing cubature facilities (names, cubic capacity, initial and current use, ownership)

Currently an undeveloped area, which contains foundations of the buildings that used to exist there

Table 12 General technical condition of the development

Good	Bad	Difficult to determine
Not applicable	**Not applicable**	**Not applicable**

Table 13 Do existing infrastructure structures require an expert opinion on their technical condition? If so, specify which structures

-

Tables 14 and 15 describe the location of elements of the external communication infrastructure and media relative to the area.

Table 14 Local road and railway infrastructure

Road or railway facilities	**Road/railway line number**	**Distance from the area**
Nearest existing provincial, poviat or municipal road	**DK 79** **Korfantego Avenue** **Konduktorska Street**	**2 km** **runs along the area** **runs along the area**

Table 15 Local industrial lines near the area

Type of infrastructure	Distance from the area
Water system	**remains of a former installation in the ground and a water supply system in Korfantego Avenue Ø 600 mm**
Sanitary collector	**remains of a former installation in the ground and a manifold in Korfantego Avenue and Konduktorska Street**
Medium voltage power line	**Within the area**
Gas pipeline	**Within the area**

Source: own study based on (MSZ–KIIP, 2020)

Table 16 and Table 17 show the location of pollution emitters and landfills relative to the site.

Table 16 Local air pollution emitters

Emitter's vicinity	Yes	No
The area is adjacent to the sewage treatment plant – distance less than 500 m		**X**
The area is adjacent to a functioning point emitter of air pollution – distance less than 500 m		**X**
Sewage treatment plant within the area		**X**
Point emitter of air pollution within the area		**X**

Table 17 Unused landfills

Facility	Distance (m)	Notes on nuisance
Unused municipal landfill	-	-
Unused industrial landfills	200 m	**Recultivated Wełnowiec Heap**

Table 18 General internal evaluation of the communication system

Type	General description (degree of development, technical condition)
Road network and car parks	**None**
Rail infrastructure	**None**
Other (footpaths, bicycle paths, horseback riding paths, lifts, etc.)	**None**

The following table shows the type of current land use.

Table 19 General types of current use of the area

	Yes	No
Production and services		**X**
Housing		**X**
Communication and transport		**X**
Recreation in the open air		**X**
Arranged greenery or nature conservation		**X**
Open waters		**X**
Agriculture		**X**
Unused area	**X**	
Other (specify)		

Table 20 sets out a document directing future land use, in Table 21 the activity that led the site to a degraded form.

Table 20 A document specifying the directions of future use of the area

Local area development plan	**X**	Study of land management conditions and directions	

Table 21 Activity that caused degradation

Energy sector		Machinery industry		Industrial waste depository		Opencast mining	
Metal industry		Construction industry		Municipal waste management		Underground ore mining	
Chemical industry		Paper industry		Wastewater treatment		Aggregate extraction	
Coke industry		Textile industry		Cement factory		Sand extraction	
Iron industry		Wood industry		Transport business		Rock mining	
Metallurgy of non-ferrous metals		Food processing		Underground coal mining		Peat exploitation	

Tables 22, 23 and 24 show the structure of site pollution with specific substances.

Table 22 Presence of waste in the area

Types of waste (classification according to Waste Act)	Present	Not present	No data
Hazardous	**X**		
Municipal		**X**	
Other than hazardous	**X**		
Neutral			**X**

Table 23 Is the area polluted?

Yes	**X**	No		no data	

Table 24 What types of substances cause contamination?

type of contaminant	Yes	No	no data (but contamination is highly probable)
metals	**X**		**lead, arsenic, thallium, nickel, cadmium**
organic compounds (other than pesticides)		**X**	
gas emissions		**X**	
pesticides		**X**	
other (specify)	**X**		**sulphides oxidizing to sulphuric acid for decades**

Source: Own study based on (Nieć, Salamon and Auguścik 2018)

Below, Table 25 provides additional information about the site, while Table 26 and Table 27 suggest directions for re-developing the site.

Table 25 Additional relevant area information (e.g. occurrence of slopes above 15%, ponds, ditches, shallow underground voids, especially large parking areas or storage yards, garages, extensive bushes, wild animals, etc.)

The analyzed area hides concrete foundations of once functioning buildings under the surface. The western and southern ends of the foundations of the demolished hall have the character of slopes, 2.5 m high. Due to the existence of these slopes, the height of the area is not uniform. The land falls are violent, running along the hall's foundation lines. At the southern end of the area, in the corner between the intersection of Korfantego Avenue and Konduktorska Street there is a reservoir of standing water of 0.49 ha. It is used as a receiver of water from the rainwater drainage system

Table 26 Suggested preferences for development directions in the light of the origin of the area

Production sites	Service building sites	Residential buildings	Communication and transport sites	Sport and recreation in the open air	Greenery, nature
X	**X**	**X**			

Table 27 Possibility of multifunctional development (work-housing-rest) in the light of the origin of the area and its size (only areas over 20 ha)

Yes, after eliminating the risks associated with the activities carried out in this area	No.

Information on whether there are groundwater intakes near the described area is given in Table 28, while Table 29 informs whether the area is included in the area covered by the program "Environmental resources protection,

strengthening the system of protected areas and multifunctional development of open areas – preferred functions economic".

Table 28 Main groundwater reservoirs and intakes

Criterion	Yes/No
Presence of groundwater intake	**Not present**
Location in a protection zone of the groundwater intake	**No**
Location within main groundwater reservoirs	**No**

Table 29 Road facilities of supra-local importance

Road facilities	Road no.	Distance
Nearest motorway or expressway	**DTŚ 902** **A1**	**3.7 km** **4 km**
Nearest national road	**DK 94**	**1.7 km**
Nearest motorway junction	**A1 and A4**	**23 km**

Source: own study based on (Google Maps, 2020)

Tables 30 and 31 contain data on distances from the terrain to roads and objects of supra-local importance.

Table 30 Is the area within the zone defined as "Protection of environmental resources, strengthening the system of protected areas and multifunctional development of open areas – preferred economic functions?"

Yes	**No**

Table 31 Other facilities related to transport of supra-local importance

Facility	Name	Distance
Road border crossing point	**Chałupki**	**73 km**

Source: own study based on (Google Maps, 2020)

CONCLUSION

The analyzed area is in the vicinity of both the residential zone (Józefowiec housing estate) and industrial areas. The location and good communication with the center of Katowice means that objects of residential, service and economic nature or combining these functions could be located here.

This should be preceded by specialized tests for the content of hazardous substances in the soil and the determination of how to counteract any possible risks.

A constant process is the improvement of solutions restoring areas to function within the city structure. Examples include clusters, cooperation networks, information, communication and monitoring platforms, surveys or environmental audits (Bondaruk and Pilch, 2013, Tereny Poprzemysłowe i Zdegradowane jako integralna..., 2020, Michalski and Szczęśniak, 2015, Ligarski, 2018, Szczęśniak, et al., 2018). In a situation where spaces located in the vicinity of city centers are highly desirable for investors, it is important to properly identify and develop post-industrial areas meeting this criterion. The key to choosing the right direction for the development of such an area is to collect full data thereon.

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Abstract: The transformation of the Polish economy during the period of its transformation from a planned socialist economy into a market economy resulted, among others, in the emergence of a large number of post-industrial areas which are no longer used. Located often in developed urban areas, with many disadvantages such as contamination or unstable ownership status, they are not of interest to investors. Exploiting the potential they undoubtedly have would in many cases require the investment of considerable resources, but in order for these to be allocated to the investment, the investor expects to gain complete knowledge of the character and specificity of the place. The article is an example of a preliminary analysis of a selected post-industrial area, which helps to outline the direction of future area redevelopment.

Keywords: degraded post-industrial area, revitalization