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## **THE PRESENT AND THE FUTURE OF MINING TOWNS AND CITIES – DIFFERENT FACES OF MINES**

### **Introduction**

Quite a lot of research into the present state and the future of cities tends to be focused on mining towns and cities. It is reflected in a wide range of publications as well as in the popularity of conceptual designs for development of areas or facilities connected with mining. The reason for this is the variety and complex nature of phenomena and problems occurring in mining towns or cities, which determine both their present image and the possible directions of future transformations. Researchers from different fields study economic and social issues related to the growth of mining centres, but they also focus on aspects of key significance to urban spaces, landscape and natural environment, including: the way the mining operations affect their environs, the use and aesthetic function of post-mining facilities and their role in the development of a city or town after the raw materials have stopped being mined, or re-naturalisation of areas degraded by mining operations.

The rank of the signalled problems has been defined by the sheer number of mining towns and cities, where the tradition of excavating natural materials frequently goes hundreds or thousands years back. There are numerous such areas in the world, they are also present in our country. One of the largest European mining regions is the Ruhr District (*Ruhrgebiet*) in north-west Germany, or in Poland – Upper Silesia Coal Basin (*Górnośląskie Zagłębie Węglowe*), Legnica-Głogów Copper District (*Legnicko-Głogowski Okręg Miedziowy – LGOM*), sulphur basin in the Świętokrzyskie and Podkarpackie Voivodships as well as numerous sites of rock material surface mining situated mostly in mountainous and upland areas, inter alia in the Carpathians, the Sudetes, the Świętokrzyskie Mountains and in the Kraków-Częstochowa Jurassic Highland.

Regardless of the concentration of mining facilities and their accompanying industrial plants, mining regions are usually highly urbanised areas, encompassing large agglomerations and conurbations, many of which perform the function of key economic and social metropolitan centres in the scale of the whole country. The *Metropole Ruhr* confirms the above statement – it is an area comprising eight cities with populations exceeding 100 thousand people, including Dortmund, Essen and Duisburg, and the joint population of more than 5 million.<sup>1</sup> In Poland the largest urbanised mining region is the Silesian Agglomeration, comprised of 19 towns and cities with the joint population of over 2 million people.<sup>2</sup> The presented data

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<sup>1</sup> Based on the data published at website [www.metropoleruhr.de](http://www.metropoleruhr.de).

<sup>2</sup> According to the statistical data provided by the Statistical Office in Katowice, as of the 31<sup>st</sup> Sept. 2006.

indicate that the problems associated with the contemporary development of mining towns and cities are important not only in Poland and Germany, but also in other countries where mining and further processing of native natural resources are of considerable economic significance.

The problems discussed further on in the article are closely connected with urban space. They are illustrated by examples of various mines in Poland and abroad which remain in diverse relations with the structure of the town or city since some of them are situated within densely developed urban areas (such as the mines in Wieliczka, Bochnia or Essen), at the city outskirts (the mines in Regensburg) or in open areas of the suburbs (the surface mines of the Cottbus Industrial Region, the KGHM *Polkowice-Sieroszowice* mine). Regardless of the different spatial relations – mines and their towns or cities remain inseparably bound in the functional as well as visual and compositional aspects.

### **Contemporary image and problems of mining towns and cities.**

Mining towns and cities make a numerous and varied group. The fundamental factor differentiating mining centres is the method of mining. Among the commonly used techniques of excavation two are of the greatest importance for cityscapes: surface and underground mining, the latter also called sub-surface mining. The selection of method depends largely on the type of the excavated mineral. Aggregates, including rocks, sands and gravels as well as brown coal tend to be excavated in surface mines, of which the most common are quarries. Other minerals in turn, such as hard coal, metal ores (iron, copper, zinc, lead, chromium, gold, silver, platinum and others) and chemical minerals (e.g. rock salt, potassium and magnesium salts) are most commonly extracted in underground mines.

Each method of mining brings certain consequences for the urban space, in particular the accumulation of various industrial elements, such as: surface pits and sub-surface chambers, shaft buildings with winding towers, engineering facilities related to the process of raw material excavation, including appliances and machines, structures of different functions, including industrial plants for further processing of the extracted mineral, open areas and many others. Mining towns and cities also have a characteristic culture and tradition as well as symbolic imagery expressed *inter alia* in nomenclature and architectural detail.

Besides the raw material excavation method, the factor that distinguishes different mining towns and cities from each other is the condition of the mine, which may be in one of the three basic phases:

- the phase of mining operation on an industrial scale;
- the phase of gradual wind-down of the mining operations and initiating the process of closing down the mine;

- the phase in which the mine exists as a facility but has definitely ceased any excavation operations and the closing down process has been completed.

The fact that a mine remains in one of the phases listed above is of key significance for the condition of the city space, its current transformations and future development potential .

When it is in the phase of industrial scale mining operations, the mine is perceived primarily as a mining company, whose functioning may contribute considerably to the economy and social life of a town or city. However, as regards cityscape an active mine causes a number of conflicts, whose scale and character also depend on the method of material excavation. The most obvious of negative aspects of underground mining operations is the occurrence of mining damages, which not only bring about degradation of urban structure components, such as development, roads or technical infrastructure, but also pose a threat to the land forms, underground and surface waters as well as vegetation. In the case of surface mining the adverse influence on urban development is limited, it should be remembered, however, that surface mining interferes radically into the landscape and entails a complete transformation of the land surface within the boundaries of the working pit and in its direct vicinity.

Another way in which the presence of a mine manifests itself in the space of a town or city is the visual and compositional significance of mining facilities, especially their dominance over the cityscape. Winding towers above underground mine shafts play a particular role in this respect – they are very characteristic engineering structures, which are commonly identified with mining. In many towns or cities they are the key element of the urban composition, a determinant of the local identity, a landmark and reference point in the area. Majestic shaft winding towers dominate the skyline of the aforementioned Ruhr District, Silesian cities and towns, in Wieliczka near Kraków and in many other centres of underground mining all over the world. Surface mines play a lesser, yet also important, role in shaping the visual aspect of the landscape. Due to their horizontal arrangement, large area and colouring and texture that are different from its surroundings, surface pits are distinctly visible in the cityscape, and sometimes they constitute an unusual background or closure for the views from the outside and inside of the urban structure. Such situation may be observed for example in Kraków, where many places offer views over the walls of former quarries in Podgórze.

Regardless of the mining method, active mines are isolated from the city space. Due to the specific character of mining works and the related hazards, active mines are fenced away and guarded, which not only denies access to outsiders, but also blocks the view inside the mine area. Thus actively operating mines may contribute to the disintegration of urban fabric and become bothersome spatial barriers. They are perceived as degraded, dangerous and hostile areas, deteriorating the city space overall quality and unattractive for an average user.

The phase of a mine's active operation is always limited in time. Some historic mines, such as salt mines in Wieliczka and Bochnia, continued extracting the mineral for over seven centuries, yet "the lifespan" of an average mine is usually much shorter. It is determined by various factors, usually of economic and technical nature. There are many reasons why the volume of excavated material in a mine is systematically reduced, which eventually leads to the complete cessation of operations and the mine close-down. The essence of this phase is the process of closing down, which is regulated by the provisions of relevant acts of law.<sup>3</sup>

The primary objective of a mine close-down is restoring the site to the conditions existing prior to the commencement of the mining operations and removal of all the mining facilities whose further existence finds no rationale. Due to the considerable differences in the spatial transformation brought about by underground and surface mining methods, the character and scope of closing down such mines are different. In the case of underground facilities, the closing down process always encompasses filling up tightly all the underground post-excavation cavities, including the mine shafts, reclamation of mining waste heaps as well as complete or partial demolition of the structures built on the surface of the site. Closing down of surface mines is focused on filling up or securing surface pits and restoring environmental balance to the excavation area. The fate of surface pits may be different depending on their size and the type of the mined mineral. Defunct surface pits in brown coal mining areas are usually filled up with earth and replanted with vegetation. On the other hand worked pits in mines extracting aggregates – sands, gravels and rocks, are first appropriately secured and subsequently left empty or filled with water, and thus they remain tangible remnants of the former mining operations.

The phase of closing down a mine is a critical moment in its existence, from the point of view of shaping mining towns and cities' spaces and their appeal it is the most important stage. It is so because it is not merely a process of repairing the damages and alleviating the conflicts brought about by the mining operations, but also a period of transforming a specific cultural heritage which is the direct consequence of mining. In practice numerous elements of this heritage are subject to irreversible destruction and elimination from the city space in the process of the mine close-down. It is particularly true for underground mining towns and cities, where a mine close-down usually entails the loss of the most important and most attractive elements, i.e. the underground worked pits and shaft winding towers.

Completion of a mine close-down process also means its definite end as an industrial plant. Depending on the scope and method of the close-down, the image of the closed mine may be very different. In extreme cases the whole mine is destroyed "returning" to the town or city the whole hitherto occupied area. As a rule, however, some post-mining facilities remain within the urban structure – transformed to different degrees, yet bearing witness to their

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<sup>3</sup> The requirements that must be fulfilled by entities undertaking mining operations in Poland, including the rules of mine close-downs, are specified in the act of the 9<sup>th</sup> June 20011 – *Geological and Mining Law* (J. of L. of 2011, No 163, item 981 as amended).

former industrial function and preserving a part of the local identity. In the case of surface mines they are secured remnants of worked surface pits, while as regards underground mines, with a few exceptions, only surface structures are preserved.

The sites of defunct mines, together with all the development on the surface, are in general transferred to the local governments, which may dispose of them at their will. It should be remembered that in many cities post-mining sites are located near the centre, they are fully outfitted with the necessary infrastructure and easily accessible by any means of transport. They are thus attractive areas for location of significant municipal functions but at the same time they may be subject to market play, speculation and lobbying from private investors. The situation is usually reflected in the further fate of post-mining sites and facilities. Some of them are sold or leased for new forms of economic operations, for obvious reasons unrelated to the former function of the site. On the other hand, many towns and cities undertake efforts – with various results – to make some post-industrial use of the preserved post-mining facilities considering them an important part of their heritage and identity. Such actions are usually undertaken under the banner of “redeveloping the mine”, i.e. bringing it back to life after a longer or shorter period of disuse.

The decision to redevelop the site of the mine and its facilities after it has ceased its mining operations and the close-down process has been completed is of fundamental significance for the future of mining towns and cities. Two basic factors determine the future:

- the condition and variety of post-mining elements left in the urban space after completion of the mine close-down process as well as
- the form and scope of the post-industrial use of those elements for the purpose of stimulating the development of the town or city.

The point of reference for the above issues is “authenticity” – the condition necessary for preservation of historic identity of an urban space and increasing its utility and aesthetic value by introducing new unconventional functions.

### **The role of surface and underground mines in urban spaces – guidelines for shaping the future of mining towns and cities.**

In the discussion of the problem so far I have presented briefly various aspects of the influence exerted over towns and cities by their mining function as well as emphasised the special role of this function in building the identity and specific character of the urban space. Two different faces of mines emerge from this discussion – actively operating industrial enterprises or defunct facilities subjected to the close-down process. Both in the former and in the latter case mines may constitute an important foundation for shaping the future of mining towns and cities, contributing significantly to the increase of their appeal if they are transformed into public utility facilities of an interesting form and function. For many mining

towns and cities it is the challenge of the present day, yet difficult to rise to. Success depends on many factors, the most important of which is the necessary preservation of the mine's authentic character and giving due prominence to its original elements.

As has been already stated, active mining establishments are most often perceived through the aspect of their bothersome function generating spatial conflicts, which are the reasons for which the mine is excluded from the city life and not integrated into its fabric. It could be assumed, however, that the mining operations are interesting as such, and a functioning mining enterprise has its cognitive and visual merits. For this reason some mines are made accessible to broader circles of users, becoming tourist attractions of a kind as well as places of education and science. It is true, however, only for enterprises operating in surface mining of materials, especially brown coal mining. For instance, active mines of the Cottbus Industrial District (Germany) perform the tourist function, and so do similar facilities in Poland – in Bogatynia (the *Turów* Brown Coal Mine) and in Bełchatów. The German mines are particularly worth paying attention to as they are accompanied by well organised tourist and educational infrastructure in the form of pedestrian pathways and cycling tracks, theme routes presenting various scientific issues in the fields of mining and geology as well as vantage points, from which all the stages of mining works in progress could be directly observed: uncovering the deposit, extracting the material with the use of various machinery and finally the reclamation of the post-excitation sites (Fig. 1).



Fig 1. Brown coal surface mine *Tagebau Jänschwalde* in the German Cottbus Industrial District – a view from an observation terrace at a cycling track (photo by the author, 2013). The display of the site of the mine enables visitors to watch all the stages of mining works: coal extraction (in the middle), uncovering the deposit for extraction (on the right) and reclamation of the post-excitation sites (on the left).

Another interesting establishment successfully combining mining with recreational and educational activities is the surface mine *Friedrich-Zeche* in Regensburg-Dechbetten. A small area has been marked out of the excavation site and turned into an cosy park with educational routes and a vantage point over a vast panorama of the mining pits (Fig. 2). The park features an exhibition of mining locomotives and freight cars as well as the of the raw materials that are mined at the site – brown coal, aggregates of different fractions and clay. The area has been outfitted with a dozen or so boards explaining various issues related to the geological structure of the site and the origin, properties and economic significance of

the mined materials. Some of them also present visualisations of the plans for developing the mine site after all the mining operations have been completed. It should also be noted that within the area of the mine there are several enclaves of preserved greenery together with sites of plant species under protection, which proves that business activity does not have to necessarily entail destruction of valuable natural resources.



Fig 2. The panorama of the surface mine *Friedrich-Zeche* in Regensburg, Germany (photo by the author, 2013). An organised park of the recreational and educational function (to the left) borders directly on the site where brown coal and other minerals are actively mined (to the right).

The German examples presented above may be considered models to be copied by other towns and cities related to surface mining. Giving an operating mine new functions – unrelated to industry – helps maintain the facility's mining operations and at the same time puts the authentic and untransformed elements resulting from the said operations on display. It also promotes better integration of the town or city with the mining sites, which to a certain degree become attractive public spaces.

It may be relatively easy to add a function going beyond industry to the regular operations of a surface mine. It is considered more controversial, though, when it comes to underground mining enterprises. Because going down into underground mining pits poses considerable safety hazards and access to such pits is significantly limited by shafts or adits, operating underground mines – in spite of their indisputable appeal – remain facilities which are isolated from the city space and almost inaccessible for people who are not the mine employees. It seems, however, that if safety measures were strictly observed and the mine's work appropriately organized, it would be possible for underground pits to accommodate visitors and perform the function of tourist sites. Such function has been – to a limited degree – introduced into the copper ore mine *Polkowice-Sieroszowice* in Lower Silesia. Having obtained relevant permit and upon completion of training, visitors to the mine may admire caves bored in deposits of pure rock salt in the part of the mine called *Kazimierzów* (Fig. 3). It can hardly be called organised mass tourism, although if the possibility of seeing the unique scenery of this mine's underground pits was more available, it would certainly give a stimulating impulse to local tourist industry.





Fig. 3. One of the mining pits in the deposits of pure rock salt at the *Polkowice-Sieroszowice* mine, a part of the *KGHM Polska Miedź* concern (photo by the author, 2007). An element of the tourist route is *inter alia* the underground machinery park.

Any underground or surface mine, which – besides its basic mining operations – carries on some other unconventional forms of business activity, should be the highlight of a city development plan – as a unique area of authentic mining culture. The above recommendation refers to the towns and cities which will be able to preserve the mining operations in a longer time perspective. In reality, however, towns and cities where minerals are no longer mined comprise a more numerous group. The key issue in such places is how to use the now defunct mine for new purposes and what are the options of incorporating these facilities back into the urban space. The contemporary discussion on this issue focuses on the development and landscape significance of mining waste heaps and surface pits – particularly quarries, which tend to be identified with all post-mining areas. Simultaneously, the potential role of underground pits is commonly overlooked, with a few exceptions of distinguished historic sites under legal protection, such as worked salt pits in Wieliczka and Bochnia.

The problem of reclamation and post-industrial use of surface mining pits has been relatively well researched by spatial planning and urban design specialists.<sup>4</sup> A broad range of possible new functions that may be introduced into defunct quarries are discussed, most of them related to recreation, education, science or culture. Special panoramic values of surface mines in the cityscape are also emphasised. However, at this point it is worth taking note of another, rarely considered aspect of surface pits' duration and how they change in time. In the process of post-industrial redevelopment of mining sites, the areas transformed by mining excavation are most frequently reclaimed by *inter alia* filling them up with water and

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<sup>4</sup> The contemporary significance as well as possibilities and directions of using areas of defunct surface mining facilities are subject of numerous academic conferences and publications; particularly interesting among them is the publication entitled *Kształtowanie krajobrazu terenów poeksploatacyjnych w górnictwie*, Kraków 2003, which contains proceedings of the conference of the same title.

replanting. Additionally, exposed pit surfaces, especially in mines extracting loose aggregates or soft rocks, are subject to rapid erosion and natural succession of vegetation. The result of these processes is gradual loss of the surface mines' original character, which turn from industrial spaces into attractive, yet unauthentic areas of dominant natural features (Fig. 4). Hence in order to preserve the specific cultural heritage of mining towns and cities, surface mining pits must be managed and maintained on a permanent basis, which, however, does not preclude the option of their adaptation so that they could still perform the functions attributed to wildlife areas.



Fig. 4. Remnants of an extensive worked surface pit in a sand mine at the outskirts of the city of Amberg in Germany. Due to the progressing and uncontrolled ecological succession seizing the area, the mine has almost completely lost its original industrial character, although it may be claimed that it has become an attractive wildlife spot (photo by the author, 2013).

An important problem concerning the future of mining towns and cities is also redevelopment of defunct underground mines. A lot of attention is paid to the “revitalisation” of these facilities, i.e. putting them to some new uses after a shorter or longer period of disuse. Analysis of Polish and foreign examples allows us to draw the conclusion that the popular understanding and practice of underground mines redevelopment identifies it with adaptation of the preserved complexes of shaft structures so that they can be used as public utility or commercial facilities. The present fate of Silesian collieries *Gottwald* and *Ferdynand* in Katowice prove the above thesis<sup>5</sup> – the first one has been transformed into a centre of commerce and entertainment and the other into the seat of the Silesian Museum – still under construction.

It could be assumed that regardless of what is the mine's final function, revitalisation bestows new significance on defunct mining facilities and makes possible their further use and preservation in the city space. Nevertheless, it must be emphasised that revitalisation understood as “bringing the mine back to life” is marked by an essential fault. It is preceded by a period of “absence of life,” when – following the close-down of the mining company – the most valuable mining elements are subject to degradation or complete destruction. It refers primarily to the network of underground pits – invisible in the city space, yet

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<sup>5</sup> See: Franta J., *Rewitalizacja obszarów poprzemysłowych – dwa przykłady – jedno podejście* [in:] *Czasopismo techniczne*, 3-A/2012, issue 12, vol. 109, published by Politechnika Krakowska, Kraków 2012, pp. 145-150.

undoubtedly constituting the essence of underground mines. Although overlooking mining pits in the process of underground mines redevelopment undermines their authentic character as industrial facilities, underground spaces of such mines are as a rule left unused. Such was the case *inter alia* of the *Zollverein* colliery in Essen (the Ruhr District), which is often considered a model example of a successful redevelopment of urban post-industrial areas.

Preservation and subsequent adaptation of worked underground pits in closed-down subsurface mines is a very difficult task, dependant on complex technological and economic factors, yet it is important and necessary from the point of view of the mining towns and cities' future. It seems that a possible solution to this problem would be to initiate the process of adapting the mine together with its worked pits already during the close-down process, or even earlier, which would eliminate or considerably shorten the detrimental period when the mine is "unused." In such case we would not be talking about "revitalisation" at all, since the essence of the whole process would not be "bringing back to life," but its harmonious "prolongation."

## Conclusions

It could be concluded from the contents of this article, illustrated by representative examples of mining towns and cities, that mining as one of many branches of industry exerts a significant influence over the city space. Mining operations in urbanised areas are the source of numerous conflicts and hazards, on the other hand they have created an added value for their towns and cities in the form of a specific cultural heritage. The rank of this value is manifested in the visual and compositional role of mining and post-mining facilities as well as in their adaptation potential – regardless of the functioning phase of the given mine. In general it should be stated that mining used to be the foundation of economic existence of many towns and cities and the main determinant of their spatial development. Now it still defines the direction in which these towns and cities will develop in the future.

Considering the above issue in greater detail, several recommendations may be formulated regarding the possibility of using mining facilities to stimulate the growth of contemporary towns and cities:

- a. as regards industrial towns and cities with actively operating mines** – it is possible, or even necessary, to incorporate mines into the city space by partial adaptation and making the mine more accessible to the general public while preserving its primary mining function, which would serve giving the mine's assets their due prominence as an industrial facility and presenting the vivid and authentic mining culture;
- b. as regards post-industrial towns and cities seeking new foundations for growth as extraction of minerals has been completed and the mines closed** – it is essential to preserve the whole variety of post-mining facilities, including underground and surface

worked pits, in their original condition, and subsequently adaptation of these facilities to the functions which would increase the town or city attractiveness. The necessary condition for fulfilling this task is coordinating the redevelopment programmes and projects with the close-down process of the mine, which creates a chance of effective protection of the mine's most important elements from unwanted transformations.

It should be emphasised that meeting the above criteria requires changing the hitherto prevailing approach of local authorities, designers and mining companies' management to the revitalisation process of post-mining areas. First of all, effective instruments for achieving the outlined objectives must be introduced, especially in the sphere of spatial planning and mining law.

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2. Franta J., *Rewitalizacja obszarów przemysłowych – dwa przykłady – jedno podejście* [in:] *Czasopismo techniczne*, 3-A/2012, issue 12, vol. 109, published by Politechnika Krakowska, Kraków 2012.
3. *Kształtowanie krajobrazu terenów poeksploatacyjnych w górnictwie*, collective work, Kraków 2003.
4. Act of 9<sup>th</sup> June 2011 *Geological and Mining Law* (J. of L. of 2011, No 163, item 981).
5. [www.metropoloeruhr.de](http://www.metropoloeruhr.de)

#### **Abstract**

The article focuses on the contemporary role of mining and post-mining facilities, especially mines themselves, in the process of spatial reconstruction of towns and cities connected with surface or underground mining of minerals. It presents the possible conflicts and hazards resulting from mining operations in urbanised areas and emphasises the role of mining in creating the specific character of the urban space, its attractiveness and adaptation potential. Two problems – important for the functioning of towns and cities and for their future – have been considered:

- giving the functioning mining facilities additional functions going beyond their industrial operations while maintaining minerals extraction as the main form of their business activity;
- transformations of defunct mines in the process of adapting them to other functions, in particular preserving the original character of surface worked pits as well as positive and negative aspects of underground mines revitalisation.

The reference point for the whole analysis is the “mine’s authentic character” as the factor determining the preservation of the historic identity of mining towns and cities.

**Key words:** urban space, mining, surface and underground mines, functional adaptation, revitalisation