Adaptation of the architectural and infrastructural post-industrial heritage of underground mines for museum functions in southern Poland

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This article addresses the problem of developing disused underground mines for museum purposes in cities and towns in southern Poland. Following the reduction in mining activities and the collapse and liquidation of many industrial plants in the region – developments related to both the global situation and the political transformation of the late twentieth century – many localities lost their previous economic basis for development. One of the strategies often used in such situations is revitalisation through culture. Establishing museums in underground mines, which in southern Poland have a history dating back to the eighteenth century, has gained popularity in recent decades. The authenticity of the preserved architectural and infrastructural heritage helps to preserve the identity of the regions by displaying the mementos and achievements of past generations in an appropriate manner. Most of the sites discussed in the paper, three of which are on the UNESCO World Heritage List, use this method of display, enriching the facility's programme with other elements. There is also a strategy to transform these post-industrial resources to a much greater extent and adapt them to modern functions using contemporary architectural solutions, while preserving the most valuable elements of their architectural and infrastructural heritage.

Keywords: post-industrial architectural heritage, post-industrial infrastructural heritage, architectural adaptation, museums in mines, southern Poland

Introduction

Museums and other architectural and urban complexes associated with high culture are today among the most important elements in the functional structure of European cities. In modern times –that is, since the turn of the nineteenth century – the edifices and complexes housing museums and other cultural institutions have become symbols of cities, on a par with the most important sacred buildings or seats of secular and clerical authorities.[1] Today they continue to build the city's brand, alongside prestigious educational and business institutions. Many of them are located in historic buildings, including those adapted for exhibition purposes in castles, palaces, mansions, places of worship and administrative buildings, as well as post-industrial infrastructure.[2] In terms of urban form, they can co-create representative public spaces. The industrial revolution led to an unprecedented expansion of the urban fabric in the nineteenth and twentieth centuries, both in the industrial basins of Europe and around the world. These observations apply equally to cities in the southern, intensely industrialised part of Poland. Geopolitical changes at the turn of the twenty-first century resulted in the decline or reduction of industry in Europe and the relocation of production to other regions of the globe. Spatial and functional conflicts contributing to the increasing inconvenience of industrial neighbourhoods within the urban fabric were among the many reasons for relocating industrial plants on a local, national and global level.[3] These changes affected Poland, as well as other post-communist countries of Central and Eastern Europe, particularly strongly in the 1990s and the first decade of the twenty-first century. They were felt most strongly in large cities and regions where industry played a leading role and was the engine of development during the communist era, such as Łódź, Szczecin, the cities of the Upper Silesia and Zagłębie Metropolis, and the Tricity.[4]

Many architectural and infrastructural complexes and facilities where industrial activity was once carried out have been preserved in both the centres and peripheries of cities and towns of southern Poland. They offer material testimony to the identity of the place and the socio-economic basis for the existence or development of a given centre, as well as the

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[1] GYURKOVICH Mateusz. Role of Culture in Revitalisation of the Postindustrial Heritage in Poland. In: *Reuso. III Congreso Internacional sobre Documentación, Conservación, y Reutilización del Patrimonio Arquitectonico y Paisajistico*. València: UPV, 2015, pp. 1294–1301, GYURKOVICH Mateusz. Polskie przestrzenie kultury. Wybrane zagadnienia, Kraków: Wydawnictwo Politechniki Krakowskiej, 2019, p. 295.

[2] PASZKOWSKI Zbigniew. Transformacja przestrzeni śródmiejskich – Na przykładach wybranych miast europejskich, Szczecin: Walkowska Wydawnictwo, 2003, p. 288, NYKA Lucyna, SZCZEPAŃSKI Jakub (eds.). Culture for revitalisation> Revitalisation for culture, Gdańsk: CSW ŁAŹNIA, 2010, p. 176, ĘDRYSIAK Tomasz (2011). Turystyka kulturowa w obiektach poprzemysłowych – zagadnienia ogólne. In: *Turystyka Kulturowa*, 6, pp. 17–35, Gyurkovich. Role of Culture..., Gyurkovich. Polskie przestrzenie...

[3] EISINGER Angelus, SEIFERT Jorg (eds.). urban RESET. How to Activate Immanent Potentials of Urban Spaces. Basel: Birkhäuser, 2012, p. 272, GYURKOVICH Mateusz, DUDZIC-GYURKOVICH Karolina, MATUSIK Agnieszka. Abandoned breweries and distilleries – adaptation of historic structures and continuation of the urban fabric as part of sustainable development of historic cities. In: *Wiadomości Konserwatorskie – Journal of Heritage Conservation*, 2022, No. 71, pp. 107–120.

[4] GASIDŁO Krzysztof. Kierunki przekształceń przestrzeni przemysł, vol. 269, 2010, Politechnika Śląska, CYSEK-PAWLAK Monika Maria. Mixed use and diversity as a New Urbanism principle guiding the renewal of post-industrial districts. Case Studies of Paris Rive Gauche and the New Centre of Lodz. In: *Urban Development Issues*, 2018, vol. 57, pp. 53–62, SZPAKOWSKA-LORANC Ernestyna, MATUSIK Agnieszka. Łódź- Towards a resilient city. In: *Cities*, vol. 107, 2020, 102936, pp. 1–14, WDOWIARZ-BILSKA Matylda. Tradition and contemporaneity of an industrial city in the restored Fuzja block. In: *Wiadomości Konserwatorskie – Journal of Heritage Conservation*, 2021, No. 65, pp. 95–104.

entire multinational and multicultural region. Most of the mines discussed here date from the last two centuries, but some older buildings and architectural–infrastructural structures can be found. The concept of cultural heritage has been theorised, defined, redefined, negotiated and renegotiated by a large number of theorists and practitioners from various disciplines, including the newly developed field of heritage studies or critical heritage studies.[5] Industrial heritage adds to the material historical record, which consists of architectural objects accumulated over the ages.[6] Industrial heritage documents a certain stage in the development of architectural and urban planning thought and also, thanks to partially preserved equipment, in the development of technology. This makes industrial heritage extremely valuable and worth preserving.[7] Many such entities have been recognised as monuments.[8]

The concept of a monument, formed in the nineteenth century, refers to a unique work of art or architecture classified as "traditional". This concept was relevant in Poland for almost the entire twentieth century, until the 1980s.[9] It was only then – on the wave of the postmodern intellectual and stylistic currents which began to break through to the broader consciousness of artists and experts (including, above all, to conservation circles) – that interest developed in all elements related to the past and how they shape the identity of places. In addition to tangible elements–objects, such as works of art, intangible heritage (such as names, functions and views) were also recognised as monuments. Monuments ceased to be perceived as single elements but rather as fragments of a larger whole (a collection, a complex, an urban establishment or a landscape). On this basis, it was recognised that a monument belonging to the world of material culture does not have to be an architectural work, and can be "only" a building or infrastructure object.

In the communist system, which promoted the primacy of industry over other areas of the economy, and which was in the 1980s in decline in Poland, this was a concept that was both innovative and obvious. Perhaps that is why it was fairly well received by both policymakers and the public. The country had, for many decades, supported various museums promoting technological achievements – most notably the Museum of Technology and Industry in Warsaw, founded in 1950 in the Palace of Culture and Science (renamed the Museum of Technology in Warsaw in 2017[10]) – as well as various memorial chambers and small local museums in industrial plants. With the cessation of production and the collapse of many of them, associated with the political changes of the early 1990s, the opportunity and need arose to exhibit post-industrial heritage and to make available and commemorate important architectural objects

[5] BITUŠÍKOVÁ Alexandra. Cultural heritage as a means of heritage tourism development. In: *Muzeológia a kultúrne dedičstvo*, vol. 9, 2021, Is. 1, pp. 81–95.

[6] GYURKOVICH Mateusz. Role of Culture....

[7] GYURKOVICH Mateusz. Selected examples of the transformation of post-industrial complexes. In: *Wiadomości Konserwatorskie – Journal of Heritage Conservation*, 2019, No. 57, pp. 142–157, ORLENKO Mykola, IVASHKO Yulia, KOBYLARCZYK Justyna, KUSNIERZ-KRUPA Dominika. Ways of revitalization with the restoration of historical industrial facilities in large cities. The experience of Ukraine and Poland. In: *International Journal of Conservation Science*, vol. 11, 2020, Iss. 2, pp. 433–450, OLEŚ Dominika, ZYCH Olga. 100 lat industrialnej katedry- Elektrocieplownia Szombierki w Bytomiu. In: *Wiadomości Konserwatorskie – Journal of Heritage Conservation*, 2021, No. 65, pp. 134–146.

8 KADŁUCZKA Andrzej. *Ochrona dziedzictwa architektury i urbanistyki. Doktryny, teoria, praktyka*, Kraków: Wydawnictwo Politechniki Krakowskiej, 2018, p. 318.

[9] SZMYGIN Boguslaw. *Kształtowanie koncepcji zabytku i doktryny konserwatorskiej w Polsce w XX wieku*. Wydawnictwo Uczelniane, Politechnika Lubelska, 2000, p. 308.

[10] https://nmt.waw.pl, accessed 1.05.2023.

and infrastructure that for many decades co-shaped the identity of cities.[11] The post-transition period saw the number of new museums dedicated to industrial production and technology – such as the Museum of Engineering and Technology in Krakow in 1998 – expand significantly in 2020–23.[12] As in the case of open-air museums, in which an attempt is made to preserve the memory of the history and traditions of the countryside, galleries or museums are being set up in an increasing number of industrial sites in cities by state and local government institutions, as well as by private investors[13] . All activities concerning historic buildings or revitalised post-industrial areas in southern Poland discussed in this article, although often inspired by good practices from other European countries, take place on the basis of applicable national and local laws (e.g., spatial development plans of various scales). [14]

Objectives and research methods

The purpose of this study is to present underground mines in cities and towns in southern Poland where, due to the reduction in mining (Wieliczka, Bochnia) or its complete cessation (Katowice, Walbrzych, Zabrze, Tarnowskie Gory), museums and tourist routes have been established in old mines. This trend, which is also present elsewhere in Europe,[15] is becoming increasingly noticeable in Poland. The area which is now southern Poland (Lower Silesia, Upper Silesia and Zagłębie Metropolis, and the Małopolska regions) belonged to various states over the centuries, including the Grand Duchy of Moravia, the Kingdom of Poland, the Kingdom of Bohemia, the Kingdom of Prussia and the Austro-Hungarian Empire and, after World War I, the Republic of Poland and Germany. Boundaries and influences have changed here relatively frequently, making the area typical of Central Europe. For reasons of narrative coherence, it was decided to examine cases of mines, located on the Polish side of the 1945 border, in which sections have been adapted for museum purposes. Some of the featured sites are on the prestigious Route of Monuments of Technology, the only tourist route from Central Europe

[11] KACZMAREK Sylwia. Post-Industrial Areas in Modern Cities. In: *Bulletin of Geography (Socio-Economic Series)*, 2003, No. 2, pp. 39–46, KACZMAREK Sylwia. *Rewitalizacja terenów poprzemysłowych. Nowy wymiar w rozwoju miast*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego, 2001, p. 141, FRANTA Anna. The Role of the Restructuring of Post-Industrial Areas in the Creation of New Kinds of Metropolitan Public Spaces – The Stimulating Function of Regulations. In: *Technical Transactions- Series Architecture*, 2007, No. 1-A, Y. 104, pp. 35–43, GYURKOVICH Jacek. Recipe for a New Life in Post-Industrial Areas. In: *Wiadomości Konserwatorskie – Journal of Heritage Conservation*, 2022, No. 69., pp. 64–71.

[12] WDOWIARZ-BILSKA Matylda. Tramway Depot Complex Restoration and Shaping the Public Space along Sw. Wawrzyńca Street in Cracow. Selected Fragments. In: *Wiadomości Konserwatorskie – Journal of Heritage Conservation*, 2022, nr 71, pp. 94–106.

[13] JUZWA Nina, ŚWIERZAWSKI Jakub (2021). Myśli- Marzenia- Miejsca. Architektura polska w innowacyjnej współczesności, Warszawa: Narodowy Instytut Architektury i Urbanistyki. GYURKOVICH Jacek. Recipe for a New Life in Post-Industrial Areas. In: *Wiadomości Konserwatorskie – Journal of Heritage Conservation*, 2022, No. 69, pp. 4–71.

[14] Ustawa z dn. 3 lipca 2003 roku o ochronie zabytków i opiece nad zabytkami z późniejszymi zmianami; tekst jednolity Dz. U. z 2022 r., poz. 840 (Heritage Protection and Preservation Act of 3 July 2003, as amended; codified text, Dz. U. 2022, item 840), Ustawa z dn.9 października 2015 roku o rewitalizacji z późniejszymi zmianami; tekst jednolity Dz.U. z 2020 r., poz.802, 1086 (Revitalisation Act of 9 October 2015, as amended; codified text Dz.U. 2020, item 802, 1086).

[15] LANGER Piotr. Casus Silesia Superior. Current state and course of development of underground mines in Upper Silesia. In: *Przestrzeń - Urbanistyka - Architektura*: PUA, 2021, No. 2, pp. 52–72.

that is part of the prestigious European Route of Industrial Heritage,[16] and three are on the UNESCO World Heritage List (Wieliczka, Bochnia, Tarnowskie Góry[17]), as they extremally important for humanity as testimonies to the development of civilisation.

Establishing museums in disused mine sites is a way of preserving the region's industrial heritage and protecting industrial symbols in the landscape that have become a strong part of the region's identity. The reasons for mine closures are manifold: from depletion of the deposit, to unprofitability, to highly dangerous mining conditions. The value of the example in Lower Silesia lies in the development of differentiated functional–exposure concepts for each site, which can be considered as individual institutions. In turn, the number of similar institutions in one region of the Upper Silesian and Zagłębie Metropolitan Area also makes it possible to treat them as an ensemble of museums which, despite having a similar theme and source, do not compete with but rather complement each other, offering visitors a variety of experiences.

The research methods, based on literature studies and in situ research, include a comparative analysis of selected examples of underground mines adapted as museums. The basic criteria for selection were: their location in southern Poland (examples from Silesia, Lesser Poland and Lower Silesia provinces were ultimately selected); the presence of historic objects related to the former mining industry (both underground and above ground) that have been adapted or expanded in the last 30 years; and the number of tourists and, based on this, the importance of the object (museum) for the city and/or region.

Developing a functional and exhibition programme for presentations of industrial heritage is crucial for the success of the institution. A retrospective look at newly established museums from a historical perspective shows that they have increased significantly in number in late twentieth century and early twenty-first century, increasing by more than 1,400 museums per year.[18] This fact confronts museums with new challenges, such as competitiveness and courting audiences. One important factor is the need to respond to the needs of audiences, who, with the development of museums, have evolved from visitors admitted to observe conventional museum-repository collections[19] to users who expect personalised messages and participation. These expectations are also linked to the comfort and quality of service spaces.[20] The targeting of programming and presentation activities must take into account that museum visitors are not a monolithic group – they have widely different needs and interests.[21] At the same time, Graham Black emphasises that the museum experience is shared by the individual but can be shared with a family or group, pointing to the need to look for collections that offer varied modes of transmission and participation, for example, for different age groups. In parallel, there is an evolution in the paradigm for choosing to visit a museum – from communing with art and knowledge to a form of leisure and recreation.

One of the museum's missions is to arrange exhibitions and displays, and for many visitors this is the essence of what a museum does; when using them, they are unaware of the

[16] The route, visited by hundreds of thousands of tourists each year, features 42 sites in 26 cities and towns in the Silesian province. Their history is linked not only to coal and silver mining but also to power engineering, railroads, communications, brewing and other industries that have shaped the existence of cities and towns in the region over centuries. The network is part of the European Route of Industrial Heritage (ERIH); https://zabytkitechniki.pl– accessed 20 March 2023.

[17] https://whc.unesco.org/en/list/ – accessed 20 March 2023.

[18] POMIAN Krzysztof . *Muzeum. Historia światowa: Od skarbca do muzeum* (T. 1). Gdańsk: Słowo/obraz terytoria, 2023.

[19] FOLGA-JANUSZEWSKA Dorota. *Muzeum: Fenomeny i problemy*. Kraków: Universitas, 2015, p. 160.

[20] BLACK Graham. *Transforming Museums in the Twenty-first Century*,.London: Routledge, 2012, p. 288.

[21] FALK John H. *Identity and The Museum Visitor Experience*, New York: Routledge, 2009, p. 302.

institution's other activities. "It is through exhibitions that the museum represents, analyses, compares, simulates and builds specific forms of discourse, the main objective of which is to narrate to society the stories of the world and the stories of humankind." [22]

By relying on the authenticity of museum exhibits and being a reliable source of knowledge, museums, through exhibitions, shape public awareness of a particular field of science or technology more effectively than other forms of mass communication[23] and, unlike them, can interact with the viewer using multiple senses.[24] Exhibitions today are seen as a form of communication between the sender – that is, the creators and organisers of the exhibition – and the receiver, the visitor, the medium of the message being the elements of the exhibition. In contrast to the historical approach, we now know that it is not enough to gather and make a collection available to the public; it is necessary to ask ourselves whether, in a given environment and form of presentation, the assumed purpose of the message is clear and comprehensible to the viewer. Treating an exhibition in this way shifts the emphasis and focuses not only on the content of the exhibition, but also on the effect, that is, the cognitive effect of the viewer. The way in which an exhibition's message is encoded should take into account the needs and expectations of the viewer. John Falk and Lynn Dierking's researched identified seven motivations of visitors[25] through which it is possible to build a more personalised message. The focus on experience and cognitive effect has significantly changed the approach to museum exhibitions. The presence of a museum exhibit is not the only form of communication: it has become possible to present values, ideas and phenomena that are not recorded in material form but can be represented in the exhibition, which means the exhibition can be treated as a combination of semantic (meaning) and semiotic (sign) play. An exhibit in such cases can have two functions: to represent what it is or to act as a symbol.[26]

The consequence is the possibility of a museum without a collection or a collection with negligible display properties. The transmission of heritage knowledge can be based on narrative or participation in a process, for example, walking an original route, doing an activity or visiting an exhibition whose constituent elements have been produced to present a particular message (such as in the museums in mines discussed below and their expositions presenting the history of the industry in situ).

On the role of the exhibition, as Teresa Scheiner writes, "It is our task to unveil what is hidden, explain what is hermetic, remind what is forgotten; toss a little more light over material and immaterial objects to sharpen all their angles, enabling societies to see them and, through them, recognise themselves".[27]

Defining the exhibition as a message places the viewer in the role of subject; the message is dedicated to them, and they interpret the exhibits, symbols and representations. Postmodern ideas posit the primacy of interpretation by the viewer over the resources and presentation of the museum.[28] New challenges, such as the need to target the viewer, define contemporary

[22] SCHEINER Teresa. *The Exhibion as Presentation of Reality* (https://drive.google.com/drive/folders/1y5ifh_Bf8m-Bg7DfERQpYC25EpeDMHPSA). *Museology and Presentation – original or virtual?* 2002 (33).

[23] DOLÁK Jan. Teoretická východiska muzejní prezentace (Theoretical Foundations of Museum Communication). In: *Muzeológia a kultúrne dedičstvo*, vol. 1, 2013, Is. 1, pp. 21–38.

[24] SCHEINER. The Exhibion....

[25] FALK John H., DIERKING Lynn D. *The Museum Experience Revisited*, New York: Routledge, 2016, p. 416,

[26] DOLÁK. Teoretická...

[27] SCHEINER. The Exhibition...

[28] BEDFORD Leslie. *The Art of Museum Exhibitions: How Story and Imagination Create Aesthetic Experiences*. London: Routledge Taylor & Francis Group, 2014, p. 168.

priorities in exhibition design, encompassing the historical perspective, the comfort of the viewer, the quality of the space in which perception takes place and the means of guidance through the exhibition. Exhibitions' spatial design has been an ongoing field of research and, above all, is the core experience of practitioners and theorists. Such professionals refer strongly to the spatial conditions of the exhibition and its quality in terms of the perception of the exhibits. The relationship of spatial place and the building of synergies between an exhibition or exhibitions in the case of former mining facilities belongs to the special case of adaptation of architectural objects. In industrial infrastructure, pragmatism and subordination to production processes dominate: the human being is in a specific place where work is done. The new function is to create exhibition spaces and link them into a layout through which visitors can be guided – and into which the concept of one or more separate exhibitions can be inserted. The mines, their infrastructure and their equipment are themselves already exhibits, and the concept of guiding visitors through them is the first exhibition scenario. According to Jean Davallon, an exhibition is a complex semiotic process played out in space.[29] Daniel Koch compares the movement of the viewer in the exhibition space to choreography and dance, noting the variability of rhythm and gesture, and sees a relationship between the content and dynamics of movement.[30] Graham Black's research, mentioned above, found that comfort and accessibility are important determinants of a positive audience experience,[31] but it can also be a distinctive feature of a place.

The Oldest Salt Mines in Poland – UNESCO Heritage Site

The historic salt mines in Wieliczka and Bochnia are Poland's oldest post-industrial sites on the UNESCO List, having been listed in 1978. The tradition of salt extraction and mining in the region dates back 3,500 years. However, the emergence of the salt mines towns of Bochnia and Wieliczka is associated only with the arrival in Poland, in the first half of the thirteenth century, of the Hungarian princess Kinga, wife of the Prince of Krakow and Sandomierz, Boleslaw the Chaste. She brought with her qualified miners, initiating the modernisation of previous mining methods. The mines became part of Krakow's saltworks and the main source of income for the princes of Krakow (who, from 1320, were the kings of Poland). The towns of Wieliczka (15 km from Krakow) and Bochnia (50 km from Krakow) were founded around them. They obtained numerous privileges and developed prosperously, both in the Middle Ages and in more modern times. After Poland regained its independence in 1918, the mines became state institutions, thriving to this day. This makes them the oldest underground salt mines still operating in Europe. In Wieliczka, due to damage to the town caused by mining, problems with water filling the mine, substantial depletion of the deposit, and greater economic benefits of tourism compared to mining, salt is currently obtained only by evaporating brine. The Bochnia deposit, on the other hand, is still being exploited, although extraction has, since 1990, been limited to cosmetic and medicinal salt. Despite this, due to the unique microclimate in the underground parts of the mine, sanatoriums have been operating there for many decades (in Bochnia since the 1980s), accepting patients both on an outpatient basis and for longer periods up to several days.

[29] DAVALLON Jean. *L'exposition à l'oeuvre: Stratégies de communication et médiation symbolique* (Kindle Edition). Paris: L'Harmattan-A, 2000, p. 384.
[30] KOCH Daniel. Narrative, dramaturgy, and spatial choreography. In: J. Peponis (ed.). *Museum Configurations* (1st edition) London: Routledge, 2023, pp. 120–159.
[31] BLACK Graham. *Transforming Museums in the Twenty-first Century*. London: Routledge, 2012, p. 288.

The biggest attraction of both towns, however, are the museums which operate in the mines' underground areas. These exploit underground corridors and chambers which had been decorated by miners over the centuries. As well as mining shafts, they include richly carved chapels (the most prominent being St Kinga Chapel in Wieliczka, which still performs liturgical functions) and underground halls carved from salt. Wieliczka Salt Mine was inscribed on UNESCO's World Heritage List in 1978, and in 2013 the entry was extended to include Bochnia mine. The description on UNESCO's website reads:

The Wieliczka and Bochnia Royal Salt Mines illustrate the historic stages of the development of mining techniques in Europe from the 13th to the 20th centuries: both mines have hundreds of kilometres of galleries with works of art, underground chapels and statues sculpted in the salt, making a fascinating pilgrimage into the past.[32]

During more than 700 years of mining, 26 shafts have been broken into the mine's nine levels and more than 9 million m^3 of post-mining voids have been excavated, stretching far beyond the city limits.

The first underground tourist route in the mine in Wieliczka was established as early as the turn of the eighteenth and nineteenth centuries, over time its course was expanded and modified, and numerous attractions for tourists were organised (underground horse railroad, demonstrations of downhill miners on ropes, etc.). At present, it includes about 3.5 km of underground passages, including 20 chambers and several underground brine lakes created as a result of mining (the aforementioned sanatorium was built around others). The tourist and sanatorium part meets all modern requirements for safety and accessibility, in line with the tenets of "barrier-free architecture." In addition to the aforementioned works of art created from salt, the museum displays historical mining tools and equipment, as well as architectural elements – wooden structures protecting the excavation, stairs, galleries and balconies. The museum also organises temporary exhibitions and numerous artistic and scientific events-concerts, theatre and opera performances, conferences and fairs. Everything takes place at depths ranging from 64 m to 135 m below ground level (levels I–III). The historic above-ground buildings of the mine associated with the entrances to the Danilowicz shaft and Regis shaft, located in the centre of the town, play a communicative role, but also to a limited extent: educational and exhibition.

Several years ago, a "mining route" was also made available in the Wieliczka mine, intended for visitors looking for a slightly more "extreme" experience. The route, which is 1.9 km long, is demanding and reaches a depth of 101 m, and takes about 3 hours to complete, similar to the much longer tourist route. Visitors, move under the guidance of guides and, like the miners, in dark corridors lighting their way only with lamps-headlamps. During the tour, tourists (no younger than 10 years old) and in good physical condition are introduced to the secrets of working underground. In total, museum exhibitions in the Wieliczka mine are visited by about 1.5 million tourists a year. Outside the museum exhibits is the Crystal Grottoes nature reserve, which contains exceptionally large halite crystals. In the 19th century, specimens from the reserve found their way into the collections of the world's leading museums, where they are still kept today (for example, at the Natural History Museum in Vienna) [33].

At the Bochnia Salt Mine, the oldest galleries and chambers were entered in the register of historical monuments in 1981, following which the tourist route and the sanatorium section

[32] https://whc.unesco.org/en/list/32 accessed 20 March 2023.
[33] https://www.kopalnia.pl – accessed 10 April 2023.

were gradually opened to the public. Currently, the underground museum in Bochnia mine[34] includes exhibitions in corridors and chambers – similar to those in Wieliczka – decorated with salt sculptures. Attractions include a ride on the mine's underground train and rowing in wooden boats on the underground brine lake (the rafting route is about 120m). Although smaller and less well known than Wieliczka, visited by only about 200,000 tourists a year, the mine museum is still Bochnia's biggest attraction. The underground part of the mine museum consists of the Campi and Sutoris shafts with adjacent buildings, and the underground route is equipped with multimedia elements.

Museums in the underground mines of Upper Silesia

The Upper Silesian and Zagłębie Metropolitan Area (GZM)[35] is a place of particular importance for the development of industry in Poland. The mining industry, like perhaps no other, degrades space, violates the stability of land, and contributes to the contamination of soil, air and water. In almost the entire area of the GZM, it was mines and, later, factories for processing extracted minerals (steelworks, coking plants, power plants, etc.) that determined the case for establishing and maintaining cities. At the same time, these industries contributed to increasing degradation of the environment – both natural and urban.

Mining damage is commonplace in this area of Poland. Today, due to the aforementioned global economic processes, the post-industrial heritage that was once the pride and livelihood of Upper Silesian cities is deteriorating. Mines and plants have closed because they can no longer withstand competition from Asian giants. Intra-EU economic and environmental policies are also among the reasons for this situation. Undertaking revitalisation activities on all levels – social, economic, environmental and urban – is therefore a necessity in many Polish cities, especially in the GZM area. One method of protecting post-industrial heritage whose previous use has been lost due to economic transformations is to give such sites a new function.[36] Not surprisingly, most museums in former industrial sites in southern Poland have been established in Upper Silesia.

Queen Luiza Adit and Guido mine

One of the oldest towns there is Zabrze. Its history dates back to the turn of the thirteenth and fourteenth centuries, when the local estates passed from the hands of the Duchess of Kalisz to the Bishop of Wroclaw. Coal, however, was not discovered here until the late eighteenth century, and it is from that time that the town began to develop faster. The oldest mine in the city was the Queen Luiza Mine (Zabrze Mine during the Polish People's Republic), founded in 1791.[37] It gave rise to other mines and smelters in the region.[38]

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[34] https://kopalnia-bochnia.pl – accessed 10 April 2023.

[35] Górnośląsko-Zagłębiowska Metropolia (GZM) consists of Upper Silesia and Zagłębie Metropolitan Area. It was established by decree of the Council of Ministers of the Republic of Poland on 1 July 2017, on the basis of the relevant law; it includes 41 cities and municipalities from the area of the Upper Silesian conurbation and the Dąbrowa Basin; further municipalities declared their intention to join the Metropolis; www.gzmetropolia.pl, accessed August 2021.

[36] WAGNER TOMASZ. Wybrane przykłady adaptacji obiektów poprzemysłowych na terenie Górnego Śląska. In: *Bogactwo dziedzictwa przemysłowego jako wyzwanie i atrakcyjny produkt dla turystyki i rekreacji. II Konferencja międzynarodowa.* Katowice: Górnośląska Wyższa Szkoła Handlowa im. Wojciecha Korfantego, 2005, 249–256.

[37] www.zabrze.aplus.pl/zabrze_przemysl_zabrza_kopalnia_zabrze.html - accessed August 2018.

[38] www.sztolnialuiza.pl/index.php/historia- accessed August 2018.

Luiza Adit can be considered unique due to its long history and numerous awards (it was the only museum in Poland to reach the finals of the European Museum of the Year Award in 2023. Luiza Adit offers tourists the longest underground water route in Poland. The route is about a kilometre long and runs directly under the centre of Zabrze.

The Main Key Hereditary Adit was created in 1799, and the Queen Luiza adit opened in 1863. Tourists can choose between several underground routes, divided by age groups (children as young as four are welcome) and thematic scope (including the water route).

Attractions include authentic pits and a depiction of coal mining methods from 200 years ago, an underground water dock with a movable wooden crane, a unique walkway carved entirely in coal, and modern working mining machinery.

The establishment of Guido Mine dates back to 1855. It was named after its founder, Prince Guido Henckel von Donnersmarck (1830–1916). Initially, the mine was intended to supply the neighbouring Donnersmarck flourmill with coal. After the seams were exhausted, the mine was used to dewater other mines. In 1967, Experimental Coal Mine "M-300" was established to test new mining equipment and machinery; very little mining took place there. In 1982, on level 170, Guido Mining Open-Air Museum was created, entered in the register of monuments and opened to the public. It has been possible to visit the underground parts of Guido Mine since 2007. Three tour routes on different levels are offered. In 2013, the oldest part of Luiza Mine, the Queen Luiza Adit, and Guido Historic Coal Mine, came together to form Zabrze Coal Mining Museum, the largest cultural and tourist institution in the city.

Thanks to EU grants, the museum, like other cultural institutions in the country, is developing and modernising. It is creating new, visitor-friendly cultural spaces in place of degraded, often dangerous, abandoned complexes of former mining buildings; showcasing the rich heritage of Silesia. Activities currently underway include, first and foremost, decongestion of Queen Luiza Adit and revitalisation of the underground workings of Guido mine. Thanks to these activities, attractive tourist and cultural facilities will soon be operating, including the Mechanical Workshop, the Pump Hall and the Compressor Chamber at Guido mine, as well as the Main Key Heritage Adit running under the city, which is the longest object of its kind in Europe and a pearl in the trail of monuments of technology.[39] The underground water channel running through the adit was opened to tourists on 14 September 2018. This interesting post-industrial heritage is now receiving increasing attention from tourists.

The entrance area to both attractions is located on the site of the former mine, so the manner of land use and the appearance of the buildings have remained similar to what they were in the past. In front of the entrance to the Luiza Adit, a public space, 'Park 12c', has been created, along with attractive forms of small architecture.

Silver mine in Tarnowskie Góry

Tarnowskie Góry is a city on the northern edge of the Upper Silesian Industrial District, part of the GZM; it was founded in the late sixteenth century to support the silver ore mining industry that was developing in the area. Legend has it that the first lump of silver was dug up in his field by a peasant named Rybka in 1490. The mine is one of two underground workings of Royal Frederick Mine, founded in 1784, where zinc and silver were mined. After

[39] POCISK-DOBROWOLSKI Jerzy. Rewitalizacja Głównej Kluczowej Sztolni Dziedzicznej jako próba stworzenia nowych punktów odniesienia w przestrzeni miejskiej Zabrza w nawiązaniu do odmiennej niż w sąsiednich miastach historii rozwoju tego ośrodka miejskiego. In: JUZWA Nina et al. (eds.) *Odnowa Krajobrazu Miejskiego: Między miastem a nie-miastem*. ULAR 5, Gliwice Politechnika Śląska, 2010 pp. 371–386.

the underground workings were developed and surface facilities built, the mine museum was opened to the public in 1976.[40] The reconstructed workings of the historic mine date back to the seventeenth and nineteenth centuries. One of the biggest attractions is a boat ride along a 270 m route. The route runs between two marinas located at the Luck of God and Viper shafts. The underground areas of the historic mine and the Black Trout Adit have been declared a historical monument. Since July 2017, it has been inscribed on the UNESCO World Heritage List,[41] where it is the only site from the province of Silesia. It is also a listed site on the Monuments of Technology Route.

The underground tourist route connects three former mining shafts – "Angel," "Viper" and "God's Luck"– and resembles a triangle in shape. On the tour you can see the mining faces carved in the rock, transport galleries and chambers created at the turn of the nineteenth century. On the premises of the mine one can also find a cinema, a conference room, a restaurant, souvenir and mineral stores, and the Open-air Museum of Steam Machines. It should be noted that it was in the local mine that the oldest steam engine on Polish soil operated.

The spaces made available for visiting are not particularly attractive compared to the others described in this article, due to their small size. However, the imaginative use of these underground spaces is noteworthy: the museum organises unusual events, such as winter swimming, which takes place in the water section. The mine received a Gold Certificate from the Polish Tourism Organisation for 2019.

New Silesian Museum in the former "Katowice" coal mine

A completely different approach to former mining heritage was applied when creating the Cultural Zone in the revitalised area of the "Katowice" Coal Mine in the centre of Katowice. One of the oldest in the region, this mine operated from 1823 to 1999; until 1936 it operated under the name "Ferdinand"). One of the elements implemented as a series of monumental – and, unfortunately, not entirely well coordinated – cultural objects,[42] it became the new headquarters of the Silesian Museum.

The Cultural Zone in Katowice is located on the axis of the market square and historic Korfantego Street, right next to the modern symbol of the city, "Spodek" entertainment and sports hall,[43] which, together with the Super Unit and the Silesian Insurgents Monument, marks the centre of the late modern city.[44] The spectacular blocks of the International Congress Centre,[45] the headquarters of the National Polish Radio Symphony Orchestra,[46] "Spodek" hall

[40] KUREK-OBROCKA AGATA. Nowe oblicze Górnego Śląska w świetle procesów rewitalizacyjnych. In: *Przedsiębiorczość – Edukacja* [Entrepreneurship – Education], 14, 2018, 109–124.

[41] https://whc.unesco.org/document/155704 accessed 3 May 0223.

[42] GYURKOVICH Mateusz (2019a). Polskie przestrzenie..., p. 295.

[43] Spodek (designed by M. Gintowt, M. Krasicki, J. Hryniewiecki 1960–1971) for decades hosted the most important cultural, sports and congress events on a regional and sometimes even national scale; Silesian Insurgents Monument (designed by W. Zablocki and G. Zemla 1967–68); Super Unit (designed by W. Król 1967–72).

[44] SYSKA Anna. *Spodek w Zenicie. Przewodnik po architekturze lat 1945–1989 w województwie śląskim*. Warszawa: Narodowy Instytut Architektury i Urbanistyki, 2020, p. 104–121, JUZWA Nina, ŚWIERZAWSKI Jakub. *Myśli- Marzenia- Miejsca. Architektura polska w innowacyjnej współczesności*. Warszawa: Narodowy Instytut Architektury i Urbanistyki, 2021, p. 13–131).

[45] Designed by JEMS Architekci; the ICC was commissioned in 2015 and the completed facility subsequently won numerous awards and honours; www.jems.pl, accessed January 2019.

[46] Designed by Konior Studio – Tomasz Konior with team (competition 2008; design 2009–2012; realization 2012–2014); the building received dozens of industry awards, including a nomination for the L. Mies van der Rohe European Architecture Award for 2015; www.koniorstudio.pl, accessed May 2018.

(built more than half a century ago in front of the mine) and the more subdued volumes complementing this composition of questionable urban planning, were created as a result of separate projects, selected in architectural competitions, and do not form a coherent whole. The aforementioned implementations covered only part of the former mine site.[47]

The new Silesian Museum[48] was realised inside a former mine, thanks to which it has also become an element of the aforementioned Route of Monuments of Technology. Above the surface, the historic former mining buildings (engine room, clothing warehouse, carpentry shop and main bath) have been adapted to new functions and the light, insubstantial glass cuboid blocks house functions complementary to the museum's programme – namely, a restaurant and a children's museum dedicated to the literary works of Alfred Szklarski. The iron winding tower that sits above the mine shaft has been turned into a viewing platform. Several historic aboveground structures (including the water tower) and areas further from the main street are still unused, waiting their turn. Some of the glass cuboids house offices and conservation studios, while others serve only as skylights. The main volume of the exhibition part of the New Silesian Museum – 6,000 m^2 of exhibition space – is entirely underground, using the space of the former mine galleries and chambers. A huge three-story parking lot is also located underground.[49]

Unlike the previously presented examples, due to the state of preservation of the pit, the architects decided not to expose the original underground elements of the former mine. The underground building is an entirely new multi-story modernist structure, illuminated by overhead light coming in through numerous skylights, which was dug deep into the existing mine galleries. It symbolises the city's transformation from a mining centre to a modern metropolis. Thanks to this procedure, the area on the surface, freed from yet another monumental volume, largely serves as a public space – a kind of urban park, with the aforementioned brick buildings of the former industrial plant and the glass cubicles that house the necessary new functions. The museum primarily presents a rich collection of art, and only a small part of the exhibition is devoted to former life in Katowice and the history of the mine inside which it is located.[50]

An example from Lower Silesia: the Old Mine Science and Art Centre in Walbrzych

More than 30 years after the fall of communism, the social, costs of the political transformation of the late twentieth century can still be felt in many cities in Poland. They are also reflected in the contemporary urban form of these centres. Situated in the Central Sudetes, just 20 km from the Czech border, Walbrzych, like most of the cities that lost their status as provincial capitals as a result of the 1999 administrative reform, is a shrinking city. With the cessation, after more than four centuries, of coal mining and the closure of the mines, the economic basis for the city's development has collapsed. In such centres, it is much more difficult than in metropolises to create and implement revitalisation programmes, and at the same time they are much more necessary. The city has managed to revitalise the two main old

[47] ZUZIAK Zbigniew K., GRZYBOWSKI Andrzej (eds.). *Centra miast metropolitalnych w Polsce. Urbanistyka a polityka przestrzenna*, Katowice: Wydawnictwo Wyższej Szkoły Technicznej w Katowicach, 2018, pp. 9–30, 109–118.

[48] Designed by Riegler Riewe Architekten (competition 2007; design from 2007; implementation 2010–2012) The museum opened in January 2015. The complex also received a nomination for the Mies van der Rohe Prize for 2015 (and was among the final 40 objects) www.rieglerriewe.pl, accessed July 2018.

[49] GYURKOVICH Mateusz. Polskie przestrzenie..., p. 82–87,115–124.

[50] https://muzeumslaskie.pl, accessed 2 May 2023.

town squares – Market Square and Magistracy Square – and small sections of streets within the historic old town structure.

One popular revitalisation strategy[51] is to use unwanted post-industrial architectural and urban heritage for cultural and educational institutions. Several cultural institutions have been operating in Walbrzych for many years, and one of the best-preserved aristocratic residences in Lower Silesia, Castle Książ, which generates huge tourist traffic,[52] is also located within its borders. Walbrzych City Council decided in 1999 to establish a new branch of the city museum, transferring the grounds of the former Julia mine and the historic buildings erected on them to the newly established institution free of charge. The site is adjacent to the southwest of the city centre. The documented history of the mine dates back to 1770. Along with the changing turns of the fate of the city and the region, it underwent numerous transformations; for almost the entire communist period it operated as Kopalnia Węgla Kamiennego (KWK) Thorez, changing its name to Julia in 1993.

It was not until 2008 that the city authorities developed a concept to revitalise the former Julia coal mine, transforming it into Stara Kopalnia Multicultural Park. This decision was related, among other things, to the need to obtain external funds – including EU funds.[53] Among the tasks listed in the Local Revitalisation Plan of Walbrzych for 2008–2015[54] relating to the area of the mine, four points are worth noting: adaptation of the former Julia coal mine for cultural purposes; adaptation of the former Julia coal mine facilities for the Sudecka Philharmonic; construction of a tourism and recreation base; and creation of an entertainment and catering complex on the site of the former mine.

Not all of these investments have been completed – the Sudecka Philharmonic is still based in the city centre and has not moved to a new facility.

The project to revitalise the former mine area includes four hectares of land, 16 historic buildings with equipment, an underground tourist route in the eighteenth-century "Fox Adit"[55] and the creation of new facilities. It was developed by Nizio Design International. The revitalisation projects developed by this studio

concern both "hard" activities involving the transformation of space, and "soft" activities aimed at activating local communities. They concern objects, areas of cities, the shape and functions of which do not meet expectations and requirements arising from changing conditions and social needs. Studies, analyses and projects created in the course of them serve to strengthen the potential of places, competitiveness and attractiveness for investors and tourists.[56]

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[51] ZUZIAK Zbigniew K. *Strategie rewitalizacji przestrzeni śródmiejskiej*. Kraków: Wydawnictwo Politechniki Krakowskiej, 1998.

[52] www.ksiaz.walbrzych.pl, accessed July 2018; research in situ August 2018.

[53] LISOWSKA Agnieszka. Stara Kopalnia Centrum Nauki i Sztuki w Wałbrzychu – przykład rewitalizacji obiektów poprzemysłowych na cele kulturowe. In: *Turystyka Kulturowa*, 2016, No. 4, pp. 6–20, ŻABSKI Łukasz. Źródła finansowania rewitalizacji obiektów pokopalnianych na przykładzie Parku Wielokulturowego „Stara Kopalnia" w Walbrzychu. In: Trzepacz P., Warchalska-Troll A. (eds.). *Rewitalizacja miast: teoria, narzędzia, doświadczenia*. Kraków: IRM, 2017.

[54] www.gospodarka.um.walbrzych.pl/sites/default/files/lokalny_program_rewitalizacji_walbrzycha_2008–2015.pdf, accessed May 2018.

[55] PIĄTEK Eufrozyna. *Historia kopalni węgla kamiennego "Julia" [Fuchs, Biały Kamień, Thorez]* – www.boehm-chronik.com/bergbau/julia.pdf (accessed July 2018 and on 3 October 2022).

[56] https://nizio.com.pl, accessed May 2018.

The revitalised area of the Julia Mine covers a similar area to the Culture Zone in Katowicewhich, given Walbrzych's much smaller size, makes this a relatively more significant intervention on the scale of the city. The observation tower within the complex, as with the one in Katowice's Culture Zone, encompasses views both of the site itself and panoramas of the city against the backdrop of the surrounding mountains. The difference, apart from the scale, also lies in the fact that the Old Mine Science and Art Centre is an overall revitalisation project, created by a single studio, and not the result of successive international competitions for individual blocks.[57]

In terms of programming, the Old Mine Science and Art Centre offers a wide range of attractions aimed at various age and social groups. Each building is dedicated to different areas, including those related to the identity of the place, the city and the region. The Old Mine[58] houses the Museum of Industry and Technology; the Ceramics Centre; an amphitheatre; the Walbrzych Cultural Centre with rooms for dance, art and science workshops; a contemporary art gallery; a conference centre; and studios-workshops for artists and craftsmen, as well as guest rooms. The meticulously restored historic buildings have been elegantly combined with the consistent minimalist aesthetic of the new volumes, necessary for the functioning of an ensemble with such a complex programme. The public spaces of the complex, equipped with greenery and minimalist urban furniture, as well as exposed former mine equipment and sculptures, allude to an industrial aesthetic.[59] The underground tourist route illustrating the history of coal mining is very popular. The Old Mine was recognised by the Polish Tourist Organisation as one of Poland's best "tourist products", winning a Gold Certificate in 2022.[60]

Discussion and conclusions

The present study collected basic data and information on the case studies. Photographs are summarised in figures 1 and 2. The data are collected in Table 1. The analysis of outdoor spaces suggests a division of these sites into two types: 1) spaces that have already been completely renovated and transformed and have a distinctly touristic character and 2) spaces that still have the original authentic character of a place of work rather than of recreation or leisure. From an analysis of interior spaces, exhibition spaces and touring spaces, it can be concluded that most of these spaces are very similar and have common features, namely, visible structural elements of an industrial nature. The exception is the Silesian Museum, which is mostly housed in new contemporary buildings.

[57] GYURKOVICH. Polskie przestrzenie...
[58] www.starakopalnia.pl, accessed May 2023.
[59] Ibidem p. 173–174.
[60] www.starakopalnia.pl, accessed May 2023.

Fig. 1: *Photographs of the cases studied – views from the outside:* a) Salt mine in Bochnia; b) Salt mine in Wieliczka, Regis shaft; c) old mine in Wałbrzych; d) Silesian Museum (old mine KWK Katowice); e) Adit queen Luiza, Zabrze; f) Coal mine Guido, Zabrze; g) Silver mine, Tarnowskie Góry. [61]

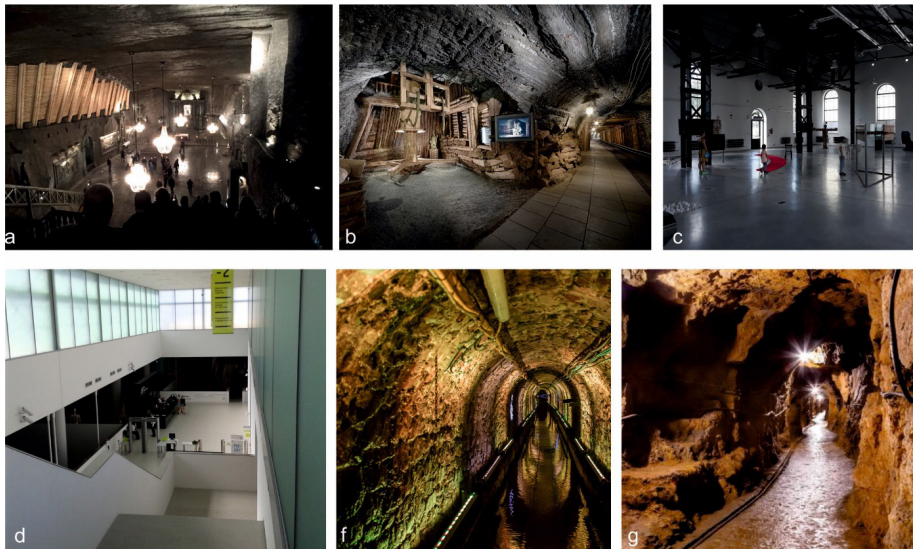

Fig. 2: *Photographs of the studied cases – views inside*: a) Wieliczka Salt Mine; b) Salt mine in Bochnia; c) Old mine in Wałbrzych; c) Silesian Museum (old mine KWK Katowice); d) Adit queen Luiza, Zabrze; e) Silver mine, Tarnowskie Góry.[62]

[61] https://kopalnia-bochnia.pl/galeria/pokaz/20 accessed 8 May 2023 Photo: Anna Dudzic, Mateusz Gyurkovich, Klaumich49 lic. CC BY-SA 4.0 wikipedia.org accessed 8 May 2023, Barbara Uherek-Bradecka, Sir Iwan lic. CC BY-SA 3.0 wikipedia.org accessed 8 May 2023.

[62] Photograph: Mateusz Gyurkovich, Szlak Tajemniczych Podziemi, Dolnośląska Organizacja Turystyczna, www.dot.org.pl, Mateusz Gyurkovich, https://podziemia.pl/ accessed 8 May 2023, https://www.zabytkitechniki.pl/ accessed 8 May 2023.

Table 1: *Selected information and parameters describing the studied cases of museums in mines.*

Mine name	**Years of operation as a mine**	**Date of establishment of the museum**	**Length (area/ volume/) of tourist route/ depth**	**Number of tourists (depending on the data: in general or annually)**	**Underground exhibition**	**Overground exhibition**	**Unusual events**
Salt mine Wieliczka	13th – 20th c.	17th c.	Tourist route: 3.5 km depth (64–135 m) Miners' route: 1.9 km; depth to 101 m	Ca. 1.5 million	+	+/-	concerts, theatre and opera performances, congresses, fairs, sports events; occasional events, e.g. weddings, banquets
Salt mine in Bochnia	1248–1990	since 1980	No data	Ca. 200,000	+	+/-	concerts, sport events; special events
Old mine in Walbrzych	1770–1999	2016	No data	Ca. 150,000 (2021) Ca.250,000 (2022)	+	+	concerts, workshops and trainings, sport events, special events
Silesian Museum (former KWK Katowice)	1823–1999	2015	25,000 m^2 (including underground exhibition on 2 levels – 6000 m^2)	Ca. 250,000 per year	+	+	Workshops, training, special events
Queen Luiza adit + Guido coalmine, Zabrze	1859–1982 (Guido) 1799 – 1998 (Luiza)	1981	1100 m, water route 900m	Guido 80,000 (2019) average 100,000 per year	+	+	Workshops, training, special events, weddings
Silver mine, Tarnowskie Góry	Since 1526	1953	1740 m, 270 m water route, depth 40 m	120,000 (2022)	+	+/- minimal	Boat tours, winter swim-ming

+ the feature exists;+/- the feature exists, but it is small, not significant in the scale of the entire exposition.

Quantitative data characterising selected cases are compared in Table 1; however, these figures do not give any information about quality. Salt mines have a different character from coal mines. Characteristically, the large halls with sculptures are much larger and more visually appealing compared to the spaces in former mining museums. Although all the museums have an exhibition, the nature of the exhibits varies and in some cases only elements related to mining technology are displayed, while typical museum exhibitions are most often dominated by art-related exhibits. The austere nature of the exhibitions is part of the creation of a distinct

brand of revitalised underground mines. Therefore, attempts to compare the expositions in underground museums do not give clear results.

Visitors' interactions with the exhibitions can be understood in an analogous way: in the Guido mine or silver mine in Tarnowskie Góry, some elements of the exhibition are movable, demonstrating how some of the mining machinery worked. Both museums are noteworthy for the unusual events that are organised in the museum spaces: concerts, museum nights, special events such as weddings and banquets, and unusual recreational events, boat rafting, winter swimming competitions and other underground sports events. These events and abovementioned movable expositions clearly indicate the differences between these institutions and typical museums, which do not organise such events.

Bondarenko refers to A. Tortika and M. Tortika's idea of two concepts of formation of a museum exposition: 1) the object of the exhibition is the main focus and all other aspects are organised so as not to interfere and 2) the use of scenic and artistic means in the creation of the exhibition.[63] The examples presented show that, in the case of museums created in mines, the issue of exhibition is a complementary element to the main content, which is the museum itself. In exceptional cases, it is possible to speak of the absence of an exhibition in the traditional sense, with only the display of elements of authentic post-industrial heritage.

Gawęda et al. state that the adaptation of post-industrial buildings for display purposes in connection with the historical values of the "site" can increase the significance of revitalisation.[64] It seems that the authenticity that results from a given location and function of a mine is an element that raises the rank of museums in mines to exceptional. Justifications for such conclusions include the museums' unusual morphology and the way they are visited, as well as their rich history, which remains original through the way they are displayed. Authenticity and integrity form a major component of the cultural values of any heritage resource, not just those objects pretending to be inscribed on the World Heritage List. It is enough to relate the "highest universal value" to another – non-global – area of comparison, making it a value of uniqueness specific to, for example, a municipality, region, province or country.[65] In the case of revitalised mines, authenticity can be identified on several levels: architectural (with original design), infrastructural (by the exposed original engineering solutions) and technological (by the fact that the underground museums can be visited safely).

In the case of museums in mines, the buffer zone that Affelt[66] mentions takes on a new meaning – it is not on the surface, but it is felt because the tour takes place underground; travelling from the entrance to the tour point is necessary. This is usually accompanied by instruction related to underground behaviour and a change in environmental conditions

[63] BONDARENKO Iryna, BONDARENKO Bohdan, GONCHAR Olena. Expositional design of the Audi museum in Ingolstadt: Representation of the brand's characteristics in automobile industry history In: *Muzeológia a kultúrne dedičstvo*, 2020, vol. 8, Is. 1, pp. 19–30.

[64] GAWĘDA Przemysław, WAGNER Tomasz, WRÓBLEWSKI Sebastian, PEŘINKOVÁ Martina. Industrial heritage and art. Contemporary adaptations of post-industrial architecture in the selected areas of Upper Silesia and Dąbrowa Coal Basin. In: *Architectus*, 2023, 4(76). DOI: 10.37190/arc230405.

[65] AFFELT Waldemar. Dziedzictwo Techniki Jako Cząstka Kultury Część I. W nurcie rozwoju zrównoważonego. The Heritage of Technology as a Part of Culture Part I. Within Current Sustainable Development. In: *Ochrona Zabytków,* 2008, No. 4, pp. 60–84.

[66] AFFELT Waldemar. O różnorodności form wyrazu kulturowego technofaktów i ich znaczeniu. In: Bogusław Szmygin (red.), *Ochrona wartości w procesie adaptacji zabytków*. Warszawa – Lublin: PKN ICOMOS, 2015. Online: http://bc.pollub.pl/dlibra/docmetadata?id=12729.

(pressure, temperature, humidity). Therefore, it should be concluded that the entrance areas of underground museums have a much greater impact on visitors than traditional museums.

The process of making underground mines available for exhibition purposes, although increasingly popular in Western European countries as well as Poland, is certainly not an easy task in terms of technical and architectural–construction aspects. The examples presented here of revitalised mines that have been made available to tourists are considered outstanding in comparison with other museums in Poland, and even perhaps in comparison to similar facilities in Europe. The main argument for this is their unique character, directly linked to the heritage, tradition and culture of the region.

This is confirmed by data on visiting tourists, who are important to the development of establishments and have an impact on the development of cities. The authenticity of the cases in question is emphasised by the local culture and identity of the region. It is particularly noticeable in Silesia, where most of the museum guides are former miners whose upbringing, traditions and way of life can be described as "Silesian". This translates into language, among other things: during a guided tour at the Guido or Luiza mines, tourists have a chance to listen to the Silesian dialect and learn the history and culture associated with mining, which was the foundation of the region's development. It seems that further research into such sites and identification of their unique features may provide answers on how to exhibit and promote them in the future, which may be a challenge in the era of digitisation and mass access to resources.

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