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Europe's cultural legacy



Deliverable 2.3

Successful stories of transforming coal mining
sites and areas into industrial heritage objects

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Summary

In many cases, dealing with the closed coal mines – the underground and surface buildings, machinery etc. – did not take into account them as valuable, worth preservation as historical monuments. The main focus was to deal with the problem, via deconstruction in particular. This regards also coal miners' settlements. Traditions, legends, customs, folklore etc. that are related with coal mining and coal miners also were not seen as worth preserving. Fortunately, this approach has changed. Even in case of those objects that exist no more, efforts are taken to preserve memory of them by any possible way, e.g. via collecting photos, documents, writing down stories, and sharing these with public.

It is worth noting that mining was a significant driving force behind the development of industry in Europe. By preserving the cultural heritage related to this industry, we are building a historical monument thanks to which future generations will have the opportunity to learn and understand the history of industrial development and successive industrial revolutions. Preserving the existing heritage is, on the one hand, an obligation to pass on our history to subsequent generations, and on the other hand, it is a kind of tribute and thanks to previous generations who worked in extremely difficult conditions to develop the technology of time and improve the quality of life of citizens throughout Europe.

Successful transformation of coal mining regions in a way that results in preserving coal mining heritage can be carried in a variety of ways, which for years has been demonstrated across the Europe. These include among others turning into museum, turning into tourist attractions and/or entertainment sites, turning into well cared elements of landscape or architecture, creating of exhibitions.

The actual process is going on and will continue during many upcoming years. In the current Deliverable results of study carried out in WP 2 are presented. In each country involved, i.e. Germany, Greece, France, Poland and Slovenia, examples of transformation activities have been identified and described in this document. They can serve as a source of guidelines and inspirations for further realization of the transformation process.

The recipients of this document may be:

- Private individuals - people interested in mining, thanks to the study, can expand their knowledge related to the mining heritage in Europe. They can learn about interesting places that may become destinations for their travels. In this way, awareness of the mining as industry and as valuable part of culture and history would become more and more common.
- Decision-makers related to the mining industry - companies and coal plants that will soon be subject to restructuring or liquidation - after reading this document, they can be inspired and develop their own visions of transforming their plants into valuable places in terms of tourism, culture or education and science,
- Self-governments and local authorities - each restructuring and transformation of industrial plants into cultural, educational or tourist facilities is associated with the process of social transformation and requires financial resources. Taking this into account, local governments, following the examples presented, have the opportunity to plan their activities in the long term, taking into account the transformation of post-industrial areas in their budgets or by preparing project applications and external funding for this type of activities. The activity of these bodies may also consist in informing and actively supporting mining plants located in their area in terms of revitalization and transformation of places related to the mining industry. It also provides the opportunity to mitigate the social consequences by retraining some of the staff and providing new jobs in closed plants.

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1. Introduction

Coal mining in a given area means not only existence of surface and underground infrastructure but also way of living, traditions, customs, etc. of coal mines' staff and local communities. For years, efforts to preserve these as valuable heritage are being taken, along with phase-out of coal mining. Examples of success in this matter, in 5 European countries – Poland, Germany, Greece, France and Slovenia - are presented in this document. Buildings, machinery and other technical objects as well as museum or museum-like collections of objects related with work, every-day life of miners and their families are included. In the descriptions, location, history and transformation process are outlined, as relevant. Also examples for excavation industry of other than “coal” minerals are included, and serve as source of inspiration.

In each of the countries involved, phasing out of coal mining is at different stage, which is also reflected in the presented examples. E.g. although Greece has a long history of mining, transformation of their coal mining sites started relatively recently, while e.g. in Germany and France the transformation has started many years ago.

2. Successful stories of transforming coal mining sites and areas into industrial heritage objects

2.1. Poland

Examples of the transformation of mining sites into cultural heritage sites in Poland are divided into 4 groups:

- Group 1 – Coal mining facilities with underground tourist route
- Group 2 – Above-ground post-mining facilities / museums. Memorial chambers
- Group 3 – Former mine shafts
- Group 4 – Examples of good practices related to the transformation of post-mining facilities not related to coal (ore mining, salt mining, oil mining, etc.)

2.1.1. Group 1 - Coal mining facilities with underground tourist route

1) GUIDO Coal Mine

Formerly: Guido Historic Coal Mine, today: a closed hard coal mine being a part of Coal Mining Museum in Zabrze.

HISTORY (translation of parts of the elaboration available at <https://kopalniaguido.pl/historia>). The mine was founded by Count Guido Henckel von Donnersmarck, who received the mining grant on 2 October 1855, and the established facility was named after him. The Guido Mine's mining field was then 1.03 km². Earlier drilling in the area suggested that this mining field would be rich in coal deposits, as was the nearby state-owned Queen Louise mine (Königin Luise Grube). Count Guido Henckel von Donnersmarck hoped to obtain coal with coking properties when he built the new mine. In 1885, a record amount of coal was mined in the history of the mine: 313,000 tonnes, but due to the generally low profitability in the same year, Count Guido began the process of selling the mine to the State Mining Treasury of Prussia (Königlich - Preussischer Bergfiskus), known as Fiskus. From then on it was state property. It was incorporated as the Southern Field in the state-owned mine "Królowska Luiza" (Queen Louise). At the beginning of the 20th century, water from the excavations of the Guido Mine was used to generate energy by launching an underground hydroelectric power plant. In the first years of the 20th century, south of the "Guido" mine, a new mine "Delbrück" ("Delbrückgrube" - later the

"Makoszowy" mine) was built, extracting coking coal. A coking plant was built next to it. In 1904, the workings of both mines were connected underground, and in 1912 the "Guido" mine was formally incorporated into the "Delbrück" mine. In 1962, the Guido shaft became inoperative by a decision issued by the District Mining Office in Gliwice. In 1979, this shaft was backfilled to the level of 170 meters. On the other hand, the railway shaft lost its function as a downhill shaft and until 1967 it was used only for lowering materials necessary for the work of miners and wood for the construction of the support. In 1967, the area of the former Guido Mine was transferred to Zakłady Konstrukcyjno-Mechaniczne Przemysłu Węglowego (Construction and Mechanical Plants of the Coal Industry). The M-300 Experimental Mine was established on its premises, the main task of which was to test new mining machines and equipment. During operation, the M-300 Mine excavated the remains of seam 620 at the 400-metre level. In 1975, the former Southern Field of the Królowa Luiza Mine was transferred into the hands of the KOMAG Central Design and Construction Centre. In 1982, an agreement was signed between the director of the M-300 Experimental Mine and the Coal Mining Museum in Zabrze, which was then represented by Krystyna Barszczewska. According to the provisions of the contract, part of the excavations was to be adapted for the purposes of an underground open-air museum. In the same year, "Guido Open-Air Mining Museum was created at level 170, open to the public, and then entered into the register of monuments. In 2000, on the wave of lowering costs at all costs in the coal industry, the dismantling of a unique, underground mine, which could be visited, began. However, the involvement of many institutions, primarily the municipal government of Zabrze, the Marshal's Office of the Silesian Voivodeship and private individuals, led to the suspension of liquidation activities and the establishment in 2007 of the Historic Mine "Guido" as an independent cultural institution of the City of Zabrze and the Silesian Voivodeship. In the same year, level 170 was reopened to tourists, and a year later level 320. In February 2015, sublevel 355 was opened. In April 2013, the Guido Mine and the Zabrze Coal Mining Museum were merged into a single institution called the Zabrze Coal Mining Museum.

AT PRESENT

Guido Coal Mine offers:

- Guido Coal Mine Sightseeing [43] - are possible on two levels 170, 320 and sublevel 355. You go there with the authentic elevator (in Silesia called "shola"), the same that is used in active coal mines. - The Dark of the Mine [40] - is the journey to deepest and rawest regions of Guido Coal Mine. The tour guide will take you to 355 level and the last active longwall, mined in the second half of the 20th century. You will see the coal mine preserved in the state it was left by miners over twenty years ago. - Miners' Shift [42] takes visitors to the deepest regions of Guido Coal Mine – the lowest point of the route is 355 metres below the surface of the ground. The route goes through a mining longwall No. 4, mined in training and research purposes in the second half of the 20th century. The visitors receive will receive full equipment and frontman's outfit. The site is also prepared to serve as a venue for events. The Guido Coal Mine together with Sztolnia Królowa Luiza (Queen Luiza Adit) have attractive educational offer (educational trips). The main point of the 170 level is St. Barbara's chapel, which is a great attraction in religion-related tourism. Religious ceremonies are held there. Next to the Guido mine, the Guido Hostel [41] was established as part of the complex, where tourists can stay overnight.

2) Queen Louise Adit

Queen Louise Adit (formerly: Queen Louise Mining Open Air Museum; Skansen Górniczy Królowa Luiza) - is part of the Coal Mining Museum in Zabrze [58]. The name "Sztolnia Królowa Luiza" (Queen Louise Adit) is a modern name used for a tourist site composed of two interconnected historic sites: kopalnia

"Królowa Luiza" (Queen Louise coal mine) and Główna Kluczowa Sztolnia Dziedziczna (Main Key Hereditary Adit).

HISTORY

The history of the Main Key Heritage Adit begins at the end of the 18th century. In 1779, Friedrich Anton von Heinitz, minister of state and de facto head of the Prussian government, co-founder of the world's oldest mining academy in Freiberg, Saxony, brought Friedrich Wilhelm von Reden to Silesia, who - as director of the Higher Mining Office in Wrocław and later minister for mining and metallurgy - played the role of a precursor in the industrial revolution in Silesia. Reden was able to enlist the support of many eminent scientists and entrepreneurs for his grand plan to build the first modern industrial basin east of the Elbe. **Salomon Isaac of Brabant**, a Jewish merchant and later a senior official of the Mining Office in Tarnowskie Góry, discovered coal deposits, thus **giving rise first to the "Królowa Luiza" mine** and later to other mines and steelworks throughout the region. Scotsman John Baildon - known as the father of modern metallurgy, a student of one of the most eminent engineers of his time - John Smeaton - was the creator of, among others, the Royal Iron Foundry in Gliwice (Królewska Odlewnia Żeliwa w Gliwicach; now Gliwice Plant of Technical Devices; Gliwickie Zakłady Urządzeń Technicznych), where the second blast furnace on the European continent was built, fired with coke made from coal extracted from the "Królowa Luiza" mine (Queen Louise mine).

Główna Kluczowa Sztolnia Dziedziczna (Main Key Hereditary Adit)

The high costs of dewatering the mine and transporting the coal led Count Reden to implement an innovative dewatering and transport system that he had seen during his stay in England where this type of solution had been used from the 1820s onwards. Adits created at that time drained mines of coal, non-ferrous metal ores and limestone. Similar solutions were also in operation in the metal ore mines of the Harz Mountains and the Mansfeld Mountains. The design of the adit also took into account the experience gained during the construction of the "Lisia Sztolnia" ("Fox Adit") in Wałbrzych (1791-1823), which was used not only to drain the Fuchs ("Victoria") mine, but also to transport coal (1801). This resulted in the Główna Kluczowa Sztolnia Dziedziczna (Main Key Hereditary Adit), which was constructed over a period of 64 years, from 1799 to 1863, making it the longest hydro-technical underground structure associated with coal mining. It made it possible to drain two model state mines and about 20 private mines and made coal seams accessible for mining. In addition, it was part of an important waterway linking Upper Silesia with the ports of Western Europe, thanks to the construction of the Kanał Kłodnicki (Kłodnica Canal), whose origin was the outlet of this adit. Coal transported by this route from the "Królowa Luiza" mine enabled the establishment and development of the Królewska Odlewnia Żeliwa w Gliwicach (Royal Cast Iron Foundry in Gliwice).

"Królowa Luiza" mine

Since its foundation in 1791, the mine developed rapidly, already in 1816 acquiring a total of 25% of all coal production in Upper Silesia. In 1842, after the completion of the "Dechen" shaft, the exploitation of coal seams began located below the Main Key Hereditary Adit. In 1846 the mine received one of the first railway sidings in Upper Silesia, which made it possible to transport coal to distant customers. In the 1850s, shafts were constructed: Carnall (Zabrze II), Prinz Schönaich and Krug, later forming the West Field of the mine. Between 1869 and 1890, the Poremba I-IV shafts were explored, forming the East Field of the plant. In 1898, the "Queen Louise" reached an astronomical and unbeaten for many years output of as much as 3.3 million tonnes of coal, employing 8,500 miners. It was then divided into three mining fields: West, East and South (the former 'Guido' mine). At the beginning of the 20th century, the Wilhelmina ventilation and wood shaft (Sienkiewicza Street) was built. In 1929, the company was split into two independent mines - "Królowa Luiza Zachód" and

"Królowa Luiza Wschód" delivering a total of 2.6 million t of coal. Along with the mine, Zabrze also changed, transforming from a small village into a thriving industrial centre. Many other innovative technical solutions, later common in other mines, were introduced in the "Królowa Luiza" mine during almost the entire period of its existence. The mine was regarded as one of the largest and most efficient coking coal mines in Europe. **The naming of the mine after Queen Louise of Prussia - one of the most famous and respected women of the late 18th and early 19th centuries. - demonstrates the huge role the mine already played in the state economy at that time.** Further development resulted in the establishment of modern coal-processing plants: one of the first coking plants and a power plant on Polish soil, another coking plant and a briquetting plant. The picture of Zabrze at the turn of the 19th and 20th centuries fully illustrates the character, momentum and significance of industrialisation in this part of Europe. The scale of the investments made in the mine later, including after the Second World War - resulting in a record output for the country - led to Zabrze being called the capital of Polish mining. After the Second World War, the "Królowa Luiza Zachód" and "Królowa Luiza Wschód" mines were **renamed "Zabrze-Zachód"** (in English: Zabrze-West) **and "Zabrze-Wschód"** (in English: Zabrze-East). In April 1957, the two mines were **merged into one plant, KWK "Zabrze"**, which remained in the mining vanguard following the example of its predecessor. In 1962, thanks to the use of a modern longwall shearer and the development of a special work organisation, a record daily output was achieved. This method of mining was given the name "Zabrze longwall" in Polish mining, and the system of work organisation was called the "Zabrze system". The importance of the mine was also evidenced by the fact that one of the ships of Polska Żegluga Morska (the Polish Shipping Company), sailing in the years 1959-75, was given the name 'Kopalnia Zabrze' (Zabrze mine). In January 1976, the **'Zabrze' and 'Bielszowice' mines were merged into one mining company, which was renamed KWK 'Zabrze'**. The merged plants employed 10,000 workers and extracted 6 million tonnes of coal. The new name of the mine (KWK "Zabrze") was **changed to KWK "Zabrze-Bielszowice"** in 1983. In the record year of 1987, the 'Zabrze-Bielszowice' mine employed a total of almost 12,000 people and extracted 5 million t of coal.

TRANSFORMING INTO TOURIST ATTRACTION

In 1998, after 207 years of operation, **the 'Zabrze' mine ceased coal mining. In the meantime, events took place in the history of the former "Queen Louise" which started a new tourist chapter in the mine's history. The first underground tourist route of hard coal mining in Poland was established in the West Field of the "Zabrze" mine.** It was intended to play a propaganda role and encourage young people to take up mining jobs. **The opening of the route took place in June 1965.** The underground attraction **was called "black Wieliczka"**, but the official name was Ośrodek Propagandy Górnictw) ("Mining Propaganda Centre"). In this way, one of the first centres in Europe was created in Zabrze, where a working coal mine was opened to the public. The tour, which included a mechanised longwall, was located at level 503 m, where visitors were lowered into the Carnall shaft via a mine shuttle. The route was managed by the Międzyzakładowy Górniczy Oddział Polskiego Towarzystwa Turystyczno-Krajoznawczego (MGO PTTK) (Inter-factory Mining Branch of the Polish Tourist and Sightseeing Society) at the Zabrzeńskie Zjednoczenie Przemysłu Węglowego w Zabrzu (Zabrze Coal Industry Association in Zabrze), which is why it was popularly known as the Mining Propaganda Cal Wall or the PTTK Coal Wall. It was visited by more than 10,000 visitors every year. **Due to problems with maintaining the network of underground excavations, the mine ceased its tourist activities in 1979.**



Figure 1. Commemorative photo after visiting the "PTTK longwall" at the Zabrze mine [144].

It was soon decided to use for propaganda and tourist purposes the mine area around the Wyzwolenie shaft (the former Wilhelmina shaft), where a mining school had been located since the 1930s. In 1983 the management of KWK "Zabrze - Bielszowice" decided to build a new training and propaganda adit, which was connected to the old excavations of the former "Królowa Luiza" mine. A model training adit was created, perfectly imitating a real mine and featuring, among other things, mechanised longwalls. The opening of the entire complex of workings, named Ośrodek Szkolenia Zawodowego i Propagandy Górnictwa (the Mining Training and Propagation Centre) at the "Zabrze - Bielszowice" coal mine, took place in December 1985. **Propaganda, tourist and training activities were carried out until the early 1990s. For the next two decades, a branch of the Coal Mining Museum in Zabrze - the "Królowa Luiza" Open Air Museum - operated in the excavations by the Wilhelmina shaft and the surface buildings around the Carnall shaft. Tourist traffic and museum activities were conducted in the historic complex.** The open-air museum is probably remembered by many as a place where, as children, they could see a demonstration of how a steam engine worked, take a ride on the Karlik railway or chop coal with a real pickaxe. It was also the setting for interesting film and theatre projects. It is worth mentioning the Polish-Italian production "Marcinelle", starring Olaf Lubaszenko and Zbigniew Zamachowski, which tells the story of one of the biggest mining accidents in the Belgian mine "Marcinelle" in 1956. Bogusław Wołoszański visited the open-air museum twice (in 2002 and 2006), making episodes of "Sensacje XX wieku" (The Sensations of the 20th Century) in the underground excavations. Other productions made at the Skansen include "Barbórka" (2005, Zbigniew Stryj, Marcin Dorociński), "Sówka Erwin" ("Erwin the Owl"; 2005, directed by Adam Sikora) or "Chodnik 05", a dance performance by the Gliwice Music Theatre directed by J. Stańek. The performance was the basis for the film "Chodnik 05", broadcast as a TV show (TVP Kultura). **The open-air museum functioned until 2011, when it underwent a thorough revitalisation as part of the Królowa Luiza Adit project.** The revitalisation resulted in Park 12C, a tourist facility designed primarily for families with children [143].

A great revitalization project of the Queen Luiza Adit [145]

The opening of the entire Królowa Luiza Adit is the result of mining and construction works carried out on a grand scale, which began in 2009. The "Królowa Luiza Adit" project is an investment financed with more than PLN 182 million of EU, as well as municipal, voivodeship and government funds. The largest of the projects implemented for the tourist arrangement of the Adit is called "Europejski Ośrodek Kultury Technicznej i Turystyki Przemysłowej" ("European Centre of Technical Culture and Industrial

Tourism") and its beneficiary is the City of Zabrze, the executor is the Muzeum Górnictwa Węglowego w Zabrzu (Coal Mining Museum in Zabrze), and the project's implementing partner is the Silesian Voivodeship. Over 20 companies and mining enterprises in total were responsible for the execution of the investment. Located 40 metres below the centre of Zabrze, the Main Key Heritage Adit has not been explored since 1953, when it was decided to close it and backfill the outlet at Karola Miarki Street. It was extremely difficult to estimate the real condition of the Adit, as well as the extent of the revitalisation works, which subsequently contributed to extending the deadline for opening the facility. The first informal explorations were carried out as early as 1999. Enormous amounts of overlying silt and poor ventilation were the biggest obstacles to uncovering the 200-year-old workings of the Adit. In spite of this, earlier assumptions were confirmed - the Adit has been preserved in very good condition, and what is more, during the exploration a unique, 19th-century gallery was discovered, drilled into coal seam 510, which will also become part of the tourist route. Heavy mining and construction work began a decade after the first explorations. **Mining companies began the arduous process of caving the Main Key Heritage Adit in 2012** and ended in March 2014. It is estimated that a total of almost 19,000 tonnes of silt left the Adit over several years. The layers of silt deposited in the Adit hid many interesting objects that could be considered treasures due to their age. These included fragments of wooden troughs, beams, an iron ore wagon, mining tools, as well as two well-preserved 100-year-old transport boats. The objects will be exhibited for tourists. **In the next stage of the works, revitalisation and arrangement works were carried out in the underground of the adit**, related to the sealing of the adit, the construction of a pool basin and jetty at its outlet, as well as the renovation of the historic roof support in strategic sections, including under Karola Miarki Street. The work carried out now allows tourists to go boating on a section of approximately 1100 m. **The coal gallery and the Wilhelmina Shaft** lead to the former excavations of the 'Królowa Luiza' mine, where an underground mining museum operated until 2011. These workings have also undergone **extensive modernisation and have been enriched with a range of multimedia, as well as refurbished mining machinery: a longwall planer, a recessing machine, an overhead loader, a longwall shearer, a roadheader and a Karlik mine railway**. **At the turn of 2014 and 2015**, the Adit was **enriched with a completely new mine workings** - a transport diagonal, excavated at the Carnall Shaft from the parking basin up to the minus 40 m level. In addition to the outlet at Miarki Street, the diagonal represents the second free entrance to the adit from surface level. **In parallel with the underground mining works, the above-ground part of the Adit was built and revitalised, comprising three locations: Wilhelmina Shaft, Carnall Shaft and the outlet of the Adit in the city centre.**

AT PRESENT

Attractions offered in the Queen Louise Adit:

- **Underground water route [90]** A fragment of underground excavations are on foot here, and 1,100 meters is a unique, underground rafting by boat.
- **Underground family route [89]**; about 1.5 hours of wandering through an underground labyrinth of mining passages. After passing through narrow corridors, everyone can see real, active mining machines.
- **Above-ground zone – Park 12C [143]**; a place combining educational and entertainment dimensions. The place is dedicated to the inhabitants of Zabrze and surrounding cities as a place for walks, family recreation, fun and social gatherings.
- **Military Technique Park [87]**; Right next to Park 12C, in cooperation with the Military Technology Foundation - Mała Armia "Grupa Śląsk", the Military Technology Park was created, where you can admire interesting military exhibits. Among them there will be tracked vehicles, armed personnel

carriers, military trucks, rocket launchers, and even T-34 and T-72 tanks, used in the Polish Army in the 20th century.

- **Queen Louise Adit Carnall Zone [88]**; completed in July 2021, the revitalised above-ground zone, located by the Carnall shaft of the Królowa Luiza Adit, is a post-industrial space which, thanks to revitalisation, has just been given a second life and has become the largest cultural zone in Poland. The post-industrial buildings can be visited on your own or with a guide. In the buildings you can see there e.g. a working steam engine, more than 100 years old, or a unique, one-of-a-kind exhibition on mine rescue and mine danger. There are two options for visiting the zone - the Miner's Way and the Rescue Mission. The Carnall zone has from the outset become a venue for festivals, concerts and thematic events such as the Carnall Festival or the Barbora Fair - BLOVE



Figure 2. Attractions offered in the Queen Louise Adit [58].

3) Former Nowa Ruda Mine

Background: In the Former Nowa Ruda Mine (Dawna Kopalnia Nowa Ruda) there is a museum and an underground tourist route. The later one - Podziemna Trasa Turystyczna “Kopalnia Węgla” (The Coal Mine Underground Tourist Route) was established back in 1996, in the “Nowa Ruda” Mine that lies in the former “Piaś” mining field in Nowa Ruda. While the mine was still in operation in Nowa Ruda, the idea of preserving part of it in the form of a museum was born in several minds. The idea was to remind people of Nowa Ruda's heritage, to pass it on to future generations who no longer had contact with the mine, and to be an important point on the cultural map of Nowa Ruda and Kotlina Kłodzka (the Kłodzko Basin).

AT PRESENT.

General info. Here you can learn about the ways of securing galleries and the working methods miners used in the past. You can also see old mining machines and the cars of the underground railway, which used to transport people and coal. A highlight are the petrified tree trunks from over 250 million years ago. They can be seen exposed in front of the entrance to the adit and in their natural position in two places on the walls of the underground galleries. Visitors can admire, among other things, a fossilised araucaria, which is unique in the world. The original control room is also open to the public. In the above-ground mining complex you can also see the furnaces and shaft towers, unique in the world. It is one of the few 19th-century industrial and mining buildings preserved in such excellent condition.

Offer. Visiting of The Former Nowa Ruda Mine is divided into two parts - museum and underground.

In the museum part, in each of the four exhibition halls, tourists will learn about a different topic related to the mine. The first room deals with the coal itself. You can follow the process of coal formation, learn about its properties and see its different types. The exhibits include, among others, authentic imprints of ferns, horsetails and clubmoss from 300 million years ago, coals and many minerals. The next room is about the history of mining. You can find out how mining in Nowa Ruda developed and get to know mining traditions, such as Barbórka. The exhibits include, among others, uniforms, swords, walking sticks, lamps, helmets and tankards. In the third room, tourists will find out why the Nowa Ruda mine was one of the most dangerous mines in Europe, what the risk of carbon dioxide was and what conditions our miners worked in. In the hall you can see various types of oxygen apparatus and many mining equipment, such as methane meters, detonators and detectors. The last room is the control room, called the "heart of the mine". The original equipment allows you to feel as if we were watching over the safety of miners underground. After checking the messages and maps, tourists can go underground. On the way to the Lech adit, you can see the shaft tower of the same name and fans. In the mine itself, tourists will be able to feel as if they have stepped into a still-working place. Not only can you see everything, but also touch it yourself and even work with mining tools. Equipment left behind by miners still works. In action you can see, for example: a conveyor, a harvester, a jackhammer or a ventilation duct. Along the route there are exhibitions showing the work of miners, horses and children. A great attraction is the ghost Treasurer, who still lives in the mine and scares and amuses tourists. At the end of the journey, you leave the mine on an authentic mining railway. The underground tourist route is approx. 700 m long. In addition to the pure tourist visiting, a number of attractions are offered the Former Nowa Ruda Mine, like e.g.[115] terrain games (following a map, finding hidden objects, carrying out particular tasks etc), use of real miners' equipment, and other.

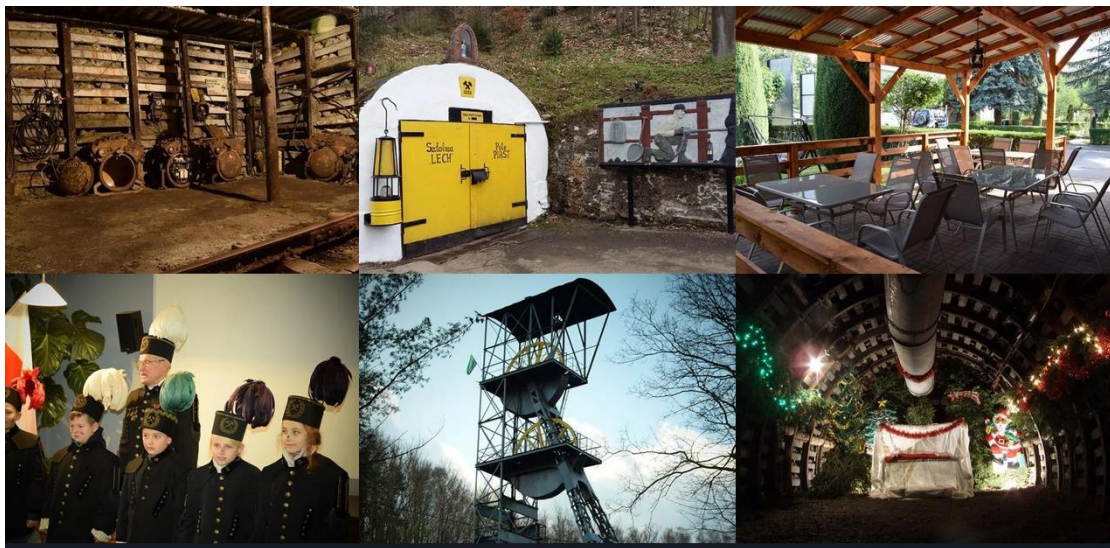


Figure 3. Former Nowa Ruda Mine [115].

HISTORY

The coal mine in Nowa Ruda was one of the oldest in Poland. Its origins date back to the first half of the 15th century, when coal mining began. The mine consisted of two mining fields - Piast and Słupiec. The decision to put the Nowa Ruda mine into liquidation was taken by the Minister of Industry and Trade on 22 January 1992. The Piast field was to be liquidated first. It started with the G-3 branch, extracting refractory slate. The last coal from the Piast field left the shaft on 15 September 1994. The Nowa Ruda mine consisted of two mining fields - Piast and Słupiec, whose excavations were not

connected to each other. The decision to put the Nowa Ruda mine into liquidation was made by the Minister of Industry and Trade on January 22, 1992. The Piast field was to be liquidated first. It started with the G-3 branch, extracting refractory slate. The last coal from the Piast field left the shaft on September 15, 1994. The shafts were filled in the following year. Even during the decommissioning, an initiative group of employees was formed with the aim of creating a mining museum and saving some of the excavations from being buried. It was headed by ventilation engineer Czesław Lis. The efforts were crowned with success. What survived was a set of training excavations at the Lech adit and a 37-metre-long section of the Piast II shaft. The first tourists visited these underground sites on 9 February 1996. The underground route initially belonged to the Nowa Ruda colliery, then to the town, until it finally came into private hands. Some of the miners working in the Piast Field moved first to the Słupiec Field, which was in operation for five and a half years. Then they had to look for other work. Some went to Upper Silesia. The first mention of mining in Nowa Ruda dates back to 1434. The beginnings of mining in Drogosław (a part of Nowa Ruda) date back to 1742, when the Stillfrieds, the owners of Nowa Ruda, established the Ruben mine, where they extracted hard coal and then also refractory slate. Coal mining began in 1781. In 1868, the Maxschacht shaft was dug down to the first level, later Lech. Then, for the first time, dynamite with water was used. From 1975, Lech became a ventilation shaft. From 1945 the Ruben mine was called Nowa Ruda. In 1946, the Przygórze and Jan mines were added to it. In 1954, the mining area of the former Jan mine was transformed into the Słupiec mine. In 1971, the Nowa Ruda and Słupiec mines were merged into the Nowa Ruda mine in Słupiec. On April 1, 1992, the mine was put into liquidation. In 1994, the Mining Museum was established in the Piast mining field, later transformed into the Underground Tourist Route "The Coal Mine in Nowa Ruda". On February 8, 2000, coal mining in the area of the Słupiec field ended.

4) **"Former Mine" Science and Art Centre in Wałbrzych**

"Former Mine" Science and Art Centre in Wałbrzych (Centrum Nauki i Sztuki Stara Kopalnia w Wałbrzychu) is the biggest post-industrial tourist attraction in Poland, located in the former bituminous coal mine – Hard Coal Mine "Julia" ("Thorez"); Kopalnia Węgla Kamiennego "Julia"; The 2014 revitalization of the biggest mine located in Wałbrzych which at the height of its activity employed several thousand workers allowed for the creation of an exceptional object among tourist attractions in Poland. Currently, it covers the area of 4.5 hectares of historic post-industrial objects with authentic equipment, such as a machine park which has been secured and made accessible for visitors. With the help of guides working in Stara Kopalnia (former miners who worked in KWK "Julia" in the past), all visitors can not only see the enormous scale of mine infrastructure, but also learn about the character of the dangerous and demanding work of a miner.

In 2015, Stara Kopalnia was awarded a prestigious title of "Zabytek zadbany" (en. a well-kept monument) granted by the National Heritage Board of Poland, which additionally emphasized the unique character and the scale of revitalization works conducted in the whole object.

This perfectly preserved post-industrial complex is a source of knowledge on the history and culture of coal mining, as well as about ceramic industry in Lower Silesia. The structures of Stara Kopalnia include:

THE MUSEUM OF INDUSTRY AND TECHNOLOGY – This is where you can learn about the history of coal, mining, and miners working in extremely dangerous conditions. The museum collections include mining equipment and its elements, relics related to the activity of Wałbrzych mines, as well as audio-visual materials and archives. The museum also has an archaeological and geological departments with extensive collections from the Wałbrzych area.

GALLERY OF CONTEMPORARY ART – Stara Kopalnia is a place featuring works of prominent artists, presented as a part of temporary and permanent exhibitions.

UNIQUE CERAMIC CENTER – Centrum Ceramiki Unikatowej (en. Unique Ceramic Centre) offers ceramic and pottery workshops (individual and group classes) during which the participants work on a selected clay modelling technique. The Centre also conducts classes for kindergartens and schools as well as for students of all education levels. In the Centre, we also offer a possibility to organize original, creative birthday parties.

GUEST ROOMS AND A CAFÉ – We have single and double rooms, including one double room with facilities for the disabled. Each room has its separate bathroom with a shower and a hairdryer. All rooms are equipped with a TV and a telephone. In the former mine foreman room, we can now find a café and ticket offices.



Figure 4. Julia Mine from a bird's eye view [18].

BACKGROUND AND HISTORY

The museum was established on the premises of Kopalnia Julia in Wałbrzych. The Julia Mine is located in the Wałbrzych district of Biały Kamień, at 29 Piotra Wysockiego St. Over the years it has changed its names: Fuchsgrube, Biały Kamień, KWK Julia, KWK Thorez, KWK Julia. 'Julia' was formed by the merger of several small mines, which had been operating coal in the area of the municipality of Biały Kamień since the 16th century. The original name of the Consolidirte Fuchs mine complex survived until 1945, when, after the site was taken over by the Polish administration, it was changed to Julia. Turbulent times, full of rapid change, brought two more name changes. From 1946 to 1949 it operated as "Biały Kamień" (the White Stone), and in 1950 it was rebranded as Kopalnia Thores (the Thorez Mine). It was not until 1993 that the name Julia Coal Mine was reverted to and remained.

Over years, the mine was repeatedly enlarged by the addition of new mining fields and the development of surface infrastructure, the mine has grown into a large complex. Today, the mine complex consists of a complex of buildings from different phases of the plant's expansion. Among the oldest are the brick hoist towers from the second half of the 19th century (Julia and Sobótka), which were extended with steel shot towers (Julia in 1893, Sobótka in 1903). In the machine rooms, complete electric winding machines with current converters have been preserved, which replaced the steam-powered winding machines in 1911.

Changes in the national economy of the 1990s resulted in massive mine closures. A similar fate befell Julia. In September 1996, Julia ceased coal mining. However, due to the high historical significance of the site, it was decided that it was worth protecting and even promoting. Of all Wałbrzych's mines, Julia is the oldest and best preserved complex of industrial buildings from the turn of the 19th and 20th centuries. There are sixteen buildings on an area of 4 hectares. All of them have been entered in the register of historical monuments.

In 2008, the Wałbrzych municipality commissioned a concept for the new development of the former mine.

Between 2009 and 2014, renovation and conservation works were carried out at the mine, which included a complex of more than a dozen buildings. These works excluded 3 objects in the south-eastern part of the mine: the sorting plant, the railway scale and the washing and flotation building. Due to the impossibility of preserving the original function, the buildings were adapted to meet current/present needs: part of the complex was restored and given the form of a museum exhibition, while the remaining buildings, with their external form preserved and selected elements of the interior authenticated (roof trusses, steel beams, backfillings), were given a completely new function. In 2014, a modern science and art centre opened in a complex of eleven revitalised buildings. The Museum of Industry and Technology was established on the basis of its mine buildings.

5) Training Mine of the SztYGarka City Museum in Dąbrowa Górnicza

The Training Mine of the SztYGarka City Museum in Dąbrowa Górnicza (Kopalnia Ćwiczebna Muzeum Miejskiego „SztYGarka”) is located in the south-eastern part of the mining area of the former "Paris" coal mine in Dąbrowa Górnicza, in the vicinity of Górnicza and Legionów Polskich streets. In its vicinity, on a gentle slope sloping in a north-easterly direction, there is a small square with a monument to Stanisław Staszic. In addition, in the vicinity of the Mine, there is St Barbara's Church and the buildings of the Stanisław Staszic Vocational School Complex and the SztYGarka City Museum. The museum is currently a rarity in the region. The mine, consisting of 3 levels, has been open to the public as an underground tourist route since 02.01.2010 and is very popular among tourists. The Exercise Mine shows how middle mining staff was trained as part of apprenticeships. Visitors can see mechanical and electrical training areas and the securing of mine workings with specialised supports.

The main attractions:

- OSINOBUS with a multimedia presentation on the industrial history of Dąbrowa Górnicza
- Coal face with KWB 3 longwall shearer
- Training stands for pupils
- Roof supports
- The raw nature of the excavations

HISTORY AND BACKGROUND

Construction of the Training Mine at the State School of Mining and Metallurgy (PSGH) began in April 1927. The first phase was completed in 1929. The mine was designed to familiarise students with various mining equipment, geological surveys, ventilation and underground surveying. The future miners also carried out the excavations. Their total length was about 250 m. In the following years, it was successively extended. At present, the length of the underground workings (galleries, slopes and adits) is around 800 metres. Practical classes for mining school pupils were carried out in the Excavated Mine until 1994.



Figure 5. Exercise Mine of the Szttygarka City Museum – underground corridor [161].

After the 'school role' of the mine ended, it was severely neglected. There was flooding of the corridors with water. The technical condition became so life-threatening that it was closed down. The problem arose of how to save this valuable building for the town. At that time, the Dąbrowa City Museum "Szttygarka" took charge of the mine. The excellently preserved coal excavations, galleries and machinery could become a recognised tourist attraction for both domestic and foreign tourists. This is because everything here looks like in a real mine. Narrow, winding corridors stretching over several hundred metres, machinery and exhibitions designed to familiarise visitors with mining traditions. Since January 2010 The Training Mine has been open to the public as an underground tourist route. The route includes 650 metres of excavations located on three levels. Above the entrance to the site, there is a monumental inscription informing about the object and stating the historical belonging of the Mine. The Training Mine of the "Szttygarka" Town Museum is an interesting and unique facility, where the natural conditions and appearance of the training excavations have been preserved. This unique character and atmosphere of the facility was appreciated by the authorities of the Silesian Voivodeship by including the Training Mine on 26.10.2010 in The Industrial Monuments Route of the Silesian Voivodeship (Szlak Zabytków Techniki Województwa Śląskiego).

6) Mining Training Adit in Wodzisław Śląski

For years, the Mining Training Adit in Wodzisław Śląski (Górnicza Sztolnia Ćwiczebna w Wodzisławiu Śląskim) has served as a place for learning the mining profession, and now also serves as an unusual regional chamber, reminding visitors of the mining traditions of Wodzisław Śląski. The Exercise Adit was opened in 1984. If you want to go underground and see the miners' working conditions, you need to go to Gałczyńskiego Street (a bit north of Wodzisław's market square), where the Mining Exercise Adit operates, run by the District Continuing Education Centre. The history of the adit is linked to the Zasadnicza Szkoła Górnicza at the "1 Maja" mine, which has been in operation here since 1972. The formal opening of the adit, in which the pupils of this school learned about the difficult profession of mining, took place in 1984. Today, the adit still serves an educational function, but also invites tourists to experience the atmosphere of a real mine. The mine shafts are located a few metres underground and are about 500 m long. Steel arch and masonry supports are used. The galleries, ramps, walls, shafts and workshops are fully equipped with, among other things, longwall shearers, a cutter, conveyor, rail and other mining equipment. The 1 Maja coal mine (Coal Mine 1st May; pol. Kopalnia Węgla Kamiennego 1 Maja) was a large mine in the south of Poland in Wodzisław Śląski, Silesian Voivodeship. Built in 1960, it was called "Mszana". Since 1961 it was called 1 Maja (1 May), in honor of International

Workers' Day. It was one of the most modern and best coal mines in the Polish People's Republic. It was combined with Marcel Coal Mine in 1995. It closed in 2001. The coal mine covered 35.6 square kilometers, and coal production was around 8,400 tons per day.



Figure 6. Mining Training Adit in Wodzisław Śląski – entrance [174].

2.1.2. Group 2 – Above-ground post-mining facilities / museums. Memorial chambers

1) Ignacy Historic Mine in Rybnik

Ignacy Historic Mine is an industrial complex located on the site of the former hard coal mine, which has been renovated and adapted for culture and tourism. It's situated in Rybnik in the south of Poland.

From April 15, 2021, the Historic Ignacy Mine in Rybnik is a cultural institution whose task is to disseminate and popularize the culture of industrial heritage, cultural and scientific education and recreation. Our vision is to offer smart entertainment and recreation in a well-kept industrial era monument.

The main objects are:

- **KOŚCIUSZKO COMPLEX.** In the engine room and the shaft top of the Kościuszko shaft, there is an interactive exhibition of a popular science character relating to the idea of a science centre. The exhibition depicts the times of the first industrial revolution. It not only tells the story of how the steam engine was invented, but also shows it in action. The centrepiece of the exhibition is a steam-powered winding machine that is more than a century old and which is put into operation for visitors during special demonstrations. In the historic Ignacy Mine, it is explained how man first harnessed the forces of nature and how this changed our world.
- **VIEWING TOWER.** A unique attraction is the former water tower, revitalised and adapted for tourist and recreational purposes. From the top, you can admire the magnificent panorama of the Rybnik, Wodzisław and Racibórz regions. In good weather, one can see mountain ranges in the Sudetes and the Tatra Mountains. The total height of the object is 46 metres. At the top of the tower, there is a viewing platform with a full 360° angle of view. Communication between the tower levels is via a

steel staircase in the form of a spiral staircase with a balustrade and handrail on the right-hand side of the flight. The staircase consists of 222 stairs and 3 landings, allowing for a possible rest. The tower is located at 299 m above sea level.

- **MACHINE ROOM OF THE GŁOWACKI SHAFT.** The engine room of the Głowacki Shaft is open to visitors. The interior of the engine room has been reconstructed to the state from the turn of the 1980s and 1990s. The main exhibit is a steam hoisting machine from 1900. It was manufactured at the Wilhelmshütte Eulau (Wilhelm Steelworks in Iława, now a district of Szprotawa in Lower Silesia). The machine had a power output of 530 horsepower. It operated the Głowacki (Oppurg) shaft located in the building next door. The machine operated continuously until 2008 when the steam supply was cut off.
- **THE DISCOVERY, IMAGINATION AND ACTIVITY ZONE (Strefa Odkrywania, Wyobraźni i Aktywności; SOWA).** The carpentry building next to the engine room of the Głowacki Shaft houses SOWA, a small science centre called SOWA. The exhibition was acquired in cooperation with the Copernicus Science Centre in Warsaw. It consists of several research stations and a do-it-yourself room, where various natural phenomena are explored through play. Find out more about the project on the special SOWA subpage in Rybnik.
- **STEAM PARK.** In the immediate vicinity of the historic Ignacy Mine is the so-called Steam Park. It is an over hectare green area with a playground, experience garden or steam fountain. It is an ideal place for recreation and relaxation.

The Ignacy Historic Mine has attractive offer for schools and children – [111] & [114]

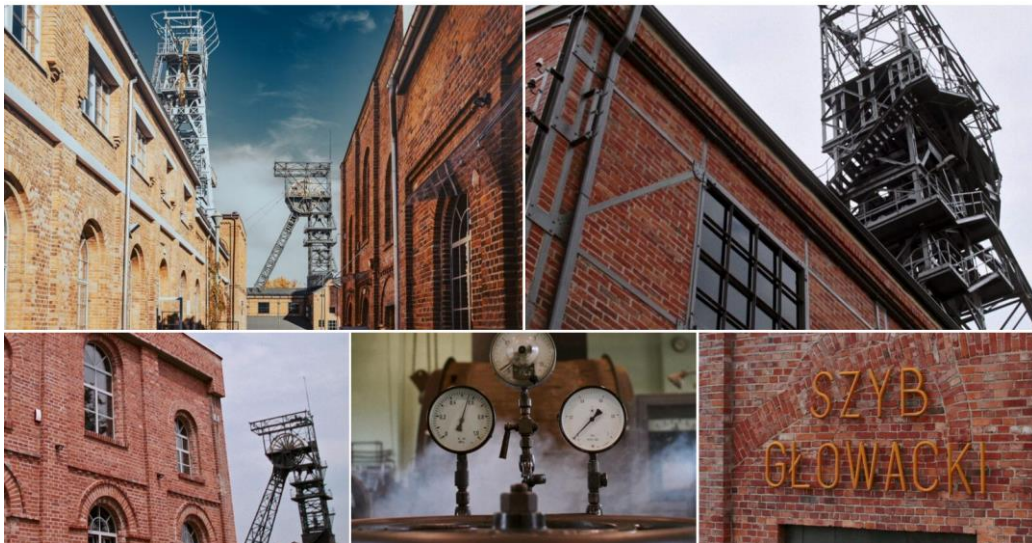


Figure 7. Ignacy Historic Mine in Rybnik [113].

HISTORY OF THE MINE

NOTE. A full description is available here [112] 1792. In Biertułtowy, a coal seam was discovered on the land of the royal estate. The Versuch Kohlengrube mine was established there for testing purposes. Soon afterwards the mine was named "Hoym" in honour of Count Karl Georg Heinrich von Hoym, Prussian Minister for the Silesian Province. The mine was located on the northern slope of Biertułtowski Hill. Today there is a cemetery on the site. The construction of the mine began with an excavation of a horizontal gallery (Mundloch - adit mouth) from the valley of a stream, now known as the Niedobczycki Stream, in a southerly direction to the coal seam. At a distance of 75 m from the adit mouth, a 19.3 m long shaft named "Wetter" (Ventilation Shaft) was sunk into the seam. It was also used for mining and was equipped with a manual hoist.

1806 FIRST STEAM ENGINE. A mechanical dewatering device was needed to open the lower lying part of the deck. For this purpose, a steam dewatering machine was brought from Zaborze (today's district of Zabrze). The machine had previously been used in the excavation of the Main Key Hereditary Adit (Główna Kluczowa Sztolnia Dziedziczna), leading from the Klodnicki Canal (Kanał Kłodnicki) in Zabrze to the Queen Louise mine (Kopalnia "Królowa Luiza").

1810. On the basis of the royal edict of 23 December 1808, there was a change in the Prussian administration. The Silesian Province was then established, headed by the Chief Presidium of the Silesian Province. Since 1810 the mine came under the direct administration of the state mining authorities. From then on it was called the "Royal Hoym Mine in Biertułowach" („Królewska Kopalnia Hoym w Biertułowach”).

1834 Mine owned by miners. On 11 June, the Prussian treasury sold the Hoym Mine to private individuals. The plant became the property of the miners. On 21 June, the owners of the "Sylvester" mine in Niedobczyce sold more than half of their kuks (shares) to the miners of the "Hoym" mine. On the same day, a protocol was signed for the consolidation of these mines into a single plant called "Consolidated Hoym Mine in Biertułowach" („Skonsolidowana Kopalnia Hoym w Biertułowach”).

1841 Incorporation of the "BIRTULTAU" mining area. The "Birtultau" mining field in the central part of Biertułów was added. From then on, the area of the "Consolidated Hoym Mine" („Skonsolidowana Kopalnia Hoym w Biertułowach”) increased to 2305 Prussian measures, or 1,978 km².

1854 CONSTRUCTION OF THE "GRAF REDEN" SHAFT. The sinking of the shaft in the northern part of the concession, at the very border with Niewiadom, began. It was given the name "Graf Reden". In 1856, a 72 KM high-pressure steam dewatering machine was installed on the shaft. Two years later, the 'Graf Reden' shaft was equipped with a 14 KM steam winding machine. This was the first machine of its kind in the mine.

1856 OPENING OF THE RAILWAY LINE TO NIEWIADOM. In October, the railway line running through Niewiadom was put into operation. Under an agreement of 1858 with the railway company "Wilhelmsbahn", the mine obtained a siding with a loading ramp in Niewiadom. From the "Graf Reden" shaft, a Rossbahn horse railway and a transport ramp with the Brennsberg cableway led to it. This was a two-track route, with full carts going down under their own weight and empty carts pulling upwards. The speed of transport was regulated by a brake disc device. The excellent quality of the coal made it highly sought after, especially in winter, and most of the production was sent to Austria. This contributed to the development of the mine.

1868 INCORPORATION OF THE "CAROLUS" MINE. The exploitation of the "Hoym" deposit was approaching the northern boundary of the endowment and at the end of 1868 the disused "Carolus" mine from Niedobczyce, located next to it, was leased. The lease agreement was signed in October of that year by Grundmann on the part of the "Hoym" mine and Heitz on the part of the "Carolus" mine. The Hoym mine was able to mine in the Carolus area, paying an appropriate rent on the coal extracted and bearing all mining costs. The mining works in the "Hoym" seam entered the "Carolus" mine area a year later. ^[1]_{SEP} In 1878, Frederick Wilhelm Grundmann became the sole owner of the 'Carolus' mine, and after his death in 1887 it passed to his heirs.

1870 INCORPORATION OF THE "LAURA" MINE. The miners (owners) of the "Consolidated Hoym Mine" (Skonsolidowanej Kopalni Hoym”) purchased the "Laura" mine, which lay in the Niewiadom area. On the basis of an agreement of July 1870, the quarrymen decided to merge the two mines into one plant. A protocol for the consolidation of the mines was signed in December. The consolidation protocol was

signed in December. 1 January 1871, the company was created under the name "Consolidated Hoym-Laura Mine" („Skonsolidowana Kopalnia Hoym-Laura”). Confirmation of the consolidation by the Royal High Mining Office in Breslau (Królewski Wyższy Urząd Górniczy we Wrocławiu) took place in September 1871.

1874 CONSTRUCTION OF THE "KOSCUSZKO" SHAFT. In the "Laura" field, the sinking of a new mining and drainage shaft, named "Grundmann" (now Kościuszko), began. It received a hoisting machine of about 20 KM, manufactured in 1871 at the Eggels Machine Factory in Berlin (Fabryka Maszyn Eggels w Berlinie). In 1879, after the installation of a surface dewatering machine of about 90 hp, the shaft was commissioned for mining and dewatering. On the surface, it was connected by a track to the existing Rossbahn horse railway, leading to a railway siding

1890 MINE IN THE HANDS OF THE DUKES OF HOHENLOCHE. The mine changed hands once again. It was Prince Hugh Hohenlohe Oehringen. The prince purchased the field of the "Omer Pascha" mine adjacent to the north. After Prince Hugh's death in 1897, the entire property passed to his son Christian. Prince Christian Hohenlohe Oehringen bought the remaining shares of the Hoym mine from other miners and on November 11, 1897 he became its sole owner. At the end of the 1990s, the mine was modernized in order to concentrate mining and drainage

1913 CREATION OF THE CHERNICE COAL ASSOCIATION. There was another change of ownership of the mine. A joint stock company called "Czernitzer Steinkohlen Bergbau Aktien Gesellschaft" (Czernick Coal Society, Joint Stock Company; Czernickie Towarzystwo Węglowe, Spółka Akcyjna) became its owner. The society was incorporated in November at a shareholders' meeting at the Royal Higher Court in Breslau (Wrocław). The takeover of the mine took place on 1 April 1913, as the financial year began on that date. The company's share capital amounted to 3,500,000 marks and was divided into 3,500 shares of 1,000 marks each. Prince Hohenlohe donated all the movable and immovable assets of the "Consolidated Hoym-Laura Mine" and the "Omer Pascha" worth 2,500,000 marks (2,500 shares) to the company. The rest was acquired by the shareholders. The seat of the company was initially Breslau (Wrocław), later Niewiadom.

1922 AFTER THE WORLD WAR I. At the beginning of July, the Rybnik powiat was incorporated into Poland. This did not cause perturbations in the operation of the plant. The ownership situation remained the same, only the company received a Polish name: Czernickie Towarzystwo Węglowe, Spółka Akcyjna. The name of the mine was also changed from "Consolidated Hoym-Laura Mine" („Skonsolidowana Kopalnia Hoym-Laura”) to "Hoymgrube". The previous director of the mine, Otto Giersberg, resigned and was replaced by Eng. Marian Wojciechowski, who began taking over the director's duties as early as November 11, 1921. The rest of the management team has hardly changed.

1925 As of 1 January 1925, the name of the plant was changed from 'Hoymgrube' to 'Hoym Mine'.

1936 In September, the mine was renamed 'Ignacy', in honour of the incumbent President of the Republic of Poland, Ignacy Moscicki.

1956. In the wave of social revolts initiated by the June uprisings in Poznań, there was also unrest at the mine. Underground, the use of rope haulage was being replaced by the use of electric battery and traction locomotives. In the longwalls, trials were being made with the use of shearers to replace the manual mining and loading of excavated material. On the surface, investments were made, but only those necessary to keep the site in operation

1968 MERGER WITH KWK "RYDUŁTOWY" The underground works aimed at making the "Jejkowice" party available ended in failure. Water rushed into the newly dug shaft and all these works were stopped. The failure to make the new field accessible meant that the mine faced the prospect of

closure. The simplest and most advantageous way to extend its life was to connect the "Ignacy" mine to the neighboring "Rydułtowy" mine. Pursuant to the decision of the Minister of Mining and Energy, on January 1, the mine was incorporated into the "Rydułtowy" Hard Coal Mine in Rydułtowy as Ruch II. On the same day, the construction site at the "Jejkowice" shaft was handed over to Renovation and Construction Plants in Rybnik ("Zakłady Remontowo-Budowlane w Rybniku") for the production of prefabricated concrete elements.

1995. On 11 August, the last coal carriage was pulled out and mining was stopped at the Kościuszko shaft. The shaft continued to be used for driving people and lowering mining materials to service the faces in its vicinity.

2006. The "Kościuszko" shaft was shut down and the shaft was filled with granite rock.

2008. On September 24, the last departure of employees from the mine via the "Głowacki" shaft took place. The steam for the hoisting machines of the "Głowacki" and "Kościuszko" shafts was cut off.

TRANSFORMATION OF THE MINE INTO A TOURIST ATTRACTION

On Friday, 11 August 1995, the last wagon of coal left the Kościuszko shaft. The former Ignacy Mine ceased mining black gold. One of the oldest mining plants in Upper Silesia had operated continuously for 203 years. It seemed that nothing would be left of the former "Hoymgruba". However, this unique industrial complex was saved, thanks to the determination of the former employees of the Historic Ignacy Mine Association, its entry in the register of monuments, and the subsequent revitalisation undertaken by the City of Rybnik using its own and EU funds.

1999. On 19 September, the Historic Ignatius Mine Association (Stowarzyszenie Zabytkowej Kopalni „Ignacy”) was founded. In November, the Association was registered with the District Court in Katowice. The Association's objectives include cultivating the mining traditions of the former Ignacy Mine, collecting material assets of mining culture, promoting knowledge of regional achievements and traditions related to coal mining, activities supporting the development of the Silesian local community, inspiring scientific and research, socio-cultural, educational and tourist activities.

At the end of the year, the historic Ignacy Mine was opened to tourist traffic. Initially, tours of the mine included the surface buildings and underground passages at the level of 600 metres. At that time, excursions were organised to the underground parts of the mine, where a tourist route was mapped out. The Ignacy Mine was then part of the Rydułtowy Mine. In 2002, for safety reasons, the management of the Rydułtowy mine suspended the tours for visitors.

2003 ESTABLISHMENT OF THE SITG OF FORMER MINE EMPLOYEES. On the initiative of a former mine worker, Stanisław Wypior, the Association of Mining Engineers and Technicians (Stowarzyszenie Inżynierów i Techników Górnictwa) of the former employees of the Ignacy mine in Niewiadom was founded. The aim of the Association was to promote mining traditions and to facilitate social contacts between former mine workers by organising gwarekas and various entertainment and tourist events.

2004 "CELEBRATION OF STEAM". In June, the first edition of the event called "Celebration of Steam" ("Święto Pary”) was organised. "Celebration of Steam" was an opportunity to popularise the idea of preserving the heritage of technology, both in scientific, local government and business circles, as well as in the local community. Three editions of this event were held. Unfortunately, on 10 September 2008 Kompania Węglowa cut off the supply of steam to the winding machines, which stopped the two steam machines still operating in Poland.

2004 CHAMBER OF MINING TRADITION. A Chamber of Mining Tradition was established at the former Ignacy mine. The Chamber currently does not exist.

2005 ENTRY IN THE REGISTER OF MONUMENTS. The Silesian Voivodeship Conservator of Monuments decided to enter the complex of buildings and the immediate surroundings of the former "Ignacy" mine into the "A" Register of Monuments of the Silesian Voivodeship (Rejestr Zabytków „A” Województwa Śląskiego). The complex included the buildings of the "Głowacki" and "Kościuszko" shafts together with the hoisting machines and the building of the power plant together with two compressors. The purpose of the entry in the register of monuments was to protect the most valuable part of the buildings together with the preserved valuable equipment.

2006 ON THE ROUTE OF THE ROUTE OF INDUSTRIAL MONUMENTS. The historic Ignacy Mine has been placed on the Industrial Monuments Route (Szlak Zabytków Techniki). The Industrial Monuments Route is a thematic tourist and cultural route connecting objects related to the industrial heritage of the Silesian Voivodeship. The Route presents the most important and interesting industrial sites in the Silesian region in terms of tourist, historical and architectural values. The Industrial Monuments Route includes existing museums, inhabited workers' colonies and operating plants.

2007 CREATION OF A VIEWING TOWER. Thanks to the efforts of the Association of Historic Mine "Ignacy" and the efforts of the Municipal Council of Rybnik, the former water tower on the site of the mine was renovated and adapted into a viewing point. The viewing tower was opened for use on 1 January 2008. From the observation deck, situated at a height of about 46 metres, one can admire the panorama of Rybnik, Radlin and Wodzisław, and in good weather see the mountain ranges of the Sudetes and the Tatra Mountains.

2010 FIRST INDUSTRIADA. The historic Ignacy Mine took part in the first Industrial Heritage Trail Festival - Industriada. This is the only festival of its kind in Central and Eastern Europe, whose aim is to present industrial heritage. Industriada was held on 12 June and 40 monuments of technology and places connected with the region's industrial tradition took part, from 23 cities in the Silesian voivodship.

2010 "IGNACY" ON A POSTCARD The Polish Postal Service (Poczta Polska) has launched a postcard with an image of the historic "Ignacy" mine. One of Rybnik's greatest monuments found its way onto postcards as part of the "Historic Mines and Mining Heritage Sites" series (Kopalnie zabytkowe i skanseny górnicze”). The card featured a picture of the "Głowacki" shaft and water tower. The Ignacy Mine also had its own stamp. It too depicted the mine shaft.

2015 FIRST REVITALISATION. The city undertook the renovation of the winding machine building of the Głowacki shaft and the compressor room building, which is part of it, and later the carpentry shop. The 1900 steam hoisting machine located there was conserved, the ceiling of the engine room was repaired and the walls were repainted. There are two halls in the building which are used for concerts, conferences and exhibitions.

2015 ACQUISITION OF THE COMPLEX BY THE CITY. As a result of negotiations with Kompania Węglowa S.A., the donation of the property located in the area of the Historical Mine was finalised. The city became the owner of the hoisting machine building and the shaft top of the Kościuszko shaft, as well as the compressor room building.

2015 CREATION OF AN INDUSTRIAL CULTURAL CENTRE. In July, the institution 'Historic Ignacy Mine' („Zabytkowa Kopalnia Ignacy”) was established under the management of the City Museum in Rybnik. However, by virtue of a resolution of the Rybnik City Council of 19 November, the Industrial Cultural Centre was established. It was a cultural institution created from the merger of the Cultural Centre in Rybnik-Niewiadom and the Historic Ignacy Mine. The Industrial Cultural Centre began operations on 1 January 2016.

2019 REFURBISHMENT OF THE "KOŚCIUSZKO" SHAFT. Extensive renovation of the shaft top and the engine room of the "Kościuszko" shaft has begun. An exhibition relating to the history of the site and steam as a source of industrial energy has been created. The exhibition has the character of a science centre - visitors will be able to learn about the individual stations empirically. The highlight will be the opportunity to see a working steam engine from 1920.

2020 REVITALIZATION OF THE FORMER COMPRESSOR HOUSE The revitalized building of the former compressor station was put into use. It gained a new, functional arrangement of rooms. The renovated facility will support the revitalization process of the Niewiadom district. That is why the new functions of the building included: a community centre, a meeting place for the local community and a place for cultural activities.

2021 DIVISION OF THE INDUSTRIAL CULTURAL CENTRE. In April, the Industrial Cultural Centre was divided. As a result of the division, a Cultural Centre in Rybnik-Niewiadom and a cultural institution called Zabytkowa Kopalnia Ignacy in Rybnik were created. Zabytkowa Kopalnia Ignacy (Historical Ignacy Mine) pursues objectives and tasks in the field of education through art, cultural education, dissemination of culture, art and cultural heritage of Upper Silesia.

2021 ON THE EUROPEAN ROUTE OF INDUSTRIAL HERITAGE. The historic Ignacy Mine has joined the European Route of Industrial Heritage ERIH - European Route of Industrial Heritage. The European Route of Industrial Heritage ERIH is Europe's largest cooperation network of technical monuments adapted to tourism and culture. Currently, ten monuments from Poland are included on the list. The former Ignacy Mine is the only technical monument from the western sub-region of the Silesian Voivodeship to be included on this prestigious list.

2021 RESTARTING THE STEAM ENGINE. Work began on putting the steam winding machine back into operation in the machine room of the Kościuszko shaft. In May 2021, an Italian internal-combustion steam generator was brought in a special container and attached to the winding machine building. The machine was then adapted for operation: all friction parts were cleaned and oiled. On 8 June, after thirteen years of "slacking off", the machine started up. It was an unofficial start-up, among the workers involved. After a successful start-up, the next day, guests were invited, headed by the mayor of Rybnik, and the machine was officially revived.

2021 STEAM PARK. In September/October, the establishment of a recreational park began. The park encompasses the area of the former lamp room and bath house and partly the area of the former mine tree yard. In the part located behind the shaft building "Głowacki", there is a steam square of a hardened, irregular form with an installation producing artificial steam for visual and sound shows. A children's playground is located right next to it.

2022 OPENING OF THE "KOŚCIUSZKO" SHAFT COMPLEX. The revitalised "Kościuszko" shaft complex was officially opened on 4 June. The exhibition "A Century of Steam" was opened to the public in the shaft hall. "A Century of Steam". The exhibition refers to the history of the site and steam as a source of energy used in industry. The exhibition has the character of a science centre. The focal point of the exhibition is a steam engine from 1920, which was put back into operation using a specially installed steam boiler.

2) Saturn Museum in Czeladz

The Saturn Museum is a young institution, established in 2009 on the basis of the Czeladź Chamber of Tradition (Czeladzka Izba Tradycji), which has existed since 2003. The main focus of its activities is the collection of artefacts and all tangible and intangible mementoes connected with the history of

Czeladź, including the mining industry which shaped the face of the city for decades, as well as researching, documenting and popularising the history of the city and the region.

The museum is housed in two buildings. Since its inception, its seat has been the so-called Palace under the Pillars - once the villa of the director of the Saturn mine. In 2016, the Museum added a second building - the beautifully restored power plant, also a relic of the Saturn mine's former activities. The historic Jewish cemetery on Będzińska Street is also under the administrative care of the institution.

OBJECT 1. Palace under the Pillars Since its establishment, the seat of the Museum is the so-called The Palace under the Pillars was built in 1924-25 as the villa of the director of the "Saturn" mine. The two-storey building with side avant-corps, covered with smooth pilaster strips, with a columned portico and a Polish-style roof, has references to classicism in its native version, realized in the form of a Polish noble manor house, very popular at the beginning of the Second Polish Republic. Behind the harmonious and tasteful exterior, there is an elegant interior with a spectacular centrally arranged hall. The most representative room of the villa, called the Hall of Mirrors from the elements of the decor - currently a place of concerts, vernissages, conferences, is enriched with mirrors and stucco work. In the adjacent Oak Hall, you can admire the original wood paneling and a beamed ceiling with a rich carving decoration with folk ornamental motifs. Around the building, a small park was arranged, which in the interwar period was closed and was intended for the residents of the villa - director Józef Przedpełski and his wife, Maria. The building has gone through various vicissitudes. After World War II, it served as an orphanage for children separated from their parents as a result of the "Oderberg" action, a workers' hotel, later for many years it was the seat of the Chief Technical Organization. Since 2000, there has been a wedding hall of the Registry Office in Czeladź. The complex history of the building meant that it was largely deprived of its original equipment. The preserved elements of the decor are: oak paneling with sculptural decorations, stucco work, two ceramic fireplaces and an oak sideboard. The building currently houses exhibition rooms, administration rooms, the Museum Director's office and storehouses for museum collections.

OBJECT 2. Elektrownia Contemporary Art Gallery [3]. Built in the years 1903-1908, the brick building is distinguished by its original architecture defined by the rhythm of densely arranged arcaded windows framed by pilaster strips, arcaded friezes and a distinctive crenelated cornice. The harmoniously shaped silhouette is crowned with a three-story tower above the avant-corps, equipped with clear references to medieval architecture - key arrowslits and expressive crenellation. The design of the building was most likely designed by Józef Pius Dziekoński, a master of Polish architecture who created in the spirit of historicism.

The building still impresses with its preserved machine park. There are converters, compressors, 2 KV and 5 KV switchgears and two DC generators manufactured by Siemens-Halske to drive shaft I and II hoisting machines. The monumental "Wanda" generator, which serves as a power unit with a two-stage and two-cylinder steam engine, manufactured in 1903, makes a great impression. The control panel from 1903, used to synchronize the compressors "Wanda" and the unpreserved "Krakus" and power unit start-ups, has survived to this day.

Since 2005, the "Elektrownia" Contemporary Art Gallery has been operating in the former power plant, whose industrial and timeless interior creates a space for the exhibition of works by individual artists and those associated in formal and informal creative groups.

Since October 26, 2010, thanks to the efforts of the Association of Cultural Initiatives from Czeladź and the activities to date for the promotion of culture, the facility has become part of the Industrial Monuments Route of the Silesian Voivodeship. This event started a new chapter in the history of Galeria Elektrownia.



Figure 8. Saturn Mine and GSW Power Plant [135].

HISTORY

The Saturn Mine was established on the premises of the presbytery farm. It was bought in 1869 by a lawyer from Warsaw, Ludwik Kozłowski. Later, the mine was bought by a group of Łódź manufacturers. Thanks to this investment, they decided to become independent from fluctuations in coal prices and reduce production costs in their factories. On February 13, 1899, they created the Saturn Consortium, and thus one of the best-managed coal companies. The development of the mine, of course, resulted in the development of settlements. Mining estates with all the rich infrastructure were built.

The most difficult moment in the hundred-year history of the mine was the time of World War II. After that, the plant was taken over by the state and became part of the great plan of reconstruction and development of the country. In 1950, at the request of the so-called "workers' activist", the name of the Saturn mine was changed to Red Guard. The original name was returned only in free Poland, after the transformations of 1989. The economic changes of the early 1990s, and above all hard economic analyses, turned out to be ruthless for the plant. On January 1, 1993, the Saturn Mine was put into liquidation, which ended at the end of 1996. Thus, after more than a hundred years, the coal industry in Czeladź ceased to exist.

3) Mining Tradition Chamber in Knurów

The chamber was opened in 1997 thanks to the efforts of the Association of Mining Engineers and Technicians KWK Knurów (Stowarzyszenie Inżynierów i Techników Górnictwa KWK Knurów). The exhibition includes memorabilia showing the history of the Knurów mine. The interior of the mining chamber from the beginning of the 20th century was also shown in an authentic way.

The Tradition Chamber of KWK "Knurów" is a permanent exhibition showing the history of the Knurów mine. The exhibition is located in the adapted rooms of the former castle, which in 1912 was rebuilt for the needs of the then director of the mine and his family. The chamber has more than two thousand exhibits, which are presented in five rooms. The first one is the director's office, where you can see m.in. a telephone switchboard from the pre-war years, a device connected to a telephone line, enabling the sending of information - the so-called teletype, as well as rich collections of German, Czech and Russian professional literature from the beginning of the 20th century. of the 20th century and historical photographs of mine directors. In the second room there is a complete mining surveyor's

equipment, which dates back to the beginning of the 19th century. XX century. You can see here e.g. theodolites and geodetic instruments, the oldest of which date back to 1905, as well as a branding room, a lamp room, methane measuring stations and a chain bath where miners' clothes hang. An exhibit of particular importance is the mining cage - a mock-up of a shaft carrying miners to the shift with original historical shaft signalling. The third room is a presentation of a mine gallery in a wooden and steel support. There are e.g. historical tools, such as: a rake, a pyrlik, an iron, a miner's cane, a wooden lute and modern ones: a coal wagon and a communication device. The next room is a collection of banners. There is also a statue of St. Barbara from the "Foch" hall, placed in a coal niche. A special exhibition was created on the occasion of the 100th anniversary of the brass band and mine rescue. On it you can see historic musical instruments as well as measuring devices and rescue equipment used to help miners underground. The last room of the Chamber of Tradition is dedicated to the city - "Knurów - a city built on coal". The exhibition shows the development of Knurów related to the establishment of the mine. In it you can admire, among others authentic interiors of the Silesian Chamber with original furniture from the beginning of the 19th century 20th century and traditional costumes. The greatest interest of visitors here, however, arouses the "moplik", which the miner used to ride on shift. In addition to exhibition activities, the Chamber of Tradition is also involved in cultural activities by organizing many interesting events and temporary exhibitions. Noteworthy among them are the minting of commemorative coins bringing closer the history and traditions of the mine or the organization of special shaft post offices, which were entered into the Book of Records and Curiosities.



Figure 9. Mining Tradition Chamber in Knurów [17].

2.1.3. Group 3 – Former mine shafts

1) Maciej Shaft in Zabrze

Maciej shaft is a historic mining plant of the former Concordia Mine, located in Zabrze-Maciejów. Since the 1990s, as a heritage of Zabrze and Silesian hard coal mining, it has been undergoing transformation, turning into a social and cultural space where interesting events, concerts and meetings take place. In the former shaft top building, there is now an elegant, industrial restaurant, a bistro called "Under Voltage" and a tourist service office. At the highest level of the shaft top, where the main mining level used to be, a banquet hall has been arranged. The railway viaduct, which used to connect the mine with Gliwice and Bytom, has found its place in the adjacent wood square, serving as a stage in the open air.

A one-hour meeting with the past in the company of a guide allows you to learn the secrets of the operation of the mine, learn about the innovative transformation of the shaft into a water intake and

look into the center of the earth. The complex is entered in the register of monuments, combining history with modernity, and the intensively enriched museum exhibition allows every visitor to feel the magic of the old technical craftsmanship, which became the foundation for the development of the entire region and the source of Silesian identity. It cultivates mining traditions that coexist in Szyba with modern design and a restaurant that stands out on the gastronomic map of Silesia - Maciej shaft is the only facility in the Silesian Voivodeship that is located simultaneously on the Industrial Monuments Route and on the "Silesian Tastes" Culinary Route.

From the highest point of the facility, from which there is a vast panorama of the surroundings of Zabrze and Gliwice, you can go down to the dark basements of the engine room, where you can stand eye to eye with the emerging elements of the mechanical and electric drive of the hoisting machine. Each of them is a masterpiece of technology in itself, and all together create a unique atmosphere of communing with the forces of nature that have been mastered by human technical thought. After a thorough revitalization and re-opening of the ventilation canal, you can also see the inside of the canal - this is where billions of cubic meters of "used" air were released into the atmosphere during the mine's operation. The Maciej shaft is also known in the area for supplying the "spring" of drinking water. about 150 meters from the Maciej shaft, there are two water dispensers, each of which can draw water and enjoy its taste as much as they want.



Figure 10. Maciej shaft in Zabrze [155].

VISIT OF THE MACIEJ SHAFT

The Maciej shaft is part of the history of the Concordia Mine and is also a mine in miniature. The sightseeing route leads from the top of the hoisting tower through the heart of the mine, i.e. the hoisting machine, to a look deep into the earth. There is a former mine heap within the complex, which is entered in the register of monuments. In front of the heap there is a stage, which is a former viaduct connecting the complex with Gliwice. This is the only facility in the Silesian Voivodeship located simultaneously on the Technical Monuments Trail (Szlak Zabytków Techniki; [173]) and the "Silesian Flavors" Culinary Trail (Szlak Kulinarny „Śląskie Smaki”; [85]).

In the area of the shaft Maciej works a restaurant and a bistro. The site's scope of operation includes organization of:

- cultural events; The intention of the creators of Maciej Shaft complex is food culture. There an exceptional combination takes place: excellent tastes with a perfect interior in which combination of

industrial architecture using red brick with modern steel, concrete and glass is introduced. The interior and courtyard of Maciej Shaft are a perfect background for concerts, exhibitions and open-air events. The complex is made available to painters, graphic designers, filmmakers, photographers and musicians, as well as enthusiasts of other fields of art, including culinary. Both prestigious cultural events, such as concerts as part of the Ars Cameralis festival, and open events, including: Industriada, Maciej Extremalny or Chill Out are hosted there.

- educational activities; The educational package of the Maciej Shaft in Zabrze is aimed at children aged 7 to 13. Classes are conducted in the form of workshops, museum lessons or practical and technical classes conducted by guides of the Maciej Shaft Complex.

HISTORY

Concordia coal mine was built in the center of today's Zabrze, at the junction of streets ul. Hagera and ul. Kasprowicza. It belonged to Karl Lazarus von Donnersmarck, who as an owner of Zabrze obtained in 1828 a coal basin with an area of 1.5km. The mine started working in year 1841. In year 1848 the management was entrusted to his son Guido Henckel von Donnersmark. In year 1851 a coal basin Michael was attached to Concordia. It was exploiting shallowly-seated coal stratum Pochhammer (currently seam 510). Soon in the surrounding area a coking plant and ironworks Donnersmarck was built.

In 1801, i.e. 40 years before Concordia mine started working, Amalia coal mine started excavation at the south border of its mine basin. It was the first privately-owned coal mine in Zabrze. The excavation was started through an exploit of seam Amalia (currently seam 507). Amalia coal mine was attached to Concordia in year 1876.

In 1872, Concordia and Amalia mines together with Donnersmarck steelworks and coking plant became a part of Donnersmarckhütte Oberschlesische Eisen und Kohlenwerke joint-stock company, which allowed the company further evolution. The mining basin was expanded to 1.6 million m.

The main Concordia shaft was deepened to 575m. New equipment was introduced and ground based mining infrastructure was modernised. In year 1906 Concordia mine reached its historical peak production of 1 186 080 tonnes.

In 1916, Concordia coal mine expanded its territory towards the western direction of the Belfort coal basin. From the main shafts towards the new coal basin, at a depth of 220 m and 575 m, two tunnels were built.

In 1921, the first one reached Maciejów and there the Maciej shaft was constructed to provide ventilation function. Around it, an infrastructure allowing the miners to enter, material transport and later exploitation of coal and gangue. The Maciej Shaft was supposed to rebuild exploitation prowess of the mine through works in seams 600 and 700 – shallow and undulated. In 1978 in the area of the Maciej Shaft, Concordia mine extracted the last tonne coal in its history.

In 1926, company Donnersmarckhütte together with the Concordia mine became a part of Obershutten company. In 1938, Concordia was bought by Gwarectwo Castellengo-Abwehr, belonging to Ballestrema corporation, with its office in Gliwice. The mine put a great emphasis on using its resources in the western part. Mining activities, apart from finite resources, was also dependent of the changing economic and political situation (great economic crisis, world wars, after 1945 becoming a part of Poland). The decline of mining was visible. In 195, Concordia merged with the neighboring Ludwik mine. The new mine Ludwik-Concordia discontinued its activities in 1970 upon merging with Rokitnica mine, which became a part of Pstrowski mine 3 years later.

The mines functioning in Zabrze to the north of Bytomka river: Concordia, Ludwik, Jadwiga (later Pstrowski), Mikulczyce and Rokitnica, as a result of limited resources, were merged. In 1973 a corporation under the name of Kopalnia Węgla Kamiennego "Pstrowski" was born – the most structurally advanced mining facility in Poland, underground and above ground. In 1994, upon exhausting all of its profitable resources it was put into liquidation, which lasted until 1997. Since 2002, the residual resources have been mined by the first private mine since II world war – Zakład Górniczy Siltech Sp. z o.o.

In 1992, after coal deposits were exhausted, the Pstrowski Mine decided to liquidate the entire Maciej Shaft area at the bottom and on the surface. Mining Company DEMEX Sp. z o.o., established two years earlier, proposed to the Mine to abandon the liquidation of the Shaft, to innovatively transform it into a deep-water intake and to buy out the entire complex of buildings. In December 1993, the project came to fruition and the pumps of Poland's first shaft water intake were put into operation. Soon DEMEX began renovation and conservation work to protect the buildings and equipment from progressive deterioration, entered the buildings and equipment of the complex in the register of monuments, and developed a comprehensive program to revitalize the former mining facility with adaptation for tourism purposes, with a view to protecting and utilizing the created water intake.

In 2005, Maciej Shaft was placed on the Industrial Monuments Route, and DEMEX began intensive work included in the Revitalization Program. In 2011, in the Competition Zabytek Zadbany, of the General Conservator of Monuments, DEMEX was awarded the Diploma of Laureate for its exemplary concept of adapting the engine room of Maciej Shaft for tourist purposes.

2) Wilson Shaft in Katowice

The Wilson Shaft Gallery is the largest private art gallery in Poland - its exhibition area is over 2,500 m². The Wilson Shaft is located in Katowice, on the border of three districts: Nikiszowiec, Janów and Szopienice. The gallery was opened in 2001 in the revitalized building of the hall and bathhouse of the Wilson shafts of the Wieczorek mine. It is worth noting that the Wilson Shaft Gallery has been put on the Industrial Monuments Route list. It presents the rich tradition and past of historic technological facilities and the modern direction of the changes and new possibilities which they create. "What industry took away, culture must regain" - this motto describes the main goal of creating a modern art gallery in a former mine shaft. For over 10 years the symbol of hard work, effort and mundaneness has been intertwined with culture, beauty and spirituality. The harmony between culture and economy is reinforced by modern company offices hidden between the exhibits. Experiencing both the sacred and the profane strengthens the unique character of the Wilson Shaft. ART. The gallery has a unique private collection of modern art - paintings, sculptures and installations. One can see here the works of Karol Wieczorek, Andrzej Urbanowicz, Marek Kamiński, Lech Kołodziejczyk, Andrzej Tobis Eco-Industri-Art Group, Erwin Sówka and the Janów Group as well as foreign artists. Apart from presenting their own works, the Wilson Shaft Gallery promotes young, ambitious and courageous artist from all over the world. In order to change the postindustrial image of a "grey" Silesia, a group of people connected to the place searches for modern beauty. The gallery is eager to make its unique area available not only to local artists connected with the region. Frequent exhibitions of more and less famous artists diversify the events calendar of the Wilson Shaft. One of the most important recurring events organized by the Wilson Shaft Gallery and Eko-Art Silesia is the Art Naif Festival [1]. This cheerful and colorful event gathers in one place the works of naive artists from all over the world. The remarkable undertaking has been breaking stereotypes and barriers and attracting thousands of art lovers for many years. OTHER EVENTS. Apart from art exhibitons, the unique area of the gallery is used for concerts, festivals, balls, performances, lectures, conferences and shows. The Wilson Shaft has been

chosen as a movie, music video, artistic photo shoot, fashion show and various other events location on numerous occasions. The gallery area is also a perfect place for company and private parties. The combined postindustrial interior and art exhibits create a memorable atmosphere which makes parties an unforgettable experience for invited guests.



Figure 11. Wilson Shaft in Katowice [15].

HISTORY

The Gallery is located in the area of the former mine shaft of KWK "Wieczorek". The origins of the mine in this area date back to 1926, when Aleksander Mieroszewski, the last lord of Mysłowice, and the skipper Daniel Henryk Dalibor acquired the rights to mine 100 hectares of land. The mining field was called "Morgenroth" (Jutrzenka). Already in the years 1833-1835, most of the shares were bought by the Wrocław company Georg von Giesches Erben - Jerzy Giesche's Heirs, which in the following years bought the adjacent mining fields and mines, and in 1883 merged them into one "Giesche" mine. After World War II, in 1945, the name was changed to "Wieczorek", the patron was Józef Wieczorek, a mine worker and workers' activist, a pre-war member of the Silesian Sejm, who died in the Auschwitz camp. In 1864, in the area of today's Gallery, two twin shafts were built: "Richthofen" and "Hulda", in 1935 renamed Wilson I and Wilson II. The name comes from the surname of the President of the United States, Woodrow Wilson. In 1995, the Wilson Shaft was closed, and since 1998, Johann Bros, president of Pro Inwest Sp. z o. o., together with Monika Paca, president of the Eko-Art Silesia Foundation, and a team of enthusiasts from both entities began to adapt this historic building into a contemporary art gallery. The renovation and revalorization of the building was also associated with the social revitalization of the surrounding area of Katowice.

3) "Franciszek" shaft in Ruda Śląska

Franciszek Shaft in Ruda Śląska is a 19th-century facility that reminds us of the region's industrial history and mining traditions. It was once part of the complex belonging to the "Brandenburg" mine, which was the first and one of the largest mines in Ruda, and probably also the oldest in Upper Silesia. It is located east of the railway station at ul. Konopnicka in Ruda Śląska and is located on the Technical Monuments Trail. The shaft was drilled in 1857 as a mining shaft. It performed this function for over 50 years, and in 1984 it was entered into the register of immovable monuments of the Silesian Voivodeship. It is surrounded by a complex of buildings, which include the shaft head, boiler room, fire brigade, administration, switchboard and rescue station buildings. Many of them were created in the

19th century, others come from the 20th century. Although today they look neglected and their technical condition leaves much to be desired, they are some of the most beautiful industrial monuments in the city. As indicated by Dr. Eng. arch. Łukasz Urbańczyk, Municipal Conservator of Monuments, the Franciszek shaft has distinctive artistic features. It is characterized by beautiful architectural details and a clear layout. The most interesting building is the fire station, topped with an impressive tower with battlements; It is also worth paying attention to the engine room. All buildings were built stylistically referring to Romanesque and Gothic architecture. It is a material memento of the history of mining and the related working culture, and at the same time a remnant of the first hard coal mine in this area - the "Brandenburg" mine - emphasizes Łukasz Urbańczyk. Recently, the facility gained a chance for a "second life". In March 2022, the Ruda Śląska commune took over some of the buildings belonging to the complex of the former Franciszek Shaft of the Wawel mine in Ruda Śląska. The facility was also entered into the "Our Monument" competition organized by Most The Most Foundation [56]. The fate turned out to be fortunate for the monument from Ruda, because it won in the first stage of the above-mentioned competition. Thanks to this, the city can receive up to PLN 1 million for the revitalization of the facility.



Figure 12. Franciszek" shaft in Ruda Śląska [154].

4) Mikołaj shaft in Ruda Śląska

Mikołaj shaft is the only complete complex of buildings and mining equipment closed to traffic and handed over to the city. Today's complex consists of buildings: headroom, machines with a converter hall and part of the workshop, and a steel hoisting tower. Next to it is the machinery hall of the "Mikołaj" heat and power plant. Currently, we can see the hoisting tower with the shaft head, engine room and workshop buildings. In addition to buildings and structures, mining equipment has been preserved: an Ilgnera Siemens winding machine with a wheel (with a flywheel with a diameter of 6 m and weighing 20 tons), a glider indicator, a tachograph, and a set of converters.

HISTORY

"Mikołaj" shaft is located in the southern part of the oldest district of Ruda Śląska, called Ruda. Hard coal mining began here in the mid-18th century, when the "Brandenburg" mine was established, visited even by the famous German poet, Johann Wolfgang Goethe. The owner of these rich areas was one of the most powerful Silesian families - the Ballestrem family. In the following decades, many mines operated in Ruda, which divided and merged, creating further economic entities. In this way, "Brandenburg" became "Wawel", and the other old mine, "Wolfgang", became "Walenty". In the 1930s, both were merged into one, "Walenty-Wawel", which, together with the neighboring coking

plant and heating plant, created a large industrial complex. The "Mikołaj" shaft was launched in 1912, still in the "Wolfgang" mine. A hoisting tower and the buildings of the shaft head, baths, gauge room, sorting room, boiler room, power plant and switchgear were erected. In the same year, an independent mining plant "Hrabia Franciszek" (Graf Franz) was separated from the "Wolfgang" mine, which included the "Mikołaj" shaft. It was deepened many times: in 1912 it was 445 m deep, in the years 1953–1959 it reached a depth of 630 m, and in 1966 it reached the level of 800 m. In the post-war years, it operated as part of the "Walenty-Wawel" mine, which ceased operations in the 1990s. Since then, most of its buildings have been demolished or fallen into ruin. An object that has been preserved in good condition and reminds us of the two hundred and fifty-year-old tradition of hard coal mining in this part of Silesia is the "Mikołaj" shaft. In 1994, the process of liquidation of the "Wawel" mine began and ended in 1997. Eventually it ended up in the hands of the city.



Figure 13. Mikołaj shaft in Ruda Śląska [152].

5) "Andrzej" shaft in Ruda Śląska-Wirek

"Andrzej" shaft - a historic shaft tower serving a former mining shaft, located in Ruda Śląska at Obrońców Westerplatte street and Odrodzenia street.



Figure 14. "Andrzej" shaft in Ruda Śląska-Wirek [153].

HISTORY

Andrzej shaft is a characteristic brick building built in the 1870s for the needs of the then hard coal mine "Gottesseggen", meaning "God's Blessing". This mine was opened in the first years of the 19th century by land and industrial magnates - the von Donnersmarcks; it mined coal - with breaks, and after World War II under the name "Wanda-Lech" - until 1969. The shaft was over 365 m deep and was used to bring the output to the surface. It was originally named "Aschenborn" in honor of Adolf Aschenborn, the then director of the mine; It received the name "Andrzej" after the last war. The shaft head building stands out from other mine structures of this type with its shape reminiscent of medieval defensive towers. It was built on a quadrangular plan, made of brick and topped with battlements, or - in other words - battlements. The walls are very solid: their thickness reaches 1 m and 30 cm. There used to be steel flywheels moving inside the tower. The building is covered with a tented roof. It is worth remembering that in the past, other mine buildings were adjacent to the tower that currently stands alone.

6) "Bartosz" shaft of the "Katowice" mine

The Bartosz shaft complex presents a considerable historical value, primarily as an important industrial monument, its significance recognized on a national scale; today, it remains the most important and oldest shaft of the "Ferdynand" mining facility, its overall spatial layout surviving relatively unchanged.

The manufacturing complex is a valuable relic of the 19th-century industry, featuring a number of surviving buildings as well as period machinery and equipment.

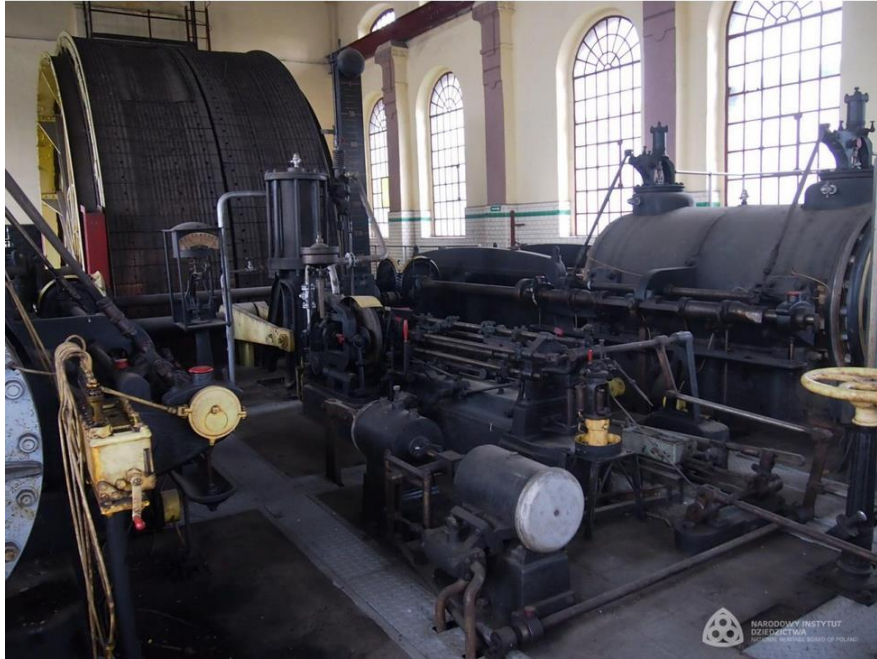


Figure 15. Katowice, Bartosz shaft development complex, steam hoisting machine, as of 2014, photo by Agata Mucha [170].

HISTORY

The “Ferdynand” mining facility was established in the Mysłowice fee-tail estate (known traditionally as an *ordynacja* in Polish), owned by Stanisław Mieroszewski. Built at the initiative of the retired rittmeister Ignacy Ferdinand von Beym, the mining facility commenced its operations back in 1823, when the exploitation of the relatively shallow deposits began. The main shaft, sunk in 1834, was originally known as “Beniamin” (its current name being “Bartosz”). The shaft was deepened on a number of occasions in the history of the mining facility. In 1840, the shaft was equipped with the first steam-powered water extraction pump, while in 1883 it was deepened substantially, reaching deposits located 300 metres below ground level. It was at that point that the shaft building was erected, subsequently redesigned in the years 1893-1895. Initially, the structure came equipped with a headframe with a single diagonal support. Further developments included the engine house - still equipped with the original steam engine from 1892 - and the power station (years 1893-1895). Despite the minor alterations introduced in the 1920s and the 1930s, the entire site has changed little throughout the years and can still serve as a perfect example of a 19th-century industrial complex. The mining facility itself changed name and ownership on several occasions; in 1839, Aleksander Mieroszewski sold the mining facility and a number of other properties to Franciszek Winckler. In 1889, Hubert von Thiele-Winckler established the Katowice Mining and Steel Industry Joint-stock Company, subsequently purchased by Fryderyk Flick, an entrepreneur from Rhineland, who merged the company with the “United Royal and Laura Steelworks Enterprise” and the “Batory Steelworks”. In 1945, the name of the facility was changed to “Katowice” - a direct consequence of its merger with the Katowice Coal Industry Union. In the 1980s, the facility formed part of the “Union of Bituminous Coal Mining Facilities in Katowice” and then of the “Katowice Mining Company”; in 1993, it became part of the Katowice Coal Mining Holding Company (KHW). In 1997, KHW adopted the decision on the merger of the “Katowice” and “Kleofas” mining facilities, which continued to operate as the “Katowice-Kleofas” mine until 1999, when the mining operations were discontinued and the liquidation of the enterprise began. The former mine site is now home to the new Silesian Museum.

7) Poniatowski shaft of the "Wieczorek" mine in Katowice

Poniatowski shaft is open to visitors only on special occasions, such as the Night of Museums or the Industrial Day. The machines and the room are in very good condition, as they were used until recently. The area nearby has huge potential - there is also a shaft tower and a fan station.



Figure 16. . Poniatowski shaft of the "Wieczorek" mine in Katowice [97].

HISTORY

The Poniatowski Shaft was originally called Nikisch, after Friedrich Nickisch von Rosenegk. Moreover, the nearby Nikiszowiec housing estate took its name from the shaft. In 1935, the name of the shaft was changed to Poniatowski, but the name of the estate remained unchanged. The Poniatowski Shaft was a transport and intake shaft - thanks to it, air from the surface entered the interior of the mine. The Poniatowski shaft is made in brick supports. The shaft winding machine was manufactured in 1908 by the German company AEG and operated until the plant was closed! A keen eye of a visitor will notice the company's inscription located on the right or left side of the lift.

8) President shaft in Chorzów - Szttygarka Complex

The President Shaft is part of the hotel and catering complex called "Szttygarka" [91] which was built on the site of a former mine, whose roots date back to the 18th century. The lift tower, which is an extremely impressive element of the complex, was built in 1933 and the author of the design was engineer Ryszard Heileman. The way it is illuminated after dusk makes a great impression on observers. The structure of the tower itself is also interesting, which stands out from others because it is made of reinforced concrete, yet retains the standard form of a single-strut tower, which was once one of the most modern in Europe. In 2008, the shaft tower was entered into the register of monuments.

The Szttygarka complex is a complex of historic buildings located on the site of the former "President" mine in Chorzów. The complex includes, among others: the "President" restaurant, where guests also have guest rooms at their disposal. In addition to the restaurant, the complex also offers interesting and atmospheric interiors, decorated in retro style in the café "Kawiarnia Pod Wieżą". Here, guests can

enjoy aromatic coffee and delicious homemade cakes and desserts. The cafe is located in a building commonly called "SztYGarka", because foremen lived here in the interwar period.

In another adapted space, the "Liquid Air Warehouse" (Magazyn Ciekłego Powietrza), a former military bathhouse and a mine air condenser, a space for meetings and organizing cultural events was created. After years of modernization and renovation works, the building was adapted and became a multifunctional hall where concerts, cultural and theatrical events, as well as social events and events take place. The latest implementation is the connection of SztYGarka and the "Liquid Air Warehouse" with a glass connector and the adaptation of the former mine bell tower for functional purposes. The connector also leads to the loft "Tlenownia" Music Club. From the café, it is only a step to the building of the former mine fire brigade, arranged with cyclical exhibitions and vernissages in mind. The facility, called "Gallery Fire Brigade" (Galeria Straż Pożarna), also houses a professionally equipped conference room.

In addition to the hoisting tower of the "President" shaft, the complex of historic mine buildings includes the following marked objects:

- historic entrance gate from the street. T. Kościuszki with a fence,
- former building of the company fire brigade,
- former foremen's residential building,
- former casino building,
- the building of the former air condensation plant, (the above facilities are part of the "SztYGarka" complex and can be visited) and:
- former warehouse building,
- the building of the former bathhouse,
- building of the former engine room of the "Erbreich II" shaft,
- building of the former shaft head of the "Erbreich I" shaft, later "Wojciech",
- building of the former engine room of the "Erbreich I" shaft, later "Wojciech",
- a former office building with baths for officials.

The main attractions are:

- President Shaft Lifting Tower with an observation deck. President Restaurant - in the former canteen for engineers and foremen. In the interwar period, the following people stayed here: Presidents of the Republic of Poland S. Wojciechowski, I. Mościcki and the outstanding Upper Silesian activist W. Korfanty
- Kawiarnia Pod Wieżą (Café at a tower) – foremen used to live here
- Liquid Air Storage. Concerts, cultural and theatrical events, social events and events take place here. Formerly a military bathhouse and a mine air condenser.

An exceptions part of the facility is "Gruba Bluesa" - a meeting place around the music and cultural traditions of Silesia. It collects collections of documents and memorabilia of Silesian rock, blues and jazz music, a center for social, artistic, educational and scientific events, and in the near future also a library, reading room, archive and media library. It is also an Art Gallery, a space for exhibitions related to music and the work of Silesian artists. After all, Gruba is the Gallery of Musicians and Music - a place of memory and reminders.

There are also permanent events held there.



Figure 17. President shaft in Chorzów - Szygarka Complex [140].

HISTORY

Mining activities in the mine were conducted until 1993. Then, some of the post-mine buildings were demolished. The buildings of the management, the old meeting hall and casino, the former foreman's residence, the mine fire brigade, the liquid air warehouse and the new casino remain. The most characteristic remnant of bygone times, however, is the 42-meter-high tower of the President shaft, which to this day evokes the history of the city and gives Szygarka an extraordinary atmosphere.

The hoisting tower of the "President" shaft belonging to the former hard coal mine on the border of Chorzów Stary and the former Królewska Huta, in the area between Piotra Skargi and Tadeusza Kościuszki streets, is a fragment of one of the oldest and longest-operating Upper Silesian mines, the most valuable relic of coal mining in Chorzów.

The hoisting tower, used to lift coal using two tanks emptied from the bottom, was built in 1933 according to the design of Eng. Ryszard Heileman from Katowice, who used French technological patterns. Its construction was financed by the capital of the Polish-French company "Skarboferm". Initially, the shaft was named "Wielki Jacek", from 1937 - "President" in honor of the President of the Republic of Poland, Ignacy Mościcki, who was associated with Chorzów in those years. The brace-type tower, with a unique reinforced concrete structure and a height of 42 m - as one of the most modern in Europe at that time - has two rope pulleys with a diameter of 5.5 m placed parallel to each other. Together with the accompanying equipment, including a skip with a capacity of 10 tons, it was able to bring over 320 tons of coal to the surface per hour! Next to the tower there were buildings for the hoisting machine and sorting room (demolished in 1996).

The history of the mine itself dates back to 1791, when, under the name "Prinz Carl zu Hessen", mining began in the area of today's Chorzów Miasto railway station. It was established on the initiative of Count Friedrich Wilhelm von Reden, from 1800 under the name "Königsgrube" (King). This mine expanded rapidly and over time was divided into four mining fields: western (1860 - Saint Barbara, with a shaft at today's Lompy Street), eastern (1864 - Saint Jacek, then "President"), southern (1869 - Król Piast, ul. Bałtycka) and northern (1898 - Wyzwolenie, ul. Bytomska) - Polish names since 1922. Already in the first period of its existence, it was one of the largest and best-equipped mines in Upper Silesia. In 1873, the annual output of the "Król" mine exceeded one million tons of coal for the first time. In the 1930s, the mine was divided into: "President Mościcki" and "Barbara-Wyzwolenie". In 1870, the "Gräffin Laura" mine (from 1936 "Chorzów") was established in Chorzów Stary. In 1970, the

"Barbara-Wyzwolenie" and "Chorzów" mines were merged into one called "Barbara-Chorzów", and the "President" mine was included as a district in the "Polska" mine in Świętochłowice. The first one ended its operation in 1993, and the second one - in 1995.

9) Towers of KWK Polska mine in Świętochłowice

The KWK Polska towers are located in Świętochłowice, on the site of the former Wieża Basztowa Hard Coal Mine. The historic lift towers have been adapted for sightseeing and today there are exhibits related to coal mining and industry in these areas. Within the facility, tourists can go through a walking maze, an educational path, and go to the "Tower Tower" viewing point. Additionally, while passing through the walking maze, it is worth stopping for a moment at the "History of Industry in Świętochłowice" exhibition. The KWK Polska Towers also host various cultural meetings, concerts and activities as part of the active senior program. Organized groups can take advantage of the offer of an educational walk, which is adapted to specific age groups. In addition, the facility organizes exhibitions, as well as corporate events, weddings, birthdays, conferences and other meetings.

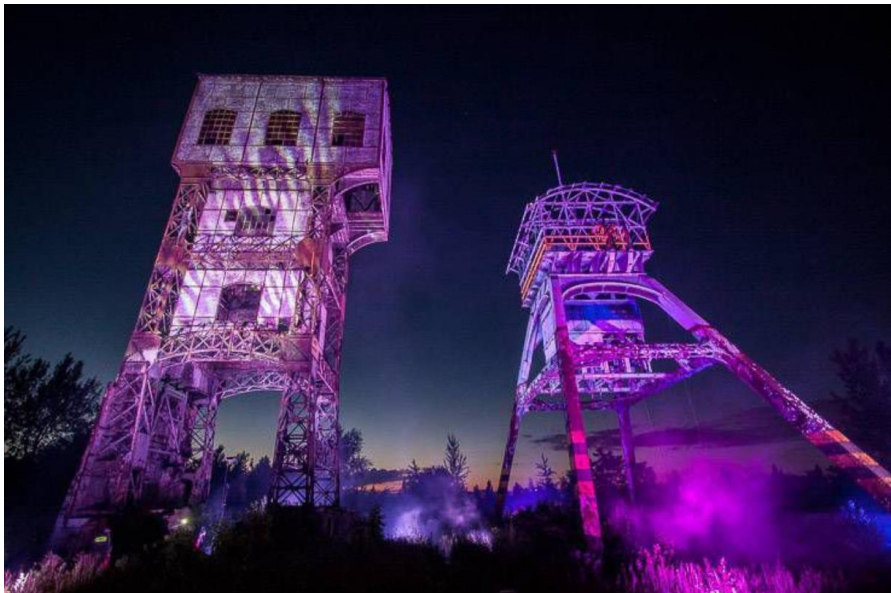


Figure 18. Towers of KWK Polska mine in Świętochłowice [163].

HISTORY

The history of the "Polska" hard coal mine, to which the towers belonged, begins in 1873. It was then that the "Deutschland" mine was created from the merger of mining fields, and its owner was Guido Henckel von Donnersmarck. After 1922, its name was changed to "Germany" and in 1937 to "Poland". In 1995, mining was stopped due to the exhaustion of hard coal deposits. Currently, the souvenirs of the "Polska" mine are the mine management buildings (currently the police headquarters in Świętochłowice) and two hoisting towers. The current facility includes two revitalized towers of the Hard Coal Mine with a four-story structure - the first three floors were built on a square plan, the fourth one is suspended - rectangular, supported on a metal structure of brackets on the eastern side. This type of structure is very rare in our area. The production complex of shafts I and II, together with machines, workshops and the converter hall, has been considered unique buildings and structures, not only in the country, but in the entire Europe.

The first of the towers is the Basztowa Tower, built in 1908 to serve a level of 180 m. Height: 29.7 m (32.5 m). The second one is the Kozłowa Tower - built in 1891, it was used to service the level of 225 m. The height of the tower is approx. 23 m. In 2015, the KWK Polska Towers came under the wing of

the Silesian Culture Center in Świętochłowice (Centrum Kultury Śląskiej w Świętochłowicach) - not only quickly becoming one of the objects of the Industrial Monuments Trail, but above all, an important cultural point of the city and the region.

The "Polska" Hard Coal Mine (original name "Deutschland") was established on October 24, 1873 by combining the mining fields: "Bohlen", "Gefäll", "Faustin", "Hexenkessel". The owner was Guido Henckel von Donnersmarck. Operation of the mine began in 1872 with the following mines and mining fields: "Fausta", "Falvabanhof", "Ottilie", "Guttmannsdorf", "Heyduck", "Kleinigkeit", "Bohlen" I and II, "Faustin" II-VIa, "Gutt Glück", "Hugo" II and "Kalina" II. Until 1922, the mine was called "Deutschland". From 1922 to 1937 it was called "Niemcy", and on May 3, 1937 it was named "Poland". After World War II, the mine belonged to the Chorzów Union of the Coal Industry. On January 1, 1972, it was merged with the "President" mine in Chorzów under the name "Polska". In 1979, the annual production of the combined mine was 2,037,838 tons. It officially ceased to exist in 1995.

2.1.4. Group 4 – Examples of good practices related to the transformation of post-mining facilities not related to coal (ore mining, salt mining, oil mining, etc.)

1) Krzemionki Opatowskie - Archaeological Museum and Reserve "Krzemionki"

Krzemionki, also known as Krzemionki Opatowskie - an archaeological reserve protecting a complex of Neolithic striped flint mines. It is located between the villages of Sudół and Magonie in the Bodzechów commune, Ostrowiec County, Świętokrzyskie Voivodeship, 5 km north-east of Ostrowiec Świętokrzyski.

Over 4,000 mines were located in an area of several kilometers - from very simple pit and niche shafts to complex underground chamber structures. These are the largest mining fields in Europe with underground galleries, mining and ventilation shafts dating back 5,000 years.

On September 16, 1994, by order of the President of the Republic of Poland, Krzemionki was recognized as a monument of Polish history.



Figure 19. The underground tourist route is the biggest attraction of the Silica Museum and Reserve. Photo: MHA [86].

On July 6, 2019, during the 43rd session of the World Heritage Committee held in Baku, a decision was made to include the Krzemionki Region of Prehistoric Striped Flint Mining (Krzemionkowski Region Prehistorycznego Górnictwa Krzemienia Pasiastego; [127] on the UNESCO World Heritage List.

Currently, the biggest tourist attraction in Krzemionki is the almost 500 m long underground route, the only one in the world in this type of facility open to the general public. A reconstructed Neolithic settlement is also open to visitors, where archaeological workshops and museum lessons are organized. In the newly opened exhibition halls you can see a modern archaeological and nature exhibition.

2) Chełm Chalk Tunnels (Zabytkowa Kopalnia Kredy w Chełmie - Podziemia Kredowe)

The Chalk Tunnels that stretch beneath the Chełm Old Town are the only former chalk mine complex of its kind in Poland or worldwide - a vast labyrinth of about 40 kilometres of winding tunnels divided into several levels. In 1994, the mine was entered into the register as a third-class monument, as a unique remnant of Old Polish and Cretaceous mining in Europe.

While visiting the almost two-kilometer route, which tourists cover in about 50 minutes, you can see numerous geological, archaeological and historical exhibitions. Particular attractions include the shaft of the Old Town well, used from the 15th to the 18th century, now reconstructed in the former Old Town market square, now named after the Chełm social activist Dr. Edward Łuczkowski.



Figure 20. Chełm, gmina miejska Chełm, tunele kredowe, fragment korytarza, stan na 2011 r. fot. Ewa Prusicka [167]

Chalk mining for economic purposes took place already in the Middle Ages. The people of Chełm made significant profits from this activity. Mining was discontinued in the 19th century when excavated galleries threatened the safety of residents. In the 1970s, after adapting selected parts of the corridors to tourist needs, a tourist route was opened to the public, which is now the biggest attraction of the city and the region, attracting numerous tourists from Poland and abroad.

3) The uranium Mine of Kletno (Kopalnia uranu w Kletnie)

The uranium mine is located on the northern slope of Żmijowiec in the Śnieżnik Massif. It operated in the years 1948-1953, using, among others, several medieval adits where iron, silver and copper mining

took place in the past. The mine included 20 adits, 3 shafts, and the total length of all mining excavations was over 37 km. A total of 20 tons of metallic uranium were mined here.

The length of the available workings is about 400 m of galleries, 1.5-2 m wide, 1.7 to over 2 m high, the temperature is constant around 7 degrees Celsius all year round. The tour lasts 45 minutes. Here you can see many exhibits related to mining, as well as local minerals, which have been highlighted especially for tourists by colorful lighting.

The Uranium Mine in Kletno is a magical place. The highlight of the route are colorful occurrences of local minerals such as fluorite, amethyst, malachite and barite. While visiting the labyrinth of colorful corridors, you will learn about the 600-year-old history of mining in Kletno, and thanks to a special exhibition, you will travel back in time and take a prehistoric journey presenting the last 500 million years of evolution against the background of the geological history of the Śnieżnik Massif.

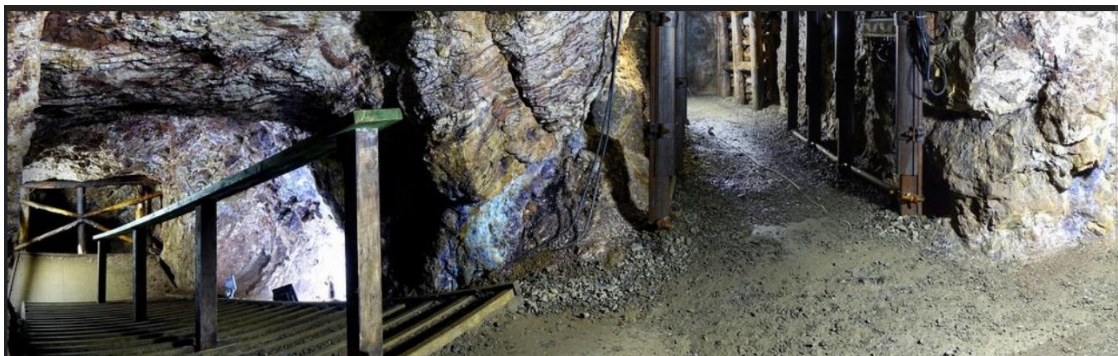


Figure 21. The uranium Mine of Kletno [108].

A wide tourist offer is provided – for individuals and groups:

- Basic offer
- Field quest – adventure and entertainment for children under the care of an experienced animator; an educational field game in the form of a series of mining and mineralogical puzzles set in the Minecraft convention
- Night adventure – night tour for a group, with a guide
- MISSION U-238 - A fictionalized, integrative outdoor game intended for groups of adults. Already in the tunnel, the game participants assume the role of scientists and are commissioned to search for uranium ore in Poland in order to make our country energy independent - this mission is top secret. And this is only the beginning of the adventures... Under the supervision of an engineer, they must find secret messages and complete assigned tasks. The success of restarting the mining plants in Kletno will depend on them.
- Geological workshops - visiting the Uranium Mine with stories about the prehistory of this place and a mineral identification course at an educational school on a medieval heap
- Little explorer - visiting the Uranium Mine; mineral identification course at an educational school on a medieval heap; learning about prehistoric snails, ammonites and trilobites by painting plaster molds; joint thematic games, puzzles and “forging” fossils from past years.
- Online workshops – for primary school students; During 45-minute workshops, students will learn about: the history of the Uranium Mine in Kletno; the specificity of miners' work, geological evolution of the Śnieżnik Massif; origin of deposits of various ores; Inanimate and animate nature

The mine offers foreign-language tourists an audio guide. Available at no extra charge at the ticket office. All you need to use is a smartphone and headphones.

4) "Aurelia" Gold Mine in Złotoryja (Kopalnia złota w Złotoryi)

Gold Mine "Aurelia" in Złotoryja - closed gold mine, located in the Kaczawskie Foothills on the slopes of Góra Mikołaja (220 m above sea level), within the administrative borders of Złotoryja. The facility is provided by the Złotoryja Culture and Recreation Center.

The length of the route for tourists is approximately 100 m. The adit is carved out of hard diabase rock, with iron ore infiltrates visible in it. There are side corridors and a ventilation shaft branching off from the main walkway, where bats live. The temperature in the basement is constantly around +8 C. The corridors are narrow and damp, so visitors must wear protective helmets. The route is illuminated.

The mine is a seasonal facility open from May to the end of September, from Wednesday to Sunday. However, from the beginning of October until December 20, visits are subject to prior reservation. Admission is paid. Near the entrance to the mine there is a parking lot with infrastructure and a basin for recreational gold panning (access via Stroma Street). The collections related to the mining of the ore are located in the local Museum of Gold (Muzeum Złota w Złotoryi:[166]).

The mine was established in 1660 as an approximately 100-meter-long adit, dug for the purpose of searching for copper ore. During exploitation, small amounts of copper and silver were extracted; there is no information on the scale of gold mining. Ultimately, the adit was closed due to the unprofitability of mining.

The mine was opened to tourists in 1973. During its penetration in 1998, a 28-meter vertical shaft was discovered, called the "Charles Shaft" (Szyb Karola), and in 2000 - side branches from the adit. The name of the mine was given in the 1990s for tourist purposes (it refers to the Latin name for gold - aurum and the name of Złotoryja from the 13th century - Mons Aurum).

There are reports that the adit was connected with the church of St. by underground corridors. Nicholas, located above the mine. However, these corridors were never found.

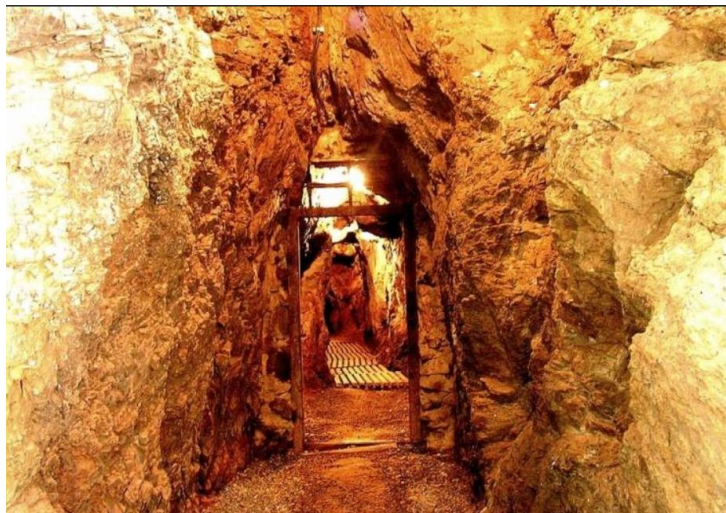


Figure 22. "Aurelia" Gold Mine in Złotoryja [165].

The Museum of Gold

The building of today's Gold Museum is a historic building dating back to the second half of the 17th century, incorporated into the city's defensive walls. The building stands out from others with its mansard roof typical of the 18th century. The building was rebuilt in the 19th century. It was converted into a museum in 1973-1977. Until 1997, the facility was cared for by the Złotoryja PTTK branch and

the Złotoryja Land Lovers' Society. In 1998, the Museum was handed over to the Złotoryja Cultural Center. It remains within its structures to this day as the Museum Department. Most of the collection comes from the gift of Leopold Schmetterling - a teacher and collector born in Tarnopol. The collections contain items from various fields: geological, bibliophilic, numismatic and archaeological.

By decision of the City Council in May 1998, the Social Museum of the Złotoryja Land received a new name - the Gold Museum. In the same year, a permanent exhibition related to gold mining, gold extraction in the Kaczawa region, and gold panning competitions was opened. For several years, it has been collecting geological objects characteristic of the morphology of the Kaczawa Mountains and Foothills. The museum is a place of meetings and cooperation with the Polish Society of Friends of Earth Sciences, the Polish Brotherhood of Gold Diggers, and the Society of Lovers of the Złotoryja Land. The museum as an institution collects minerals and rocks found in the Kaczawa Foothills. It organizes temporary exhibitions from private collections: rocks, fossils and minerals of Lower Silesia and inanimate photographs of the world of the Sudetes.

In cooperation with the university museums in Wrocław: the Geological Museum, the Mineralogical Museum and the Geological Museum of the Polish Geological Institute in Warsaw, numerous lectures in the field of Earth sciences as well as meetings with collectors and enthusiasts of Earth's treasures are held here. Since 2002, the Museum has co-organized a large nationwide art competition for children and teenagers called "Enchanted in Stone". The competition promotes respect and care for nature in all its forms and contributes to the development of interest in active ways of spending free time, surrounded by the natural beauty of inanimate nature.

5) Gold Mine in Złoty Stok (Kopalnia złota w Złotym Stoku)

The Gold Mine in Złoty Stok is one of the most beautiful attractions in Poland, called "Lower Silesian Eldorado". The Gold Mine Underground Tourist Route was established in 1996. From the 320 km labyrinth, two extremely interesting adits are open to the public: the "Gertruda" Adit and the "Upper Black Adit" with the only underground waterfall in Poland (8 m high), from which you can take the Orange Tram. The newest section has been open to the public since 2008 - the Czarna Dolna Adit.

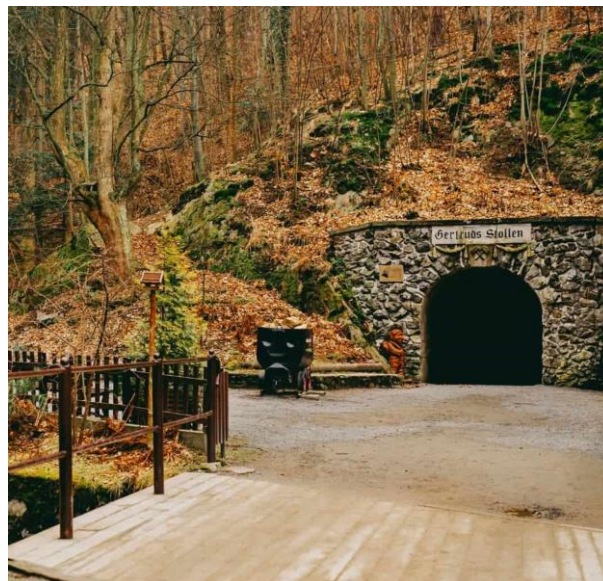


Figure 23. Gold Mine in Złoty Stok [50].

The fairy-tale world created underground (a gnome, a mad alchemist and a miner) and the unique way of guided tours delight and delight tourists. The following additional attractions are offered:

underground boat trip; visiting the Memorial Room; display and casting of commemorative gold bars; gold panning; display and minting of commemorative coins; climbing wall, paintball, diamond field; mine tour with a story (group games with a story).

6) Historic Silver Mine and Black Trout Adit in Tarnowskie Góry (Kopalnia Rud Srebronośnych i Sztolnia Czarnego Pstrąga w Tarnowskich Górach)

In Tarnowskie Góry there is an underground tourist route enabling visitors to visit the underground of a former silver-bearing ore mine, founded in the Triassic dolomites. Also available to tourists is a 600 m long section of the adit that was once used to drain the mine. Tourists travel the route in the adit in boats, while the tourist route in the Historic Mine (a 1,740 m long tourist trail connecting three shafts „Anioł”, „Żmija” and „Szczęść Boże” was created at a depth of 40 m) combines sections on foot and by boat. While visiting the mine, tourists also visit a multimedia museum. The historic silver-bearing ore mine has been a historical monument since 2004. In 2014, the facility joined the European Route of Industrial Heritage (ERIH). In 2017, it was included on the UNESCO World Heritage List.

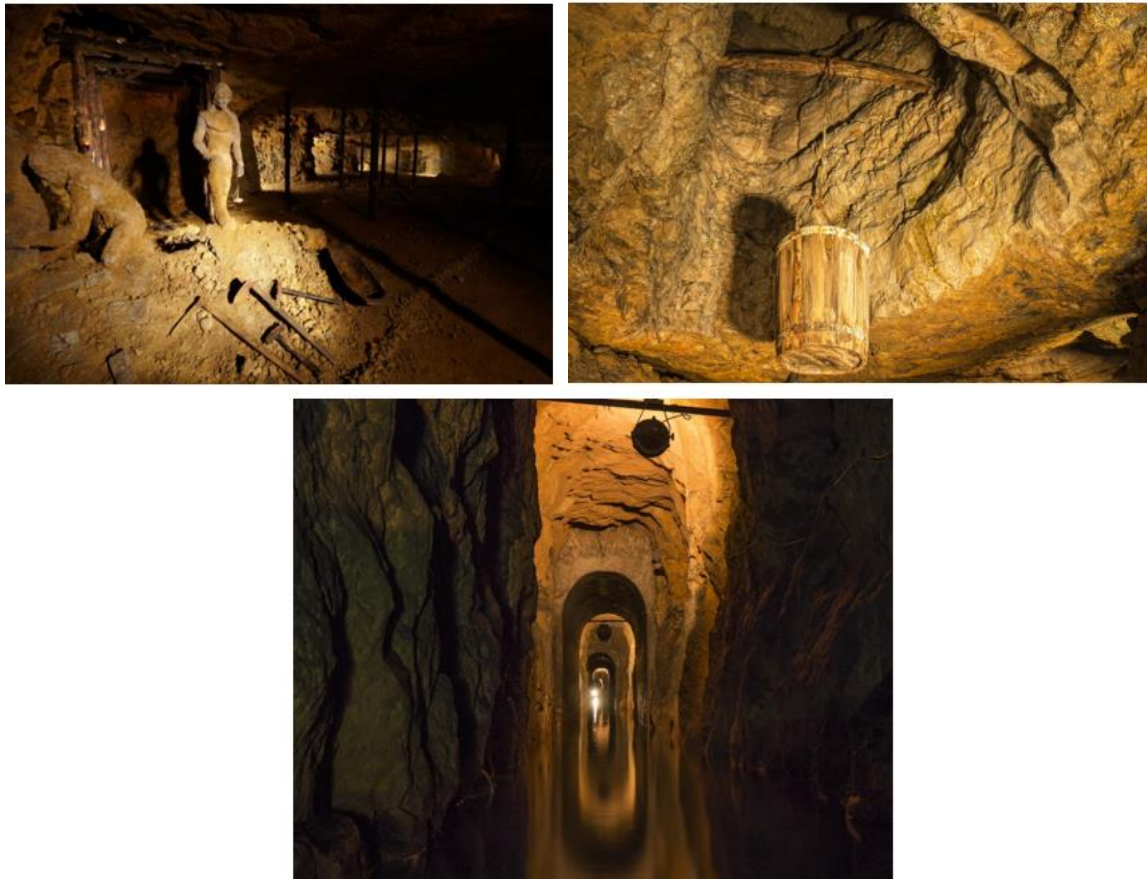


Figure 24. Historic Silver Mine and Black Trout Adit in Tarnowskie Góry [45].

-- During the visit in the former mine, tourists see mining sites carved in the rock, transport galleries of various heights and huge chambers built at the turn of the 18th and 19th centuries. One of the biggest attractions is the passage of boats on a 270 m long route. They run between two marinas located near the shafts Szczęść Boże you and Żmija. The mine is not only the former workplace of Tarnowskie Góry miners, but also nature that has settled underground for good. While exploring our heritage, you can find various species of mushrooms and lichens, as well as see unusual natural phenomena, including the only sinkhole in Europe located in a former mine.

In the building above the mine shaft there is a modern education center about ore mining in Tarnowskie Góry. You can read here, among others: with methods of mining silver, lead and zinc ores and learn about the operation of ancient drainage devices. Tourists' eyes are attracted by a special installation illustrating the operation of the first steam engine in this part of Europe, which was brought to pump water from the workings of the Fryderyk mine.

-- The Black Trout Adit is one of the longest underground boat passages in Europe, a fragment of the 19th-century Deep Fryderyk Adit. The facility is located in the charming Repecky Park. The route runs several dozen meters underground. In mysterious scenery, by the light of carbide lamps, tourists cover a distance of 600 m in boats. The guide sets the boats in motion, pushing them away from the walls of adits called ocios. At the same time, he tells stories about ancient mining. Due to the way it is visited, the adit is also called underground Venice. Gliding through crystal clear water, boats filled with tourists pass through four brick gates (of Remembrance, the Brave, the Happy and the Lazy; PL. Pamięci, Odważnych, Szczęśliwych i Leniwych). Each of them hides secrets related to the construction of this masterpiece of underground hydraulic engineering. The adit is also a contact with nature. Various species of fungi and dripstones can be observed on the walls. The crystal clear water attracts several species of fish, including trout, which gives the facility its name. As regards additional elements for tourists, these are: educational room, exhibition of historic mining lamps, a boules field places to rest.

7) Museum of Ore Mining in Bukowno (Muzeum górnictwa rud w Bukownie)

Ore Mining Museum in Bukowno - a museum located in Bukowno, dedicated to the history of iron ore mining. The facility is located in the premises of the "Skałka" School Complex. The museum was established in 1990. Its exhibition is part of the collection gathered in the 1960s and 1970s in the cultural center of Zakłady Górniczo-Hutnicze "Bolesław" by Edward Gawarecki, an employee of ZGH. This exhibition was partially destroyed in 1989, and partially - thanks to the efforts of Eng. Ryszard Kozioł - was secured and placed in the basements of kindergartens in Bolesław and Bór. In the meantime, the adaptation of the rooms in the "Skałka" School Complex, previously used as a catering school and a boarding school, began, and eventually a museum was established there.



Figure 25. Museum of Ore Mining in Bukowno [13].

Currently, the facility occupies 13 rooms in which collections illustrating the history of iron ore mining in Bolesław, from the 13th century to the 1980s, are exhibited. A tunnel was also set up, equipped with exhibits from ZGH "Bolesław", including: in means of transport used in mines (battery locomotives, carts for transporting people and excavated material). In addition, the facility has an ethnographic

exhibition with exhibits showing everyday life in the Olkusz region at the turn of the 19th and 20th centuries.

8) Saint John Mine in Krobica (zinc mine) - the underground tourist route "Mine St. John" in Krobica

The St. John mine in Krobica in Lower Silesia is one of the youngest underground tourist routes in Poland. The approximately 350 m long route, open to visitors, leads through narrow corridors on two levels. The side branches of the excavated tunnels, wooden supports and appropriately placed lighting create an amazing atmosphere of the dungeons visited.

Underground Tourist Route St. Mine Jan in Krobica was established on the basis of a complex of historical mining excavations, where mining was carried out in the period 1576-1816.

The guide will take you around the picturesque, fabulously colorful 18th century St. Adit. Leopold and the 16th century mine of St. Jan. While visiting the route, you will see preserved historical remains of tin ore mining pits, traces of manual mining of ores, and museum exhibits referring to the mining traditions of the Jizera Mountains and Foothills. Through extraordinary stories and legends, passionate guides will make you feel the atmosphere of a medieval mine and the hardship of mining work will remain in your memory for a long time.

The recent history of the tourist facility dates back to the first decade of the 21st century, when the Mirsk Commune authorities were visited by Maciej Madziarz, a scientist from the Wrocław University of Science and Technology, whose aim was to convince the local government authorities to participate in the EU project entitled "Reclamation of areas degraded by mining works." The Mirsk Commune allocated approximately PLN 1 million for the project, over PLN 2.5 million was obtained from EU funds, and the remaining funds were secured thanks to a loan from the Voivodeship Fund for Environmental Protection and Water Management and the support of the Polish Copper Foundation" [2]. The geopark was officially opened in July 2013. According to the provisions of the contract, the commune, as the beneficiary, was obliged to make the underground part available free of charge for 5 years, at least during the full season. In winter, the workings through which the underground route runs temporarily became a shelter for bats. Ultimately, bats created their habitats in quiet tunnels that were not used for tourists.

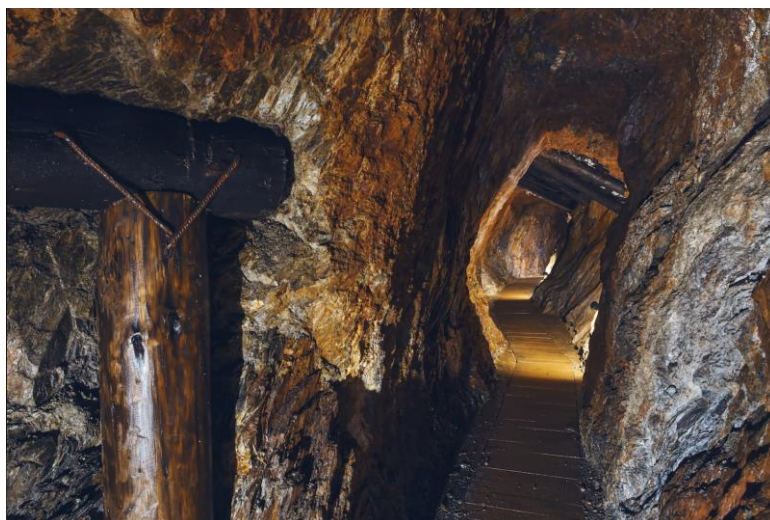


Figure 26. Saint John Mine in Krobica (zinc mine) - the underground tourist route "Mine St. John" in Krobica [44].

HISTORY

Saint's Mine Jana, or rather the beginnings of mining in the area of the then towns of Krobsdorf and Giehren, today Krobica and Gierczyn. Historical sources date the first known works to 1512, when miners who came from the area of Jachymów (Sankt Joachimsthal) in the area of today's Czech Republic were to start searching for deposits, and soon afterwards, thanks to the initiative of the Schaffgotsch family, i.e. the owners of Gryf Castle, within which the castle was located Gierczyn estate, other Jachymów miners settled there. The first open-pit mines were created, transformed into shafts and underground mines, which were then drained with adits. While drilling such an excavation, which was intended to release the water collecting in the mine, miners sometimes came across new, exploitable deposits (in the 16th century it was mainly tin ore) also found in headings and exploration adits, especially in this purpose made. This is how the network of underground corridors was created. By the end of the 16th century, numerous mines in the Gierczyn area were extracting quantities of tin ore comparable to the largest centers in the Saxon and Czech Ore Mountains. The sudden collapse of mining operations occurred during the Thirty Years' War in the 17th century, after which tin mining in this area never returned to the level of its former glory.

The 18th century brought major changes - it was at this time that cobalt deposits were discovered in the area of Przecznicza and Gierczyn. During this period, the Leopold adit in Krobica was also established, focused mainly on the extraction of cobalt used to create a blue dye from ores containing the mineral cobalt, and the development of technology allowed for the improvement and acceleration of mining works. Shooting using explosives, including black powder, became more and more common in mines, thanks to which it was possible to crush hard parts of rocks. The Jizera mining industry, which in our region focused mainly on cobalt, in the 19th century came under the jurisdiction of the Prussian Minister of Mining, Count Frederick Wilhelm von Reden, who was responsible for the significant industrialization of Silesia.

At the beginning of the 19th century, around 1816, mining in the Leopold adit finally ended. The area of the Gierczyn and Przecznicza mines became again the object of interest of German specialists during World War II, who were searching for tin in the area but also expressed interest in potential uranium mineralization. Work in the Gierczyn area was carried out in the 1950s and 1960s. According to witnesses and according to source information, uranium was sought there. Near the Krobice adit there is a forest spring, the radioactivity of which is examined by scientists from the Wrocław University of Science and Technology, comparing it with the records created by a probe located in the adit.

9) Former Nickel, Chrysoprase and Opal Mine in Szklary Huta - Underground Educational Route (Kopalnia Niklu, Chryzoprazu i Opalu w Szklarach Huta)

This is a unique place in the world due to the unique, highly valued gemstones found here, such as green Chrysoprases, milky-white Opals and red Carnelians. The King of Prussia, Frederick the Great, was very fond of them.

In 1890, a mine of nickel ore and precious jewelry stones was opened here, but it was finally closed in 1993 when nickel mining stopped being sufficiently profitable.

Today, an Underground Educational Route operates here, which in 2018 received the status of the so-called "Documentation Station". In simple translation, this means that the Underground Route has the status of a Geological Reserve, protected by law and intended for tourism and education.

Australia is currently the second place in the world with deposits of Chrysoprase, including Opals.



Figure 27. Former Nickel, Chrysoprase and Opal Mine in Szklary Huta - Underground Educational Route [47].

HISTORY

The occurrence of weathering nickel ore in the Szklary massif was discovered in the 1880s by Adolf Reitsch, a mining engineer from Ząbkowice Śląskie. Exploitation in Szklary began in 1900. In the following years, the Adolf, Michał and Benno mining fields were established, as well as the Selma and Maria fields near Grochowa. A year later, a steelworks was opened and the main shaft was drilled, and in the following years the mining settlement gained a railway connection. The Robert adit was officially opened in 1914. Ore exploitation in Szklary produced approximately 350 tons of pure metal per year. Later, magnetite and semi-precious stones also began to be mined. Until these lands were taken over by the Polish administration, the mine gradually experienced periods of growth and decline. In 1947, the Russian authorities began open-pit mining, which led to extensive destruction of many kilometers of underground galleries. Quantities of semi-precious stones that were difficult to estimate were also burned, including: chrysoprase. The Robert adit survived thanks to its adaptation as a nuclear shelter.

10) Uranium mine "Liczyrzepa" in Kowary (Kopalnia Uranu "Liczyrzepa" w Kowarach)

An underground tourist route with a length of approx. 1,200 m in a closed uranium ore mine in Kowary. The mine was exploited by the Germans during World War II. Then uranium was mined there for the needs of the USSR. Mining works were completed in 1973. In the 1920s, the Germans began searching for and mining uranium in iron ore mines. During World War II, Kowary uranium ores were researched in Oranienburg for the needs of German atomic science. After the war, uranium ore was mined for the USSR to produce an atomic bomb. The R1 Plant was responsible for obtaining and preparing ores for shipment; their activities were strictly secret, and the miners' work and lives were under constant control of "comrades from the security service". By 1973, over 20 exploration tunnels had been drilled in Kowary alone and dozens of kilometers of underground excavations had been made to a depth of 700 m.



Figure 28. Uranium mine "Liczyrzepa" in Kowary [33].

The plant was taken over in 1973 by the Wrocław University of Science and Technology, conducting research on explosives and classes for students in the field of mining work. When the healing properties of radon were discovered in the former Podgórze mine, the third Underground Radon Inhalation Center in Europe was built for PPU Cieplice, where in the years 1974-1989 diseases of the circulatory and respiratory systems, potency disorders in men, and women's ailments were effectively treated.

11) „Podgórze” Mine, uranium mine (Kopalnia Podgórze w Kowarach)

The Podgórze Mine in Kowary is the only mine in this city that was established after World War II. Exactly in 1950, a radon anomaly was discovered in the upper part of Jedlica. A few months later, the drilling of adit No. 16 began. In September of the same year, the deposit was already exploited. The mine operated in the years 1950-1958, during all these years 196.2 tons of uranium ore were extracted, according to sources, with a uranium content of 0.25% per ton. In the years 1974-1989 it housed the only one in Poland and the fourth in the world Radon Inhalatorium, where patients of the health resort in Cieplice could use underground inhalations with noble gas radon. The tourist route located here is approximately 1,600 meters long. It runs through the adit 19a, which was built in the 1950s. During the tour, visitors will learn about the history of mining from the 12th century to the secret activity of the R-1 Industrial Plant. They will hear about the specifics of miners' work, techniques for mining underground uranium deposits, and they will learn where the USSR was armed during the Cold War. Sightseeing takes about 1 hour. The temperature in the mine is around 8 degrees.

By visiting the Podgórze Mine, tourists learn about the history of mining in Lower Silesia, starting from the 13th century. An additional attraction for visitors is receiving mining lamps for the duration of the tour, as the route itself is not lit.

VISITING THE PODGÓRZE URANIUM MINE. The tour of the uranium mine begins by equipping the group with flashlights. Then there is a short story about the mining traditions in the region. Then we enter adit 19A. The first point inside is a chapel dedicated to Saint Barbara, patron saint of miners. We then get to see mining equipment, from communications to lighting and protective equipment. There is also an interesting collection of uranium glass in the basement.

At the end of the tourist route there is a small loop ending with a flooded shaft. This 242-meter-deep facility is a mecca for cave diving enthusiasts. It is currently the deepest diving site in Polish underground. It was also here that a Polish record was set in 2015. Michał Rachwański descended to a depth of 157 meters.



Figure 29. „Podgórze” Mine, uranium mine [141].

The corridors, flooded after mining, were cut off for over 50 years. Currently, three levels of the mine are open to divers. The most popular one is located at thirty meters. However, those who are more experienced can dive deeper into the meaning. The second available level is at a depth of 70 meters and the third at 109 meters.

You can also see there an original-size model of the Soviet RDS-1 atomic bomb. This is the first Soviet bomb, a copy of the American one codenamed "Gadget". Her plans were stolen by Russian spies. RDS-1 was detonated on August 29, 1949 at a training ground in Kazakhstan. According to various sources, the explosion had a power of between 10 and 22 kilotons.

12) Museum of Iron Ore Mining in Częstochowa (Muzeum górnictwa rud żelaza w Częstochowie)

The Iron Ore Mining Museum is the only institution of its kind in the country that shows the history and development of ore mining in Poland. It is a complete model of the underground workings most characteristic of iron ore mining on a natural scale. It is located in underground corridors excavated in 1974-1976 between the Exhibition Pavilions of the Częstochowa Museum in Stanisław Staszic Park. It presents a permanent exhibition entitled The history of iron ore mining, commemorating the centuries-old tradition of ore mining typical of the Częstochowa region. In the museum, located since 2009 on the Technical Monuments Trail of the Silesian Voivodeship, you can see equipment from several mines, such as Rudniki, Wręczyca, Barbara and Szczekaczka in Brzeziny. The exhibition shows road headings with wooden and steel supports, a pump chamber and a fragment of the operating "wall" with supports and equipment with machines and devices. Original machines and means of transport were placed in the walkways and chambers. The exhibition room, divided into separate stands, shows a full set of tools and machines used by miners in the past. Collected, among others: numerous types of mine workings supports, mining lamps and minerals. Historical tools and methods of extracting iron ore are also presented.



Figure 30. Museum of Iron Ore Mining in Częstochowa [159].

13) Wieliczka Salt Mine (Kopalnia Soli Wieliczka)

The mine was included in the UNESCO World Cultural and Natural Heritage List in 1978. It is the only mining facility in the world, active continuously from the Middle Ages to the present. Its original excavations (sidewalks, ramps, mining chambers, lakes, shafts, shafts) with a total length of approximately 300 km are located on 9 levels, reaching to a depth of 327 m, and illustrate all stages of the development of mining technology in particular historical eras.

Visiting the tourist route, i.e. 20 historic chambers connected by walkways approximately 2 km long (located at a depth of 64-135 m) and the underground exhibition of the Krakow Saltworks Museum (located on the third level of the mine) lasts approximately 3 hours.

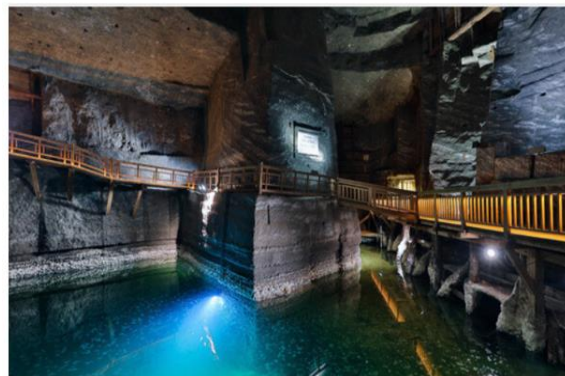


Figure 31. Wieliczka Salt Mine [110].

The three-kilometer tourist route leads through several of the 20 large chambers, open to visitors at depths ranging from 64 to 135 meters. The Wieliczka mine has 9 levels, the first of which - the Bono level - lies at a depth of 64 meters, and the last one at a depth of 327 meters. The Daniłowicz shaft serves as the entrance to the mine. The oldest part of the mine located today is the Goryszowki shaft, dating from the second half of the 13th century. It has been in continuous use since the Middle Ages until the present. At the beginning of the route, the Chapel of St. Antoni. In the Janowice Chamber, a group of figures carved from salt illustrate the legend of Saint Kinga's ring found in the first lump of salt, and in the Burnt Chamber, dangerous work in burning methane is shown. An interesting room is the very high Chamber of Pieskowa Skała, carved out around 1669. The largest underground church is the Chapel of St. Peter, located at a depth of 101 meters. Kingi dimensions: length approx. 54 meters, width approx. 18 meters and height approx. 12 meters. The relics of the Queen of Poland, considered a saint, are located here. In addition to religious ceremonies, classical music concerts are also held here. In the Erazm Barącz Chamber, tourists are welcomed by the monument of Johann Wolfgang Goethe. The floor of this chamber was flooded with water, creating a salty lake. On its bank stands the Treasurer - the good spirit of the mine. In 1997, the Underground Rehabilitation and Treatment Center was opened in the Teodor Wessel Chamber, on the third level (-135 meters). The Michałowice and Drozdowice chambers are each 35 meters high and have the most interesting structures protecting against collapse, but the highest available chamber is the Stanisław Staszic Chamber. The distance between the "ceiling" and the "floor" is up to 50 meters. The Warsaw chamber (3rd level, length 54 meters, width 17 meters, height 9 meters, 135 meters underground) hosts mining celebrations, sports competitions and events, music concerts, and exclusive New Year's Eve balls. The walking route is complemented by the Krakow Saltworks Museum located on the third level. The collections are exhibited here in 14 chambers. The total length of passages connecting approximately 3,000 workings (sidewalks, ramps, mining chambers, shafts) exceeds 300 kilometers.

14) Salt Mine in Bochnia (Kopalnia Soli Bochnia)

Salt Mine in Bochnia - the rock salt mine founded in 1248 is one of the oldest continuously operating industrial plants in Europe and Poland (salt was mined here until 1990).

For almost eight centuries, the "underground salt city" was created. Since 2000, the Bochnia mine has been a Historical Monument, and in 2013, it was recognized internationally by joining the prestigious UNESCO World Heritage List.

Many surprises await visitors in the unique labyrinth of salt corridors. The descent to the mine itself is a great experience. You go down to the underground city in a real mining elevator. A ride on an authentic mining train brings a lot of joy not only to children but also to adults. A boat ride through the chamber flooded with brine is another attraction, guaranteeing many unforgettable experiences thanks to which we can get to know the beauty of the Bochnia mine. In the largest of the underground chambers, the Wążyn chamber, further attractions await: a sports field and a mini playground for children.

The Bochnia Salt Mine also offers thematic, specialized routes. The nature route presents the extraordinary phenomenon of glowing halite crystals, while the historical route "Expedition to the Old Mountains" is intended for people who like a pinch of adrenaline and a bit of physical exercise combined with visiting unusual places.



Figure 32. Salt Mine in Bochnia [39].

A unique and unique attraction of the Bochnia mine is the Underground multimedia exhibition, which allows you to promote the mine and general history in a way that has never been done before. The mine tour is a journey in time, starting in the times of Bolesław the Chaste and Princess Kinga. The guides are helped in telling about the history of the mine by Polish kings, Genoese salt mine officers, and the ghost of a Cistercian - a monk whose order is associated with the creation of the mine in Bochnia.

An overnight stay is an offer combining a tour of the mine, a stay in the largest of the underground chambers - the Ważyn chamber, and an overnight stay in a salt chamber 250 m underground. During their overnight stay, guests visit the tourist route, use the attractions in the chamber and spend the night in the unique microclimate of the mine. Overnight stays are organized for both organized groups and individuals.

15) Salt Mine in Inowrocław (Kopalnia Soli Inowrocław)

The Permanent Saltworks Exhibition was opened 10 on January 21, 2011 in the basement of the Municipal Theater in Inowrocław, in the museum rooms of the Kujawski Cultural Center. This exhibition refers to the no longer existing mine, it was created on the occasion of the 25th anniversary of the end of the exploitation of salt deposits in the "Solno" mine. Inowrocław is often called the "city on salt", because it is located on the huge salt dome of the Inowrocław Plain. The exhibition consisting of ten rooms in KCK is permanent and is the only exhibition of this type regarding the history of salt industry in the Kuyavian-Pomeranian Voivodeship. The main goal of this museum-like facility is to present the rich history of soloing, which has been developing in the area of today's Inowrocław and Kujawy since prehistory. According to archaeologists, salt was mined in these areas 3,000 years ago, then in Roman times, in the 2nd century AD, there were probably four brine graduation towers. Archaeologists also unearthed traces of an early medieval saltworks producing salt by evaporating brine drawn from natural springs.



Figure 33. Salt Mine in Inowrocław [80].

VISITING. Beginning the tour, we go straight to the Inowrocław salt mine, unique not only in Poland but also in the whole of Europe. Its uniqueness lies in the unusual colors in which salt has naturally occurred in Kujawy since ancient times: pink, red, white and gray. The history of salt mining in Kujawy can be learned thanks to exhibits located in as many as ten exhibition halls, which will take visitors back to antiquity and lead them to the present day - until the last days of the salt mine in Inowrocław. The interior of the exhibition is lined with real rock salt, the colors of which are simply breathtaking. During the tour, you can also admire chandeliers made of salt, a chapel with a cross carved in a block of salt, and a wagon with real salt wells. Realism is added by mining equipment and tools, and even an elevator stylized as a mining cage. Ending the tour may be done by watching a short film showing the corridors of the Inowrocław mine shortly before it was flooded. It was filmed in the 1970s, but it will interest viewers of all ages, as it tells in a very accessible way about the exploitation of salt deposits near Inowrocław. The exhibition can be visited together with the exhibition curator in the basement of the Municipal Theater building in Inowrocław.

16) Kłodawa Salt Mine (Kopalnia Soli Kłodawa)

Kłodawa mine (Polish: Kopalnia Soli Kłodawa) is utterly different from Wieliczka and Bochnia more well known mines. First of all, it is situated at a completely different salt deposit in central Poland. It came to existence about 200 mln years ago. Kłodawa mine is first of all still an operating company. It produces salt for the food industry, agriculture, chemical industry and road maintenance during the winter season. The Kłodawa salt is very original because of its colour (the only such salt in Europe) pinkish-white or orangish-white. The salt of this colour reacts ideally with various colourful lamps giving fascinating effects in the tourist chambers. Moreover, this is the deepest salt mine available for Polish tourists as it involves getting 600 meters underground. Thanks to that, even if you visit the mine in the middle of winter the temperature there is above 20 Celsius degrees. During the visit in the mine you can see some real mining activities (especially at the entrance) and you can also visit many interesting salt chambers which all have beneficial influence for our health. Kids will definitely enjoy the ghost chamber. As an additional attraction we can add the fact that the mine is visited only in real mine safety helmets, which gives amazing opportunity for taking funny photos and jokes. Visit in the mine usually takes about 2.5 h.



Figure 34. . Kłodawa Salt Mine [28].

The descent to the 600-meter level in the mine elevator at a speed of 6 m/s is an extraordinary experience. The tour program includes a lecture on the history of the Kłodawa deposits and mines, a ride in an elevator to the closed workings open to the public, a walk through the corridor workings to the chapel of St. Kinga, viewing the used salt chambers and the exhibition of machines used in salt mining. It is worth paying special attention to the unusual colors of the excavations, which make us realize that the salt is not only white and its colors are created naturally.

17) Oil mine in Bóbrka - Museum of Oil and Gas Industry in Bóbrka (Muzeum Przemysłu Naftowego i Gazowniczego im. Ignacego Łukasiewicza - Pomnik Historii)

Oil mine in Bóbrka, currently the Museum of the Oil and Gas Industry. Ignacy Łukasiewicz - an oil mine opened in 1854 and still operating in Bóbrka in the Chorkówka Commune, near Krosno. Its founders were Ignacy Łukasiewicz, Tytus Trzeciecki and Karol Klobassa-Zrencki.

The Monument of History is the most prestigious form of monument protection. It has been awarded since 1994 by the president at the request of the Ministry of Culture and National Heritage. On December 10, 2018, "Bóbrka - the oldest oil mine" also joined the elite group of Historical Monuments.

The museum is organized on the site of a former oil mine founded by Ignacy Łukasiewicz in 1854. A rich exhibition of the oil mining, gas and refining industries is located on approximately 20 hectares of land. There are authentic objects here documenting the beginnings of the oil industry in the world. In the center of the site there is an obelisk, erected by I. Łukasiewicz, commemorating the establishment of the "rock oil" mine in 1854. Among the oldest mine equipment, noteworthy are two active shafts (so-called mine shafts) "Franek" and "Janina" and several oil shafts from the first years of the mine's development (1854-1880). Additionally, 8 wooden buildings from the 2nd half of the 19th century, which housed mechanical workshops, warehouses, administrative and residential rooms, active drilling holes from the 1890s, old oil pipeline systems and oil storage tanks, drilling rigs with masts and towers for deep rotary drilling, portable drilling rigs with masts for impact drilling, various types of hoisting devices for technical operations in oil wells. The restored administrative building, built by I. Łukasiewicz, presents: furniture and memorabilia related to Łukasiewicz, maps, geological collections, a plan of the "Bóbrka" mine from 1879, models, photographs and drawings illustrating the development of drilling and exploitation techniques, a collection of kerosene lamps and models and photographs of former oil refineries.



Figure 35. . Oil mine in Bóbrka - Museum of Oil and Gas Industry in Bóbrka [74].

The most valuable museum monuments include objects from the times of Ignacy Łukasiewicz:

- The obelisk was founded in 1872 by Ignacy Łukasiewicz.
- “Franek” digging pit, handmade around 1860 to a depth of 20 m,
- “Janina” digging pit; manually dug to a depth of 96 m and then deepened with a hand drill to a depth of 156 m; it is still used today.
- a mechanical workshop from 1864, with a wooden structure, which was used for drilling using the percussion method. It contains the simplest processing machines
- Administrative building of the so-called mine Łukasiewicz's house from 1865, where a pharmacy exhibition was organized. It also presents radio plays devoted to the history of the discovery of oil and the establishment of the oil mine in Bóbrka. The building houses a collection of kerosene lamps, photographs and a geological exhibition.
- wooden mine forge from 1856; inside there are two fireplaces built of brick, fueled by a leather bellows from 1890-1895; is equipped with old blacksmith tools;
- a reconstructed hand drill from 1862, used for drilling shallow holes using the percussion method.

The museum monuments in Bóbrka also include: a boiler room from the end of the 19th century with a wooden structure, which supplied steam to power mining equipment (there is a flame tube boiler in the boiler room); a Canadian-type drilling rig from 1885, powered by a steam locomotive; Bitków-type percussive drilling rig from 1923; SM type drilling equipment; rotary drilling equipment type Trauzl, OP-1200, N1400S; pumps, compressors of old design; treadmills for group pumping of wells; a collection of domestic and industrial gas meters; laboratory equipment; a collection of rotary drilling tools.

18) Nagórzyckie Caves in Tomaszów Mazowiecki; former underground quartz sand mine (Groty Nagórzyckie w Tomaszowie Mazowieckim)

"Groty Nagórzyckie" are artificial excavations that are the remains of a sand mine, located in the southern part of Tomaszów Mazowiecki. The sand extracted here was initially used for agricultural

purposes, then for the needs of glassworks. Exploitation of the Nagórzycze deposit began at the end of the 18th century and was discontinued at the beginning of the 20th century.

The Caves consist of a labyrinth of numerous alcoves, corridors and rooms. After sand mining ceased, this place almost immediately became a local attraction. In 2012, a 160 m long professional underground tourist route was created, from which approximately 70% of the workings are visible. The presented exhibitions refer in their content to the history of this place, the legends associated with it and the use of sand in the glass production process.

The Nagórzycze Caves is a labyrinth of numerous underground rooms, corridors and alcoves, which were created by combining the work of nature with the work of human hands. A mining wooden support was made, placed every 1 meter. The road open to visitors runs through the central part of the excavations, but thanks to the unique openwork nature, the entire underground space is visible, while the backlighting creates an extremely interesting visual space.

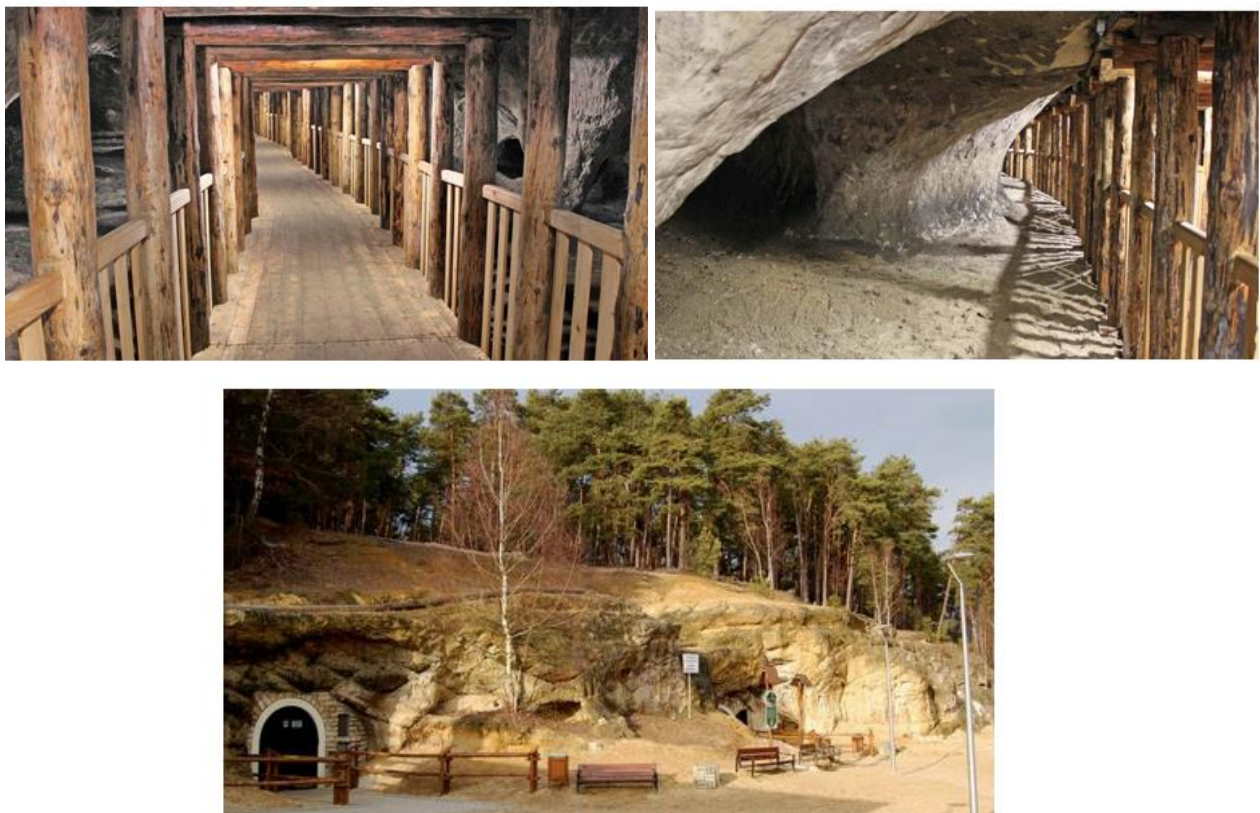


Figure 36. Nagórzycze Caves in Tomaszów Mazowiecki; former underground quartz sand mine [27].

The Underground Tourist Route has been enriched with exhibitions aimed at presenting the space and history of the Nagórzycze Caves, traditional glass-making methods, as well as introducing visitors to the legends of the Tomaszów region. Among those exhibited were: mannequins, replicas of mining tools from the era in which the arrowheads and fragments of solidified glass mass were created.

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2.2. Germany

2.2.1. Group 1 – Coal Mining Facilities with Underground Tourist Route

1) Zollverein Coal Mine Industrial Complex (Essen, North Rhine-Westphalia)

Zollverein is a UNESCO World Heritage Site. The former coal mine offers underground tours that allow visitors to experience the mining conditions and the history of coal mining in the region.

History and Background

In 1847, entrepreneur and industrial pioneer Franz Haniel initiated the first shaft excavation in the northern part of Essen. Steinkohlenförderung (coal production) began in 1851, with 13,000 tons of coal extracted in the first year. By 1890, this had increased to one million tons. Over the next 60 years, additional shafts were constructed, resulting in a total of eight shafts across the Zollverein mining field. The final shaft, Schacht XII, was completed between 1928 and 1932. It operated as an industrial powerhouse with largely automated processes, following the principles of Fordism and assembly-line production.

Schacht XII reached a depth of approximately 1,000 meters and produced over 23,000 tons of raw coal daily—four times the output of an average regional mine. Throughout its operation from 1851 to 1986, a total of 240 million tons of coal were extracted, employing up to 8,000 miners in shifts both above and below ground. Over 600,000 people worked at Zollverein during its entire existence. Zollverein was often described as the “most beautiful colliery in the Ruhr region,” a “technological marvel,” and the “cathedral of industrial culture” (Figure 37).



Figure 37. Front view of the Shaft XII complex at the Colliery Zollverein in Essen [© HaraldBe, 2020].

Transformation into a tourist attraction

In 1986, the Zeche Zollverein ceased its coal mining operations. The decline of the coal industry in the Ruhr region led to the closure of many mines, including Zollverein. The end of mining marked a significant shift in the area’s identity and economy. In recognition of its architectural and industrial significance, the entire Zollverein complex (especially Schacht XII) was designated a UNESCO World Heritage Site in 2001. This status ensured its preservation and drew attention to its historical and

cultural value. Architects and preservationists worked diligently to restore and adapt the Zollverein structures for new purposes. The iconic Shaft XII complex, with its Bauhaus-inspired design, became a focal point for redevelopment.

Attractions offered at present

Ruhr Museum: Located in the former coal washing plant, the Ruhr Museum offers comprehensive exhibitions on the natural and cultural history of the Ruhr region. It includes displays on geology, archaeology, industrial history, and contemporary art.

Red Dot Design Museum: Housed in the former boiler house, this museum showcases contemporary design from around the world. It features an impressive collection of award-winning products and innovations.

Coking Plant: Visitors can explore the former coking plant, which played a crucial role in the production process of the coal mine. Guided tours provide insights into the industrial processes and the site's history.

Coal Mine Industrial Complex: The preserved buildings and machinery of the former coal mine offer a glimpse into the past. Guided tours are available to explore the shaft tower, the mining facilities, and other parts of the complex.

Zeche Zollverein Park: The surrounding park offers a unique blend of industrial architecture and nature. Visitors can enjoy walking paths, gardens, and art installations scattered throughout the site.

The Shaft XII: This is the most iconic part of Zeche Zollverein, often referred to as the "most beautiful coal mine in the world" due to its Bauhaus-style architecture. It's a central point for various tours and activities.

Ice Rink: During the winter months, the former coking plant is transformed into a large ice rink, offering a unique skating experience in an industrial setting.

Educational Programs and Workshops: Zeche Zollverein offers numerous educational programs and workshops for all age groups, focusing on industrial heritage, arts, and environmental education.

Cultural Events: The site hosts a variety of cultural events, including concerts, theater performances, and festivals, leveraging its atmospheric industrial backdrop.

Gastronomy: Several cafes and restaurants are located within the complex, providing a range of dining options from casual to fine dining, often with a view of the historical industrial structures.

The preserved industrial architecture includes such as conveyors, steel structures, and towering chimney, the vast grounds, including the coking plant, coal washery, and surrounding landscape. The visitors can experience the guided tours with the insights into the mining history, architecture, and transformation.

2) Prosper-Haniel Mine (Bottrop, North Rhine-Westphalia)

Though now closed as an active mine, it previously offered underground tours showcasing coal mining operations. It is also part of the larger Ruhr industrial heritage route.

History and Background

The sinking of Shaft 1 began in August 1856, and by 1860, they reached a depth of 175.9 meters into the coal-bearing strata. Coal production commenced in 1863 with 315 workers. Shaft 1 had a

continuous air divider: one side supplied fresh air, while the other side exhausted used air. In 1867, a winding engine was installed after a cable break incident that resulted in 14 fatalities. The first coke plant on the Prosper I site was established in 1863. Prosper II, with Shaft 2, started production in 1875, and in 1877, they connected it to Prosper I. The mines experienced rapid growth, attracting Polish miners who settled in Bottrop. By 1890, they were producing 1 million tons of coal. Additional shafts (3, 4, and 5) were developed over the years.

In 1974, Ruhrkohle AG merged the Prosper, Jacobi, and Franz Haniel (Figure 38) mines to create the Prosper-Haniel combined mine. Several shafts and coking plants were part of this consolidation. The Prosper-Haniel mine continued to modernize and operate until its official closure in 2018. The Prosper-Haniel mine played a significant role in the region's industrial history. In 1914, the Prosper-Hafen harbor was established along the Rhine-Herne Canal, facilitating coal transportation. The mine's unique "Förderberg" (production mountain) made it the last active coal mine in Germany.



Figure 38. View of Franz-Haniel shaft system, Bottrop [© Von Goseteufel, 2008].

Transformation into a tourist attraction

The official closure of Bergwerk Prosper-Haniel occurred on December 21, 2018, after the extraction of the last coal during regular production. Following the closure, efforts were made to preserve the historical significance of the mine and its impact on the region. After its closure, the mine site was repurposed to welcome visitors and showcase the rich history of coal mining in the Ruhr region. Several initiatives were undertaken to transform the mine into a tourist attraction.

Attractions offered at present

The offered guided tours allow the visitors to explore the underground tunnels, shafts, and machinery that were once part of the mining operation with the insights into the daily lives of miners, the challenges they faced, and the technological advancements that shaped the industry.

Haniel Heap is a spoil heap (in German "bergehalde") created from the waste material produced during mining, which offers panoramic views of the surrounding area and serves as a testament to the coal mining legacy. The visitors can hike or walk around the heap while enjoying the scenic landscape

(Figure 39). The mine site hosts educational programs for schools and universities, emphasizing industrial heritage and environmental awareness. Mine installations of Prosper-Haniel occasionally hosts cultural events, concerts, and art installations within its premises.



Figure 39. Halde Haniel in Bottrop with the totems of Agustin Ibarrola and the mountain arena [© RVR/Wiciok].

3) Mine Nachtigall (Witten, North Rhine-Westphalia)

Part of the LWL Industrial Museum, Zeche Nachtigall offers an underground tour of the mining tunnels, illustrating the history of coal mining in the region.

History and Background

The Nachtigall colliery was founded in 1714. In that year, two farmers were granted the right to mine coal in the "Kohlenbank im Hettberger Holz". About 29 years later, the Baron von Elverfeldt acquired the mine. From that time on, the hard coal mine was called "Nachtigall am Hettberg".

At the turn of the 19th century, the transition from tunnel extraction to underground mining was completed on the Nachtigall with the help of steam engines. This was only possible through an association of the mine owners, who raised the capital for the conversion in this way. The Nachtigall colliery was one of the first ever to switch from tunnel construction to underground mining. However, coal mining was discontinued as early as 1892.

Subsequently, the site was taken over by the entrepreneur Wilhelm Dünkelberg, who built a steam brickwork with a double ring kiln plant and a machine factory here. In the 70s, the past was remembered and an awareness of the importance of industrial culture slowly began to develop. Since then, the Nachtigall colliery has been restored for over 20 years and officially opened in 2003.

Transformation into a tourist attraction

After coal production ceased in 1892, the site underwent various transformations. Entrepreneur Wilhelm Dünkelberg took over and established a steam brickwork (Dampfziegelei) with a double-ring kiln and a machine factory. Over the next 300 years, Zeche Nachtigall served as a sandstone quarry, a machine factory, a crane construction site, and even a scrapyard.

Attractions offered at present

Visit to the mine: allows the guests to experience and explore the unique atmosphere of the former working world, equipped with miners' lamps, real coal seams and venture into low tunnels (Figure 40) by immersing oneself in the mining history of the region.



Figure 40. Equipped with a miner's shirt, helmet, shovel and bucket, the little miners "drive" into the Nachtigallstollen visitor mine in Witten [© LWL-Industriemuseum].

Visit to the historical steam winding engines: the visitor can witness the impressive piece of machinery, which is the regular demonstrations of the historical steam winding engine take place at Zeche Nachtigall, in action as it transports visitors back to the mining era.

Exhibitions: the museum hosts both permanent and exciting temporary exhibitions, which dive into the world of raw materials and explore the pioneering period of mining in the region.

GeoPark Ruhrgebiet: one can visit the GeoPark Ruhrgebiet information center on-site and embark on a journey through geological time. The Ruhr Valley Cycle Route also passes through Zeche Nachtigall, making it an ideal stop for cyclists exploring the region.

2.2.2. Group 2 - Above-Ground Post-Mining Facilities / Museums

1) German Mining Museum (Bochum, North Rhine-Westphalia)

One of the largest mining museums in the world, it includes above-ground exhibits and an underground tour simulating mining operations.

History and Background

The German Mining Museum (Figure 41) is founded in 1930 with a long-standing tradition. Initially, it began as a permanent exhibition of mining tools and equipment by the Westfälische Berggewerkschaftskasse (WBK) in Bochum. The primary mission is to collect, preserve, investigate, exhibit, and teach the material heritage of the mining industry.



Figure 41. Front view of the German Mining Museum in Bochum [© Von Christian Nawrot].

The Deutsches Bergbau-Museum Bochum is a member of the Leibniz Association, emphasizing its commitment to rigorous research. It is jointly supported by the DMT-Gesellschaft für Lehre und Bildung mbH and the City of Bochum. In 2022, its budget amounted to 15.25 million euros, with contributions from the federal government, state, city, and the DMT-LB. The museum is an integral part of the Route der Industriekultur (Route of Industrial Heritage). During the 2010 European Capital of Culture, it served as a central hub for cultural tourism in the Ruhr region.

Transformation into a tourist attraction

The Deutsches Bergbau-Museum Bochum is part of the Leibniz Research Museum for Geo-resources. It holds the distinction of being one of the most visited museums in Germany. As the largest mining museum in the world, it offers visitors a comprehensive view of the mining world. The museum serves as a research institute for Montanarchaeology and Archaeometry, focusing on the history and technology of mining.

Attractions offered at present

The museum boasts over 12,000 square meters of above-ground exhibitions. Visitors can explore an authentic simulated mine with approximately 2.5 kilometres of tunnels (of which 1.2 kilometres are publicly accessible). Researchers at the museum delve into topics related to mining history, technology, and the preservation of cultural heritage.

Special exhibition “Doppelbock auf Museum”: This exhibition (Figure 42) provides insights into the history and renovation of the museum’s headframe.



Figure 42. Inaugural event of “Doppelbock auf Museum” exhibition in May 2024 [© THGA].

Authentic simulated mine: visitors can explore an underground world by visiting the simulated mine, with the 1.2 kilometres of publicly accessibility, which features approximately 2.5 kilometres of tunnels.

Multimedia exhibitions: The museum offers four thematic tours – (1) Steinkohle (Hard Coal), (2) Bergbau (Mining), (3) Bodenschätze (Mineral Resources) and Kunst (Art).

Raw materials laboratory: The visitor can engage with hands-on activities at the participatory stations in the laboratory.

2) LWL-Industriemuseum Colliery Zollern (Dortmund, North Rhine-Westphalia)

An industrial museum situated in a former colliery, featuring exhibitions on industrial history and heritage.

History and Background

The Zeche Zollern colliery had its beginnings in 1873 when the first Zollern mine in Kirchlinde (located in Dortmund’s western region) began coal production. The current Zeche Zollern II/IV owes its existence to the “Westfeld” of the Kirchlinde mine. Due to geological fault lines, it was challenging to extend from the existing Zollern I shaft. Therefore, the Gelsenkirchener Bergwerks-AG (GBAG) decided to sink a second shaft near the village of Bövinghausen. Unexpectedly rich coal deposits led to the establishment of not just another shaft, but an entire new colliery—complete with additional ventilation shaft (Zollern IV), administrative buildings, a wage hall, washrooms, workshops, a coking plant, and an ammonia factory.

During the late 19th century, Germany experienced an industrial boom, resulting in the construction of over 70 new collieries in the Ruhr region. In competition with each other, major mining companies aimed to assert their leadership by building high-quality showcase mines known as “Musterzechen.” Zollern II/IV was one such Musterzeche, created by the largest German mining company at the time. Architect Paul Knobbe adorned the colliery’s façades with magnificent neo-Gothic gables. The administrative building, where the mine’s leadership worked, showcased impressive architecture to emphasize the company’s prestige in national and international contexts.

Transformation into a tourist attraction

In 1969, the Maschinenhalle (machine hall) with its Jugendstil (Art Nouveau) portal became the first industrial building in Germany to be placed under monument protection. This marked a shift in how

the Ruhr region approached its industrial heritage. The Westfälische Industriemuseum (later renamed LWL-Industriemuseum) was founded in 1979, recognizing the importance of preserving industrial sites. After extensive restoration efforts, Zeche Zollern opened to the public as a museum in 1999, allowing visitors to explore the social and cultural history of coal mining (Figure 43).



Figure 43. Entrance with a view over the courtyard to the administration building at the Zollern Coal Mine in Dortmund [© Guenter-Pilger].

Attractions offered at present

Machine Hall: adorned with its Jugendstilportal (colorfully glazed Art Nouveau portal) visitors can explore behind the ornate brick facades and immerse themselves in the world of hard work underground (Figure 44).

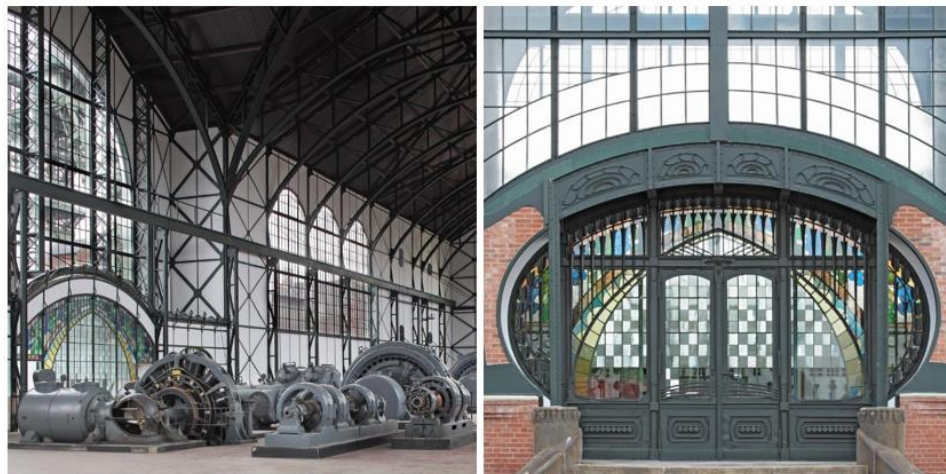


Figure 44. Brilliantly sophisticated temple of technology with a lavish “Jugendstil” entrance [© ERIH].

Underground World “Montanium”: his fascinating underground area features experimentation stations, sounds, and audio-visual projections. Access to Montanium is available only through guided tours, providing a unique glimpse into the coal mining experience below ground (Figure 45).



Figure 45. View of Montaniun Zollern Mine Underground Tour in Dortmund [© Route-industriekultur RVR].

3) Saar Polygon (Ensdorf, Saarland)

A monumental structure on the former mining site of Duhamel, serving as a memorial to coal mining in the Saar region.

History and Background

Over several centuries, coal was mined in the area of Saarland. In June 2012, the last Saarland coal mine, Bergwerk Saar, located in Ensdorf, was permanently closed, marking the end of coal mining in the Saar region. Following the closure of coal mining, the association Bergbauerbe Saar e. V. was established in order to promote the industrial heritage of mining. In collaboration with the RAG AG (which operated coal mining in the Saar through its subsidiary DSK), an artistic competition was held to design a landmark symbolizing the transition.

Over 147 designs were submitted, and the winning entry came from the Berlin-based architectural duo Katja Pfeiffer and Oliver Sachse. Their concept was a walkable large-scale sculpture, the Saar Polygon, which abstractly represents various mining motifs. It serves as a gateway to the future, emphasizing the inseparable connection between heritage and progress. The minimalist steel lattice structure (Figure 46) symbolizes the traditional ties of coal, steel, and energy in Saarland.



Figure 46. Panoramic view of Saar Polygon [© Tourismus Zentrale Saarland, Johannes Ruße].

Transformation into a tourist attraction

The Saar Polygon was constructed in spring 2016 and officially opened to the public on September 16-17, 2016. It stands atop the Bergehalde Duhamel (Duhamel slag heap) in Ensdorf, which rises approximately 150 meters above the surrounding Saar Valley. The inauguration marked the beginning of its role as a significant landmark and symbol of the region's industrial heritage.

The polygon embodies the inseparable connection between heritage and progress. It pays homage to the coal mining industry while looking forward to a transformed future. Donors who contributed €1000 were allowed to symbolically "own" a step inside the polygon, adding a personal touch and fostering community involvement.

Attractions offered at present

The Saar Polygon's unique design, standing at 27.55 meters tall, draws visitors due to its artistic and historical significance. Tourists are intrigued by its minimalist steel lattice structure, which abstractly represents mining motifs and serves as a gateway to the future. The location of the slagheap provides panoramic views of the surrounding Saar Valley, making it an attractive spot for photography and sightseeing.

2.2.3. Group 3 – Former Mine Shafts

1) Zollern II/IV Colliery (Dortmund, North Rhine-Westphalia)

Part of the Westphalian Industrial Museum, this colliery includes preserved mine shafts as depicted in Figure 47, that illustrate the coal mining heritage of the Ruhr region.

History and Background

While ground-up construction began in 1898 most of the colliery buildings has been constructed in solid brickwork by architect Paul Knobbe and completed in 1904. The central engine house, housing state-of-the-art generators and machinery, reflects the transition from Gothic Revival to Art Nouveau. The main entrance, designed by Berlin architect Bruno Möhring, features lead glazing in blue, green, and glass. Other buildings on the site include administration bureaus, blacksmith's and carpenter's shops, pithead baths, and more.



Figure 47. View of the Zollern Colliery shaft tower [© M, Holtappels and Dirk Walther, LWL-Industriemuseum].

Transformation into a tourist attraction

After its closure in 1966, the colliery was recognized as Germany's first technical building monument of international importance in 1969. Since 1981, it has served as the headquarters of the Westphalian Industrial Museum. The original pit frames were scrapped, but two similar reconstructed structures from other collieries now stand on the site. The museum is an anchor point on the European Route of Industrial Heritage.

Despite being initially slated for demolition, Zollern II/IV became a pioneer of industrial monument conservation in Germany. Its listing as a technical building monument underscores its importance in North Rhine-Westphalia's industrial heritage.

Attractions offered at present

As previously explained the colliery belongs to the LWL Industrial Museum, which provides comprehensive exhibitions on the history of coal mining, the lives of miners, and the industrial heritage of the Ruhr region. Interactive displays and multimedia installations enhance the visitor experience.

Steam-powered winding engine: this impressive piece of machinery is one of the highlights of the site. Visitors can see the steam-powered winding engine in action, demonstrating how coal was transported from the depths of the mine to the surface.

Blacksmith's shop and workshops: these areas provide insights into the various trades and crafts that supported the mining operations. Demonstrations and displays show traditional techniques used by blacksmiths and other artisans.

Miners' changing room (Kaue): this area gives a glimpse into the daily routines of the miners, featuring the original changing rooms and lockers used by the workers. It offers a poignant look at the social and cultural aspects of mining life.

Historical administration building: the beautifully restored administration building now serves as an exhibition space, showcasing documents, photographs, and artifacts related to the management and operation of the colliery.

Heritage trail: an outdoor trail around the colliery site allows visitors to explore the various industrial buildings and structures, providing context and history about their functions and significance.

Events and exhibitions: Zeche Zollern hosts a variety of temporary exhibitions, cultural events, and educational programs throughout the year. These events often focus on industrial heritage, art, and local history.

Cultural and educational workshops: the museum offers workshops and educational programs for all ages, focusing on the history of mining, industrial processes, and the social impact of the coal industry.

2) Alte Haase Colliery (Sprockhövel, North Rhine-Westphalia)

The site includes remnants of the mine shafts and serves as a historical marker of early coal mining in the region.

History and Background

The Alte Haase Colliery was established as a tunnel mine in 1699. Depending on economic conditions, it either operated as a small-scale venture or experienced periods of closure. The primary consumers of its coal were the blacksmiths in the Bergisches Land region.

In 1858, the colliery shifted to deep mining. The installation of a steam engine marked the beginning of underground shaft mining. The newly acquired steam engine pumped groundwater from the mine, initially raising it about 20 meters into the Edeltraud-Erbstollen (a drainage tunnel).

In 1883, the main extraction shaft, named Julie, was sunk to a depth of 85 meters. The Julie shaft became the last colliery in Germany to have a Malakow Tower, which was constructed in 1897. The shaft was named after Julie Dothbruch, the wife of the colliery's chief executive and a descendant of Dietrich Krefting zum Doddebruch, who had filed the first claim on Alte Haase in 1716.

Due to unfavorable coal deposits, the colliery had to expand its mining area, resulting in significantly larger water inflows compared to coal production. Despite modernization efforts, the colliery faced closure, which occurred on April 30, 1969.

Transformation into a tourist attraction

After its closure in 1969, efforts were made to preserve the colliery's structures. Converting parts of the buildings into residential units allowed for adaptive reuse while maintaining their historical character

In 2001, the Zeche Ewald had come to the end of its production of coal. The decline of coal mining in the Ruhr region led to the decommissioning of many collieries, including Ewald. With the end of mining operations, the site faced the challenge of repurposing its vast industrial infrastructure.

In 2001, a private owner acquired the colliery and began converting parts of the buildings (A and B) into residential units. In 2021, the Alte Haase GmbH took ownership of additional buildings (C, D, E, and F), and demolition work commenced. The transformation continues, including the conversion of the Malakow Tower, workshops, and machine hall into residential spaces.

Attractions offered at present

The colliery offers "mining trails" leading to shaft buildings, mine entrances, and other objects related to mining history. The Heimat-und Geschichtsverein Sprockhövel offers these informative paths.



Figure 48. Alte Haase colliery in Sprockhoevel(North Rhine-Westphalia) [© Zeche Alte Haase 2024].

3) Colliery Ewald (Herten, North Rhine-Westphalia)

This former coal mine now serves as an industrial heritage site, with preserved mine shafts and machinery on display.

History and Background

The story of Zeche Ewald began in 1872 when a group of 21 stakeholders, including the Essen entrepreneur and namesake Ewald Hilger, established the mine in the southern part of Herten.

Initially, the mine faced challenges, but it gradually developed into one of the most productive collieries in the Ruhr region after World War II. By the mid-twentieth century, Zeche Ewald had over 4,000 miners working its coal seams.

The sinking work for Shaft 1 (Hilger) began in 1872, and coal production commenced in 1877 at a depth of 464 meters. Over time, additional shafts were established: Shaft 2 was ready for extraction in 1892, the Ewald 3/4 mine shafts followed in Gelsenkirchen-Resse in 1895, Shaft 6, which went into operation in 1912, was excavated southeast of shaft 3/4. During World War II, the need for increased extraction led to the sinking of a central extraction shaft, Shaft 7. The mine continued to expand, and by the late twentieth century, it was part of the RAG Aktiengesellschaft, which later merged with other collieries.

In 2000, the decision was made to give up the Ewald colliery, and on March 28, 2000, the last shift was run. The final shutdown occurred in spring 2001.

Transformation into a tourist attraction

In 2001, the Zeche Ewald had come to the end of its production of coal. The decline of coal mining in the Ruhr region led to the decommissioning of many collieries, including Ewald. With the end of mining operations, the site faced the challenge of repurposing its vast industrial infrastructure (Figure 49).



Figure 49. Panoramic view of Colliery Ewald [© Werner 2016].

Recognizing the historical significance of Colliery Ewald, efforts were made to preserve its structures and heritage. The iconic Malakow tower, the headframes, and other remnants were retained. The site was redeveloped to serve new purposes, including cultural, recreational, and commercial activities

Attractions offered at present

The transformation of Zeche Ewald into a tourist attraction involved several key features:

Ewald Industrial Heritage Park: The site has been repurposed into an industrial heritage park where visitors can explore the preserved mining buildings and equipment. It provides a glimpse into the past and the history of coal mining in the region.

Herten Revue: This multimedia show is presented in the old power station and offers an engaging overview of the history and significance of the Ewald Colliery and the wider Ruhr area. The show combines historical footage, interviews, and artistic performances.

Guided Tours: Various guided tours are available that take visitors through the different parts of the former colliery. These tours provide detailed information about the mining processes, the daily lives of miners, and the architectural features of the site.

Training Mine: An underground training mine at the site allows visitors to experience the working conditions of a real coal mine. It offers an immersive and educational experience, demonstrating mining techniques and safety measures used in the industry.

The Schacht 7 (Shaft 7): This iconic shaft tower is a significant landmark at Zeche Ewald. Visitors can learn about its role in the mining operations and its architectural features. The area around the shaft often hosts events and exhibitions.

Ewald Promenade: This landscaped promenade is perfect for leisurely walks and offers scenic views of the industrial structures. It's a great place for photography and appreciating the blend of nature and industrial heritage.

Recreational activities: the surrounding area has been developed for recreational purposes, offering biking and hiking trails. The nearby Hoheward spoil tip (Figure 50) provides panoramic views of the region and is a popular spot for outdoor activities.



Figure 50. Aerial view of Hoheward recultivated dump area, today space for recreation, natural trails for cycling and hiking activities [© Route-industriekultur RVR].

Cultural events and festivals: Zeche Ewald hosts various cultural events, concerts, and festivals throughout the year. These events often utilize the unique industrial backdrop to create memorable experiences for visitors.

Innovation and Business Park: parts of the former colliery have been converted into spaces for businesses, fostering innovation and economic development in the region. Visitors can learn about the ongoing transformation and the new uses of the industrial site.

Restaurants and Cafes: The site features several dining options where visitors can enjoy local cuisine and refreshments. These establishments often have views of the industrial structures, adding to the unique atmosphere.

2.2.4. Group 4 – Examples of Good Practices Related to the Transformation of Post-Mining Facilities (Ore Mining, Salt Mining, Oil Mining, etc.)

1) Rammelsberg (Goslar, Lower Saxony)

Though technically not in West Germany, it is a notable site for its transformation from ore mining to a UNESCO World Heritage cultural site. It includes underground tours and a museum.

History and Background

The Rammelsberg is an ancient mountain located in the Harz Mountains, approximately 1 kilometre southeast of Goslar. The Rammelsberg has been a site for mining metalliferous ores and metal production (including silver, copper, lead, zinc, and gold) since as early as the 3rd century BC. Archaeological evidence suggests that ore extraction began here around 3,000 years ago, making it one of the oldest mining areas in the world. The mountains surrounding Rammelsberg held some of the world's richest deposits of copper, lead, and zinc.

The Rammelsberg mines operated continuously for over 1,000 years. Despite its long history, the mine was finally closed in 1988. The origin of the name “Rammelsberg” has several explanations. According to legend, it was named after a knight named Ramm, whose horse supposedly uncovered ore during a hunting trip in 968.

Transformation into a tourist attraction

Since 1992, the Rammelsberg has been part of the UNESCO World Heritage Site. Along with the historic town of Goslar and the Upper Harz Water Management System, it forms a remarkable ensemble of mining heritage. The site was expanded in 2010 to include the designation Rammelsberg Mine (Figure 51), Goslar Old Town, and Upper Harz Water Management.



Figure 51. View of exterior Museum and visitor mine [© Harzspots Team].

Attractions offered at present

Interactive Exhibits and Museums: the site developed interactive exhibits and museums, showcasing the history, geology, and technology of mining.

Schaubergwerk Rammelsberg: tourists could explore the underground tunnels, shafts, and mining equipment, gaining insights into the mining process with engaging tours: sharing stories of miners' lives and the region's rich mineral wealth.

Above-Ground Attractions: visitors could explore the historic buildings, including the ore processing plant and the Roeder Gallery with impressive mineral collections and geological displays.

Educational Programs and Events: Rammelsberg hosts educational programs, workshops, and events for schools and families.

2) Bad Reichenhall Saltworks (Bavaria)

The historic saltworks have been transformed into a cultural heritage site with tours and exhibitions on the salt mining and production process, though Bavaria is more southeastern, it's notable for its practices.

The historic saltworks have been transformed into a cultural heritage site with tours and exhibitions on the salt mining and production process, though Bavaria is more southeastern, it's notable for its practices.

History and Background

Salt extraction in the Bad Reichenhall area dates back to the Bronze Age (around 2000 to 1000 BC). A Bronze Age rim axe found near the brine springs suggests early salt production. In 696, Duke Theodor II of Bavaria granted Bishop Rupertus of Salzburg ownership of 20 brine pans and a share of the spring water. This marked the beginning of disputes over salt ownership and mining rights.

Between 1483 and 1532, Dukes George the Rich and Albrecht IV revamped the technical facilities, leading to increased salt production. By the 17th century, annual salt production reached 370,000 quintals. However, the process required vast amounts of firewood. Elector Karl Theodor addressed this by streamlining production between 1782 and 1798, reducing energy use and firewood demand.

In 1816, Bavarian salt works councillor Georg von Reichenbach built the brine pipeline from Berchtesgaden to Bad Reichenhall. This engineering marvel included the famous Reichenbach pump to overcome altitude differences. A devastating fire in 1834 destroyed much of the saline facilities. King Ludwig I oversaw the rebuilding. The magnificent Old Salt Works building now houses the Salt Museum and historic salt springs. Salt production has since moved to the modern Bad Reichenhall salt works.

Bad Reichenhall's salt was exported via the Danube River to Bohemia and Hungary. For 700 years, the brand name "Bad Reichenhaller Markensalz" has persisted, making it the oldest brand in the world.

Transformation into a tourist attraction

After the decline of salt production, the Old Salt Works in Bad Reichenhall underwent restoration and preservation efforts. The magnificent salt works building was transformed into the Salt Museum (Figure 52) to display the history of salt production and its significance in the region.



Figure 52. Old salt works main facility at Bad Reichenhall [© Jörg Braukmann].

Attractions offered at present

Tourist Facilities: the visitors can explore the brine springs, learn about the extraction process, and understand the impact of salt on the local economy.

Cultural Events: the site hosts cultural events, workshops, and concerts, making it an engaging experience for tourists.

Salt Graduation Towers: these are wooden structures where brine trickles down, creating a microclimate with salty air.

Salt Shop: the museum complex includes a salt shop where visitors can purchase various salt products.

3) Nothweiler Iron Ore Mine (Eisenerz, North Rhine-Westphalia)

This former iron ore mine has been transformed into a visitor attraction, offering guided tours and educational exhibits on the mining industry.

History and Background

The Eisenerzgrube Nothweiler boasts iron ore deposits primarily composed of Brauneisenstein (brown ironstone). These formations originated during the Tertiary period when the Oberrheingraben (Upper Rhine Graben) was formed. Mining activities occurred from 1582 to 1883 in Nothweiler. Duke Johann of the Duchy of Zweibrücken established the Erzgrube Nothweiler in 1582. Later, Baron Ludwig von Gienanth took over the mine along with the ironworks in Schönau in 1838.

Transformation into a tourist attraction

Since 1977, the Eisenerzgrube Nothweiler has welcomed curious visitors. Guided tours explore the St. Anna-Stollen, where you'll learn about ore extraction using basic hand tools. Over 700,000 visitors explore this historical gem annually.

Attractions offered at present

Historical Mining tours: the place offers to wander through the Erzgrube (ore mine) and trace the footsteps of ancient miners (Figure 53). The circular tour covers approximately 420 meters, revealing the secrets of ore extraction. It's possible that even the Celts forged their famous iron swords from Nothweiler's iron deposits.



Figure 53. View of interior tour at the Mine Eisenerzgrube Nothweiler [© Dahner Felsenland].

Colourful Formations: inside the St. Anna-Stollen, marvel at the vibrant iron ore formations in the sandstone. These stunning hues—reds, browns, and ochers—crystallized over 30 million years ago when hot, iron-rich waters emerged from fractures in the rock.

Scenic Hiking Trail: The “Grenzgängerweg” trail, spanning approximately 7 kilometres, passes by the visitor mine. This trail goes across the border between Germany and France.

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2.3. Greece

Greece has a rich history of mining activities dating back to ancient times. The country is known for its diverse mineral resources, including lignite (a type of coal), bauxite (aluminium ore), nickel, lead, zinc, gold, and marble. Mining has played a crucial role in the country's economy and industrial development.

Key Mining Regions and Minerals:

1. Lignite (Coal):

- The most significant lignite mining areas are in Western Macedonia (Ptolemaida and Florina/Amyntaio basins) and in the Peloponnese (Megalopolis).
- Lignite has been primarily used for electricity generation, with large-scale mining operations managed by the Public Power Corporation (P.P.C.) in Greece.

2. Bauxite:

- Central Greece, particularly around the Parnassos and Giona mountains, is rich in bauxite deposits.
- Bauxite mining has supported the aluminium industry, with major companies like Aluminum of Greece involved in extraction and processing.

3. Nickel:

- The Larco company operates significant nickel mines in Central Greece, contributing to the production of ferronickel for the global market.

4. Lead and Zinc:

- The Stratoni mine in Northern Greece (Halkidiki region) is known for its lead and zinc production, operated by Hellas Gold.

5. Gold:

- Halkidiki also hosts gold mining activities, with projects like Skouries and Olympiada managed by Hellas Gold.

6. Marble:

- Greece is renowned for its high-quality white marble, especially from regions like Drama, Kavala, and Thassos.

Examples of the transformation of mining sites into cultural heritage sites in Greece are divided into 2 groups:

- Group 1 – Coal mining facilities
- Group 2 – Examples of good practices related to the transformation of post-mining facilities not related to coal (ore mining, salt mining, oil mining, etc.)

2.3.1. Group 1 - Coal mining facilities

1) Ptolemaida, Amyntaio and Florina Coal Mines

The coal mines of Ptolemaida and Florina, located in the Western Macedonia region of Greece, have played a pivotal role in the country's energy sector for several decades. These lignite mines have been crucial for Greece's power generation, particularly during the mid to late 20th century when the country was rapidly industrialising. The development, operation, and subsequent transition of these coal mines offer a compelling narrative of industrial progress, economic dependency, and environmental challenges.

Early Development

The discovery of lignite deposits in Ptolemaida and Florina dates back to the early 20th century, with systematic exploration and extraction commencing in the 1950s. The establishment of the Public Power Corporation (P.P.C.) in 1950 marked a significant turning point for Greece's energy infrastructure, as the state-owned company took charge of harnessing these resources to meet the burgeoning demand for electricity.

Ptolemaida:

- The Ptolemaida basin, located near the city of Kozani, was identified as a rich source of lignite, a low-grade form of coal. The extraction began in earnest in the 1950s and 1960s, aligning with Greece's post-war reconstruction and industrialization efforts.
- The development of the Ptolemaida mine was accompanied by the construction of large thermal power plants, such as the Ptolemaida I, II, III, and IV units, Kardias I, II, III, IV units, and Agios Dimitrios I, II, III, IV, and V units which utilised lignite as their primary fuel. These plants were pivotal in reducing Greece's reliance on imported oil, providing a stable and locally-sourced energy supply.

Amyntaio - Florina:

- The Amyntaio - Florina basin, situated closer to the northern borders of Greece, followed a similar trajectory with significant lignite mining activities beginning in the 1970s. The Amyntaio and Achlada mines in the region became integral to the local economy and the national energy grid.
- The Meliti I power station, one of Greece's newest lignite-fired plants, was established to capitalise on the nearby lignite resources, further cementing the role of Florina in the country's energy landscape.

Peak Production and Economic Impact

The peak of lignite mining in Ptolemaida and Florina occurred from the 1970s to the early 2000s. During this period, the mines and associated power plants provided thousands of jobs, spurred regional economic growth, and significantly contributed to Greece's energy independence. The energy produced from these lignite mines accounted for a substantial portion of the country's electricity, making Greece one of the leading lignite producers in Europe.

Environmental and social implications accompanied the economic benefits. Extensive mining activities led to significant land degradation, air pollution, and adverse health effects on local communities due to particulate emissions and other pollutants from the power plants.

Transformation Efforts: Although the transformation is ongoing, plans are in place to repurpose these areas. The local government and P.P.C. are working on projects to rehabilitate the landscape, develop renewable energy facilities, and create recreational and tourism opportunities. The initiative aims to mitigate the economic impact of phasing out lignite mining and create sustainable development pathways.



Figure 54. . Old photographs from the mining operations, exhibits at the West Macedonia Lignite Centre (Giouvanidis, E, (2024) personal archive)



Figure 55. Section model of the mines, exhibit at the West Macedonia Lignite Centre (Giouvanidis, E, (2024) personal archive).



Figure 56. . Steam engine of the underground mine of Aliveri, exhibit at the West Macedonia Lignite Centre (Giouvanidis, E, (2024) personal archive).



Figure 57. TAKRAF 2000 gear reducer toothed wheel, exhibit at the West Macedonia Lignite Centre (Giouvanidis, E, (2024) personal archive).



Figure 58. Bucket wheel, part of the excavators, exhibit at the West Macedonia Lignite Centre (Giouvanidis, E, (2024) personal archive).

Transition and Challenges

As global awareness of environmental issues and climate change intensified, the European Union (EU) began to implement stricter regulations on carbon emissions and encouraged the transition to

renewable energy sources. Greece, as an EU member, faced increasing pressure to reduce its reliance on lignite, which is a major source of CO2 emissions.

Ptolemaida:

- In recent years, the region has seen efforts to transition from lignite-based energy production to more sustainable alternatives. The construction of the new Ptolemaida V plant, which was designed to be more efficient and environmentally friendly, is part of this transitional phase. However, there are plans to convert it to a natural gas facility in line with the EU's decarbonization goals.

Amyntaio - Florina:

- Similarly, the Amyntaio - Florina region has embarked on initiatives to phase out lignite mining. The decommissioning of older plants and the development of renewable energy projects, such as solar and wind farms, are underway. These projects aim to create new employment opportunities and ensure a smoother economic transition for the region.

Future Prospects and Transformation



Figure 59. Memorial Park in Ptolemaida for the workers in the mines, the endpoint of the annual marathon race (Giouvanidis, E, (2024) personal archive).

The closure of lignite mines in Ptolemaida, Amyntaio, and Florina presents both challenges and opportunities. The primary challenge is managing the socioeconomic impact on communities that have long depended on mining activities. Conversely, the opportunity lies in re-purposing these areas for sustainable development.

- **Environmental Rehabilitation:** Efforts are being made to rehabilitate the mined landscapes, restore natural habitats, and reduce environmental damage. This includes reforestation projects and converting former mining sites into agricultural land.
- **Renewable Energy:** There is significant potential to transform these regions into hubs for renewable energy production. Plans for large-scale solar parks and wind farms are in various stages of development.
- **Cultural and Industrial Heritage:** Recognizing the historical significance of these mining areas, initiatives to preserve and promote the industrial heritage of Ptolemaida and Florina are emerging. Museums, cultural parks, and educational tours are being considered to celebrate the mining legacy while fostering tourism and educational activities.

In the West Macedonia Lignite Centre, in the area of the depleted Main Field mines, the following have been constructed:

- An Expo Center, visited by more than 5,000 people from Greece and abroad every year.
- An artificial wet-land, adjacent to the Kozani-Ptolemaida national road, which evolves into a major ecosystem and, with the cooperation of university bodies, is expected to be used as an environmental education reserve.
- An open-air theatre constructed from old materials that were removed from the mines.
- A silviculture park, in the external deposition of the Main Field, where a model forest park was created with all the different tree species flourishing in Northern Greece.
- A pilot greenhouse for hydroponic cultivation with the use of teleheating in cooperation with the National Agricultural Research Foundation (N.AG.RE.F) and the Technological Educational Institute (TEI) of Florina.

The coal mines of Ptolemaida, Amyntaio and Florina have been central to Greece's energy production and economic development for decades. As the country transitions to more sustainable energy sources, the legacy of these mines continues to influence regional development strategies. Through environmental rehabilitation, renewable energy projects, and industrial heritage preservation, Ptolemaida and Florina are poised to become examples of how former coal mining regions can successfully navigate the path towards a sustainable and diversified future.

2) **Megalopolis Coal Mines**

Megalopolis, located in the southwestern part of Greece in the Peloponnese region, is notable for its significant lignite (a type of coal) deposits. The development of lignite mines in Megalopolis, similar to Western Macedonia, has played a crucial role in the region's industrial and economic landscape, contributing substantially to Greece's energy sector.

Early Development

The discovery of lignite in Megalopolis dates back to the early 20th century. However, large-scale exploitation of these deposits did not begin until the mid-1960s. The establishment of the Public Power Corporation (P.P.C.) in 1950 was a pivotal moment for Greece's energy strategy, leading to the systematic development of lignite mining in the region.

- **Initial Exploration:** Early exploration efforts in Megalopolis revealed extensive lignite deposits, which spurred interest in developing the area as a significant energy resource. The strategic importance of these deposits grew as Greece sought to reduce its dependency on imported energy sources.
- **Development and Expansion:** In the 1960s, the P.P.C. began extensive mining operations in Megalopolis. The construction of the Megalopolis A power plant in 1970 marked the beginning of large-scale lignite extraction and utilisation. The plant was followed by Megalopolis B in the 1980s, further expanding the region's capacity for lignite-fired electricity generation.

Economic and Social Impact

The development of lignite mining in Megalopolis brought significant economic benefits to the region:

- **Job Creation:** The mining operations and power plants provided numerous jobs, boosting the local economy and transforming Megalopolis into an industrial hub. Thousands of workers were employed directly in the mines and power plants, while ancillary industries and services also flourished.
- **Energy Production:** The lignite extracted from Megalopolis was critical in meeting Greece's growing energy demands. The power plants in the region supplied a substantial portion of the country's electricity, contributing to national energy security and supporting industrial growth.

However, the economic benefits were accompanied by environmental and social challenges:

- **Environmental Degradation:** Extensive lignite mining and coal-fired power generation led to significant environmental issues, including land degradation, air pollution, and water contamination. The open-pit mines altered the landscape, and emissions from the power plants affected air quality.
- **Health Impacts:** Local communities experienced health problems related to air pollution, including respiratory issues. The environmental impact of mining and power generation became a growing concern over the years.



Figure 60. Megalopolis' AES (power plant) and mines [41].

Transition and Modern Challenges

In recent decades, the global shift towards sustainable energy and stricter environmental regulations have pressured Greece to reduce its reliance on lignite. Megalopolis, like other lignite regions, has faced the challenge of transitioning to a more sustainable economic model.

- **Decommissioning and Repurposing:** Plans to decommission the older lignite plants have been implemented, with efforts to re-purpose the sites for new uses. The Megalopolis B plant, for instance, has seen partial closures and conversion efforts to reduce emissions and improve efficiency.
- **Renewable Energy Projects:** The region is exploring renewable energy options, including solar and wind power. These projects aim to create new economic opportunities and reduce the environmental footprint of energy production in Megalopolis.
- **Environmental Rehabilitation:** Initiatives to rehabilitate former mining areas are underway. These efforts include land restoration, reforestation, and the development of recreational spaces to mitigate the environmental damage caused by decades of mining.

Respectively, in the reclamation areas of the Megalopolis Lignite Center the following projects have been constructed:

- A recreational park (including a grove, a playground and playing fields) where various events are held in cooperation with the Municipality of Megalopolis.
- Artificial wetlands by creating artificial lakes, some of which have been enriched with fish.
- A motocross track, which annually hosts two Greek championship races and has also hosted international races of the World and European Championships. The track has been qualified as a model track by major international bodies of this sport and has become widely known through the television coverage of the races.
- A runway, the favourite place where local fans of aeroplane modelling meet and practice.
- A breeding farm for small birds and animals, which are released afterwards by students of local schools. These premises are visited by tens of educational institutes and clubs every year.

Similar to Western Macedonia, the history of the Megalopolis coal mines is a testament to the region's industrial significance and the broader challenges of balancing economic development with environmental sustainability. As Greece moves towards a greener energy future, the transformation of Megalopolis from a lignite-dependent area to a hub for renewable energy and sustainable development serves as an important example of adaptation and resilience. There are plans to convert the former mining sites into areas for renewable energy production, particularly solar power. Additionally, efforts are being made to restore the natural environment and promote eco-tourism.

3) Ptolemaida AES (Power plant)

Location: Ptolemaida, Western Macedonia

Background: The Ptolemaida region has been one of the most important lignite mining areas in Greece, providing fuel for electricity production. However, the decline in lignite usage due to environmental concerns has led to efforts to re-purpose these areas. The Ptolemaida power plant is located in the Ptolemaida Basin, which has been a significant lignite mining area in Greece. The region has supplied lignite for power generation, supporting the country's energy needs for several decades. Established in the mid-20th century, Ptolemaida AES has played a crucial role in the local economy, providing employment and contributing to the development of the energy sector. However, the environmental impacts of lignite mining and the shift towards renewable energy sources have necessitated a reevaluation of the region's future.



Figure 61. Ptolemaida AES power-plant [43].

Transformation: As Greece moves towards decarbonization and the phase-out of lignite by 2028, efforts are being made to transform the Western Macedonia region into a model for sustainable development. Work has started on the removal, dismantling of equipment and demolition of the main building of Ptolemaida AES, which includes the boiler room, the engine room, the desalination building and the Control Room, the Ash Collection System with the chimney and the Cooling Tower as well as the building installations with technical safety conditions for the personnel, the installations and the surrounding area, while 21 mechanical parts from the complex of the former Ptolemaida Steam Power Station were considered as preserved by the scientists of the Ministry of Culture in Greece. Furthermore, the repurposing of the former mining sites for renewable energy projects, such as solar and wind farms, has started. Additionally, there are plans for restoration projects aim to rehabilitate the landscape, converting some areas into natural reserves and recreational parks. Educational and research centres focused on energy transition and sustainability are also being planned in order to foster innovation and provide new economic opportunities for the local population.

Purpose: The transformation of Ptolemaida AES serves multiple purposes. It aims to mitigate the environmental impact of past mining activities, promote renewable energy, and support the local economy through new job opportunities and sustainable development initiatives. By leveraging its mining heritage, Ptolemaida AES is also positioned to become a centre for education and research in energy transition, contributing to Greece's broader goals of reducing carbon emissions and promoting sustainability. This holistic approach ensures that the region's historical significance is preserved while paving the way for a greener and more sustainable future.

4) **Amyntaio AES (Power Plant)**

Location: Amyntaio, Western Macedonia

Background: The Amyntaio lignite mines are located in the region of Western Macedonia, Greece, and have historically been a significant source of lignite, a type of brown coal used primarily for power generation. However, the environmental impacts of lignite mining, such as land degradation and greenhouse gas emissions, have led to increasing pressure for a transition to more sustainable energy sources and the seizure of operations in Amyntaio's Power plant. With Greece's commitment to phasing out lignite by 2028, there has been a need to find alternative uses for the extensive mining infrastructure and workforce.



Figure 62. Bird eye view of the Biomass Factory in Amyntaio [46].

Transformation Efforts: In response to the decline of lignite mining, the region has embarked on an ambitious transformation project that included the development of a biomass factory. This initiative aimed to repurpose the existing infrastructure of the Amyntaio lignite mines to produce biomass energy for the district heating of the city of Amyntaio, leveraging agricultural and forestry residues as feedstock. The transition from lignite to biomass not only provided a renewable source of energy but also helped mitigate the environmental damage caused by decades of coal mining. This project involves extensive land rehabilitation efforts, including reforestation and the restoration of the natural landscape affected by mining activities.

Purpose: The primary purpose of transforming the Amyntaio lignite mines into a biomass factory is to promote sustainable energy production while providing new economic opportunities for the local community. This initiative supports Greece's broader goals of reducing carbon emissions and transitioning to renewable energy sources. By converting former mining sites into areas for biomass production, the project aims to create a circular economy that benefits both the environment and the local population. Additionally, this transformation serves as a model for other regions facing similar challenges, demonstrating how industrial heritage sites can be repurposed to support sustainable development and economic diversification.

5) Aliveri Mines

Background: The Aliveri mines, located in the region of Evia, Greece, have a significant history tied to the extraction of lignite, a type of brown coal. The mining operations in Aliveri began in the early 20th century and were integral to the local economy, providing fuel for the Aliveri Power Plant, which was one of Greece's first major power plants. This lignite mining activity was crucial for Greece's energy supply, especially during the post-World War II industrialization period. Over the decades, the mining site expanded, creating a complex network of pits and infrastructure dedicated to the extraction and transportation of lignite.



Figure 63. The carriage transferred lignite on its journey from the lignite mines to the Steam-Electric Station of

Transformation: As Greece moves towards decarbonization and the phasing out of lignite by 2028, the Aliveri mines have seen a decline in activity. In response to this transition, efforts have been made to repurpose the former mining areas for new uses. The transformation includes land rehabilitation projects aimed at converting the depleted mining pits into areas suitable for agriculture, forestry, and renewable energy projects such as solar and wind farms. Additionally, there have been initiatives to create recreational spaces and nature reserves, promoting biodiversity and providing new recreational opportunities for the local community. The integration of historical mining structures into these new landscapes serves as a reminder of the region's industrial heritage.

Purpose: The primary purpose of transforming the Aliveri mines is to promote sustainable development while preserving the historical significance of the site. By rehabilitating the land and repurposing it for agricultural and renewable energy projects, the initiative aims to mitigate the environmental impact of past mining activities and support the local economy through new job opportunities. Additionally, the creation of recreational spaces and nature reserves helps to enhance the quality of life for local residents and attract tourism. These efforts ensure that the industrial heritage of the Aliveri mines is honoured and integrated into the community's future, fostering a balance between economic development, environmental sustainability, and cultural preservation.

2.3.2. Group 2 - Examples of good practices related to the transformation of post-mining facilities not related to coal (ore mining, salt mining, oil mining, etc.).

In recent years, there have been efforts to re-purpose former mining sites in Greece for tourism and cultural purposes. While Greece is still developing its approach to transforming industrial heritage sites, these are some cases:

1) Lavrion Technological and Cultural Park:

Historical Overview

Lavrion, located in southeastern Attica, Greece, boasts a rich mining history that spans several millennia. The region is particularly known for its silver, lead, and zinc deposits, which have been exploited since ancient times.

Ancient Times:

- **Classical Period:** Mining activities in Lavrion date back to the 5th century BCE during the Classical period of ancient Greece. The silver extracted from Lavrion's mines was instrumental in financing the Athenian navy, which played a crucial role in the Greco-Persian Wars. The mines contributed significantly to the wealth of ancient Athens, allowing for cultural and architectural advancements, including the construction of the Parthenon.
- **Mining Techniques:** The ancient Greeks employed sophisticated mining techniques, including the use of shafts, galleries, and washing tables to extract and process ore. Labour was primarily provided by slaves, including a significant number of captured prisoners of war.



Figure 64. Athenian tetradrachm (5th century BC coin) [42].



Figure 65. Share of 1873 of the company The Metallurgies of Lavrion and Annual General Meeting document [42].



Figure 66. Compagnie Française des Mines du Laurium (1890) [42].



Figure 67. The Lavrion Technological and Cultural Park from a bird's eye view [42].

Modern Era:

- **19th Century Revival:** After centuries of inactivity, Lavrion's mines were revitalised in the mid-19th century. In 1864, a French-Greek company, the Compagnie Française des Mines du Laurium, initiated large-scale mining operations. This period marked the introduction of modern mining techniques and the development of extensive industrial facilities.
- **Economic Impact:** The revival of mining brought economic prosperity to the region, attracting a diverse workforce and leading to the establishment of the town of Lavrion. The mining industry spurred the growth of related industries, including metalworking and chemical processing.

Decline and Closure:

- **20th Century:** By the mid-20th century, the profitability of Lavrion's mines declined due to depleted ore reserves and increased competition from other mining regions. The final closure of the mines occurred in the 1980s, leading to economic challenges and environmental degradation.

Transformation into Lavrion Technological and Cultural Park

The closure of the mines left Lavrion with abandoned industrial facilities and a need for economic and environmental revitalization. The transformation of the area into the Lavrion Technological and Cultural Park (L.T.C.P.) represents a successful effort to repurpose the historical site.

Initiation and Vision:

- **Establishment:** The concept for the L.T.C.P. was developed in the late 1990s as a collaboration between the Greek government, the National Technical University of Athens (N.T.U.A.), and local authorities. The vision was to create a multi-functional space that preserves Lavrion's industrial heritage while promoting technological research, education, and cultural activities.
- **Goals:** The primary goals were to stimulate regional development, create job opportunities, and enhance the cultural and educational landscape of the area.

Development and Features:

- **Restoration and Preservation:** Significant efforts were made to restore and preserve the historical industrial buildings. These structures were repurposed to house research laboratories, conference

halls, museums, and cultural centres. The reservation of the architectural and industrial heritage of Lavrion was a central aspect of the transformation.

- **Technological Hub:** The L.T.C.P. serves as a hub for technological research and innovation. It hosts various research institutions, startups, and tech companies, fostering collaboration between academia and industry. The N.T.U.A. has established research facilities within the park, focusing on areas such as renewable energy, environmental engineering, and material science.
- **Cultural and Educational Activities:** The L.T.C.P. also functions as a cultural and educational centre. It includes museums that showcase the history of mining and metallurgy in Lavrion, as well as exhibitions on technological advancements. Educational programs and workshops are regularly conducted, attracting students, researchers, and tourists.

Economic and Social Impact:

- **Job Creation and Economic Revitalization:** The L.T.C.P. has generated new employment opportunities in research, technology, and tourism sectors, contributing to the economic revitalization of the region. The park has attracted investments and fostered the development of new businesses.
- **Community Engagement:** The transformation of Lavrion into a cultural and technological hub has engaged the local community, instilling a sense of pride and identity. The park has become a focal point for community activities and events, enhancing social cohesion.

The history of Lavrion's mines is a testament to the region's significant contributions to ancient and modern Greek history. The transformation of the abandoned mining site into the Lavrion Technological and Cultural Park is a remarkable example of successful industrial heritage re-purposing. By blending historical preservation with technological innovation and cultural promotion, the L.T.C.P. has revitalised Lavrion, making it a model for sustainable development and heritage conservation. This transformation highlights the potential for post-industrial areas to reinvent themselves and contribute positively to regional and national growth.

2) The Milos Mining Museum

Location: Milos Island, Cyclades

Background: Milos is known for its rich mining history, particularly for the extraction of obsidian in prehistoric times and later for bentonite, perlite, and other minerals. Mining activities have shaped the island's economy and landscape. The Milos Mining Museum, located in Greece, is a significant institution that preserves and showcases the rich mining cultural heritage of the island. The museum is situated in the old facilities of the Milos Mining Company, which was active from the late 19th century until the mid-20th century. The museum's exhibits provide a comprehensive overview of the island's mining history, which dates back to the Neolithic period, and includes the extraction of obsidian, sulphur, kaolin, bentonite, and perlite.

Transformation: The Milos Mining Museum was established to preserve and showcase the island's mining heritage. It features exhibits on the geology of Milos, the history of mining, and the various minerals extracted from the island. The museum also promotes sustainable development and educates visitors about the environmental impact of mining. The museum's collection includes mining tools, machinery, mineral samples, and archival material, offering valuable insights into the evolution of mining techniques and the impact of mining on the island's economy and society.

Purpose: The Milos Mining Museum also plays a crucial role in promoting the understanding and appreciation of mining cultural heritage. Through its educational programs, the museum engages with the local community and visitors, fostering a sense of pride and responsibility towards the island's mining heritage. The museum's research activities contribute to the advancement of knowledge in the field of mining history and heritage. Furthermore, the museum's conservation efforts ensure the preservation of the island's mining sites and artefacts for future generations. The Milos Mining Museum thus serves as a model for the preservation and promotion of mining cultural heritage, demonstrating the potential of such initiatives to contribute to local development and cultural tourism.



Figure 68. Mining activities of the past in the island of Milos [59].

3) Vagonetto - Fokis Mining Park

Location: Fokida, Central Greece

Background: The Vagonetto-Fokis Mining Park, located in the region of Fokida in central Greece, is a remarkable example of the transformation of a former mining site into a cultural and educational centre. The park's name, "Vagonetto," refers to the small wagons that were used to transport ore in the mine. The park is situated on the site of the former mine, which was active from the late 19th century until the 1970s, and was one of the most significant bauxite mines in Greece, which is crucial for aluminium production. The mine's closure led to a period of abandonment and decay, but in the early 2000s, efforts were made to rehabilitate the site and preserve its mining heritage.

Transformation: Vagonetto has been converted into a mining park and museum. The transformation of the mine into the Vagonetto-Fokis Mining Park was a complex and multi-faceted process. The first step was the cleaning and stabilisation of the site, which involved the removal of hazardous materials and the reinforcement of the mine's structures. The next step was the restoration of the mine's buildings and machinery, which were repurposed for the park's exhibits and activities. The park's exhibits provide a comprehensive overview of the history of bauxite mining in the region, the mining techniques and processes, and the impact of mining on the environment and the local community. The park's activities include guided tours of the mine, educational programs for schools, and workshops on traditional mining skills and techniques. Visitors can explore the underground tunnels, learn about the mining process, and see the machinery used in bauxite extraction. The park also features an exhibition hall and a multimedia centre that provides insights into the life of miners and the history of mining in the region.

Purpose: The purpose of the Vagonetto-Fokis Mining Park is to preserve and promote the mining heritage of the region, and to raise awareness of the environmental and social issues associated with mining. The park's exhibits and activities provide a unique opportunity for visitors to experience the

history and culture of the region, and to gain a deeper understanding of the role of mining in shaping the landscape and the lives of the people. The park's focus on education and sustainability also reflects a broader trend in the field of mining heritage, which seeks to balance the preservation of the past with the needs and concerns of the present and future generations.



Figure 69. Mining activities of the past in the Fokida's mines [67].

4) Kassandra Mines (Olympiada and Skouries)

Location: Halkidiki, Northern Greece

Background: The Kassandra Mines, including the Olympiada, Skouries, and Stratoni sites, are located in the Halkidiki Peninsula of Northern Greece. These mines have a long history dating back to antiquity, known for their rich deposits of gold, silver, lead, and zinc. Over the centuries, the mining activities in this region have played a significant role in the local economy and have been pivotal in the development of metallurgical techniques. In modern times, the Kassandra Mines have been operated by various companies, with significant investment aimed at harnessing the mineral wealth of the area. Despite their economic importance, mining activities have often faced opposition due to environmental concerns and social impacts on the local communities. Recent controversies over environmental impacts have led to calls for alternative uses of these areas.



Figure 70. Bird view of Skouries mines in Halkidiki Peninsula [56].

Transformation Efforts: In recent years, there has been a concerted effort to balance mining activities with sustainable development practices. The transformation of the Kassandra Mines involves the integration of modern mining techniques that minimise environmental impact, alongside extensive

rehabilitation of previously mined areas. At Olympiada, restoration projects are aimed at converting former mining sites into areas suitable for agriculture and tourism. Skouries, while still an active mining site, is implementing measures to ensure that the local environment is preserved and that post-mining land use is considered from the outset. Additionally, initiatives in Stratoni focus on the reclamation of land and the protection of coastal ecosystems affected by mining activities. There are initiatives to develop parts of these areas for eco-tourism and cultural tourism, capitalising on the natural beauty and historical significance of the region, while efforts are being made to integrate mining activities with sustainable development practices.

Purpose: The purpose of transforming the Kassandra Mines is multi-faceted. Economically, the aim is to sustain the mining industry while creating new opportunities in agriculture, tourism, and other sectors. Environmentally, the goal is to restore and protect the natural landscape, ensuring that mining activities do not irreversibly damage the region's ecosystems. Socially, these transformations seek to improve the quality of life for local communities by providing new employment opportunities and fostering a healthier environment. By integrating sustainable practices with mining heritage, the Kassandra Mines aim to serve as a model for responsible resource extraction and land rehabilitation, aligning with broader goals of economic development and environmental stewardship in Greece.

5) Serifos Mining Park

Location: Serifos Island, Cyclades

Background: The Serifos Mining Park is located on Serifos Island in the Cyclades, an area with a rich mining history dating back to antiquity. The island's mining activities primarily focused on iron ore, which was extensively extracted and exported, especially during the late 19th and early 20th centuries. The mining industry significantly influenced the island's economy and social structure, with the mines employing a large portion of the local population. However, by the mid-20th century, the decline in global demand for iron ore led to the cessation of mining activities, leaving behind a legacy of abandoned facilities and altered landscapes.

Transformation: In recent years, efforts have been made to preserve and repurpose the historical mining sites on Serifos. The transformation into the Serifos Mining Park aims to protect the industrial heritage while promoting sustainable tourism. The park includes restored mining facilities, underground tunnels, and interpretive trails that guide visitors through the island's mining history. These attractions are complemented by informative displays and educational programs that highlight the technological, economic, and social aspects of the mining era. The park not only preserves the physical remnants of the mining industry but also serves as a cultural repository, ensuring that the history of mining on Serifos is accessible to future generations. The old mining facilities and tunnels have been preserved as part of a cultural heritage site. The Serifos Mining Park offers guided tours of the mining areas and efforts are also made to promote the park as a tourist attraction, blending natural beauty with industrial heritage.



Figure 71. The mining area of Mega Livadi, the core of the study of the Serifos open-air museum [47].

Purpose: The primary purpose of the Serifos Mining Park is to conserve the island's mining heritage and integrate it into the modern tourism framework. By transforming the abandoned mining sites into a cultural and educational attraction, the park aims to boost local tourism, providing economic benefits to the community. Additionally, the park serves an educational role, raising awareness about the island's industrial past and the impacts of mining on the local environment and society. Through its preservation efforts and sustainable tourism initiatives, the Serifos Mining Park exemplifies how historical industrial sites can be effectively repurposed to benefit both the community and the economy while safeguarding cultural heritage.

6) Thassos Mines and Environmental Park

Location: Thassos Island, Northern Aegean

Background: The mines are located on Thassos Island in Northern Greece, an area historically known for its rich deposits of iron ore. Mining activities in Thassos date back to ancient times, with the island's minerals playing a crucial role in its economic development and contributing to the metallurgical advancements of the region. The mines, in particular, were significant for the extraction of high-quality iron ore, which was transported to various parts of Greece and beyond. However, like many mining regions, the area experienced environmental degradation and economic decline following the cessation of mining operations.



Figure 72. Workers in Thassos mines in the past [63].

Transformation: In recent years, efforts have been made to transform the Sideritis Mines into an Environmental Park, focusing on ecological restoration and sustainable tourism. The transformation includes extensive rehabilitation of the former mining sites, aimed at restoring the natural landscape and promoting biodiversity. Trails and interpretive paths have been developed to guide visitors through the park, providing educational insights into the geological and industrial history of the region. The initiative also includes the conservation of historical mining equipment and structures, which serve as educational exhibits that highlight the island's mining heritage.

Purpose: The primary purpose of the mines and transformation efforts is to create a sustainable model that balances environmental restoration with cultural heritage preservation and tourism development. By converting the former mining sites into a park, the project aims to mitigate the environmental impacts of past mining activities while promoting eco-tourism and education. This initiative not only preserves the historical significance of the mines but also provides economic benefits to the local community through increased tourism and related activities. Ultimately, the Environmental Park serves as a testament to the region's ability to adapt and thrive, showcasing a successful transition from industrial use to environmental stewardship and cultural preservation.

7) Gavrio Mines

Location: Andros Island, Cyclades

Background: The Gavrio mines on Andros Island, located in the Cyclades archipelago, have a rich history dating back to the early 20th century. These mines were primarily known for their extraction of iron ore, which played a significant role in the island's economic development. The mining activities in Gavrio were a critical part of Andros' industrial heritage, providing employment and contributing to the local economy. However, by the mid-20th century, the mines faced decline due to the depletion of easily accessible ore, market changes, and the rising costs of extraction. The closure of the mines left a legacy of abandoned infrastructure and environmental challenges.



Figure 73. The mines on Andros Island [48].

Transformation: In recent years, there has been a concerted effort to transform the Gavrio mines into a site for sustainable tourism and cultural heritage preservation. The transformation includes the rehabilitation of the mining areas, converting them into hiking trails and eco-tourism attractions that highlight the natural beauty and historical significance of the region. Interpretive signs and guided tours have been introduced to educate visitors about the mining history and its impact on the local community. Additionally, the preservation of historical mining equipment and structures provides a tangible connection to the past, enriching the cultural landscape of Andros Island.

Purpose: The purpose of transforming the Gavrio mines is to promote sustainable development that benefits both the environment and the local community. By leveraging the historical significance of the mining sites, the project aims to attract tourists interested in cultural and eco-tourism, thus providing a new economic avenue for the island. The initiative also focuses on environmental restoration, addressing the legacy of land degradation caused by mining activities. Ultimately, the transformation seeks to create a balance between preserving Andros' industrial heritage and fostering a sustainable future, ensuring that the benefits of this heritage can be enjoyed by future generations while supporting the island's economic and ecological well-being.

8) Evia Mining Sites

Location: Evia Island, Central Greece

Background: Evia, the second-largest island in Greece, has a long history of mining activities, particularly for lignite, magnesite, and various other minerals. These mining operations have significantly contributed to the local economy, providing raw materials for industrial uses both domestically and internationally. However, extensive mining over the decades has led to substantial environmental degradation, including large open pits and disturbed landscapes. As mining activities ceased, these sites were often left abandoned, posing environmental hazards and limiting future land use options.



Figure 74. Mines in Evia Island transformed into lakes [45].

Transformation Efforts: In recent years, several former mining sites in Evia have been transformed into lakes. At the depth where the mining process was stopped, the underground water table appeared. Over the years, the groundwater has created a hospitable ecosystem. These are the so-called "mining lakes", and while in the past the area resembled a lunar landscape with large craters, currently wild reeds, oleanders, pines and sycamores make up the landscape. Many amphibious reptiles, birds, turtles and fish now live in the water. Additionally, these lakes have become recreational areas for locals and tourists, offering opportunities for activities such as bird-watching and hiking.

Purpose: By converting abandoned mining pits into lakes, these transformations aim to restore the natural landscape and provide ecological benefits, such as improved water management and increased biodiversity. Furthermore, these transformations support local economies by developing new recreational and tourism opportunities. Industrial heritage sites can be repurposed to enhance environmental sustainability and community well-being, ensuring that the historical legacy of mining in Evia is honoured while fostering a healthier and more diverse ecosystem for future generations.

9) Mykonos Mines

Location: Mykonos Island, Cyclades

Background: Mykonos, widely celebrated for its tourism and vibrant cultural life, also has a lesser-known industrial past tied to mining. The island was involved in small-scale mining operations primarily for barite, a mineral used in various industrial applications such as drilling mud in oil exploration, and as a pigment. These mining activities, although limited in scale compared to other regions in Greece, provided economic benefits and employment opportunities for local communities. The mining operations in Mykonos were part of a broader network of mineral extraction activities across the Cyclades, contributing to the regional economy during their peak.



Figure 75. Mykonos mining activities of the past [54].

Transformation: With the decline of mining activities due to the depletion of barite reserves and changes in market demand, the mines were eventually abandoned. In recent years, there has been a growing interest in repurposing these former mining sites to support sustainable tourism and environmental restoration. This includes stabilising the terrain, planting native vegetation, and creating pathways that integrate the historical mining sites into the natural landscape. The preservation of mining relics and structures has also become part of the local heritage tourism, offering visitors a glimpse into the island's industrial past.

Purpose: The purpose of these transformation efforts is twofold: environmental restoration and cultural heritage preservation. By rehabilitating former mining areas, Mykonos aims to mitigate the environmental impacts of past mining activities, promoting biodiversity and enhancing the natural beauty of the island. Additionally, integrating these sites into the tourism landscape provides an educational dimension, allowing visitors to learn about the island's mining heritage and its role in the broader history of the Cyclades. These initiatives support sustainable tourism, enriching the visitor experience while preserving the historical and cultural fabric of Mykonos. The overall goal is to balance the preservation of industrial heritage with environmental sustainability and economic development, ensuring that the legacy of mining contributes positively to the island's future.

2.3.3. Conclusions

While Greece has a long history of mining, the transformation of mining sites into industrial heritage objects is a relatively new but growing trend. The most notable success story is the Lavrion Technological and Cultural Park, which showcases how former mining sites can be repurposed for educational, cultural, and technological uses. Other regions like Ptolemaida, Florina, and Megalopolis are in the early stages of their transformation journeys, focusing on sustainable development and renewable energy projects. These efforts are essential for preserving industrial heritage and promoting economic diversification in former mining regions while illustrating the diverse ways in which former mining areas in Greece are being repurposed, balancing historical preservation with sustainable development and tourism. Each transformation project aims to address the environmental impacts of past mining activities while creating new economic and cultural opportunities for the local communities.

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2.4. Slovenia

2.4.1. Group 1 - Coal mining facilities with underground tourist route

1) The Coal Mining Museum of Slovenia

HISTORY

In 1957, the Museum of Slovene Mines was founded. The museum, which was for almost 40 years in operation under the patronage of the Cultural Centre Ivan Napotnik Velenje and was housed in Velenje castle, was first opened to the public on 8 October 1966. At the end of 1998, when extraction of coal moved from the Škale area to the new working field in Preloge, the museum was relocated into the abandoned underground tunnels of the Škale pit.

AT PRESENT

At the Velenje Coal Mine, we wanted to preserve our customs, traditions, as well as the machinery, equipment and everything related to coalmining. It was 1999, when the abandoned Škale mineshaft near Velenje was brought back to life with the establishment of the Coal Mining Museum of Slovenia. Visitors to the Museum, which is considered a centre of industrial art, enter it accompanied by guides in exactly the same way as miners did in the last century. Dressed in miner's clothes and a topcoat, with a helmet on their head and a miner's lunch in their pocket, they descend into the depths through the Stari jašek, a shaft from 1888. In the underground tunnels, they experience a picturesque presentation of how the miners' work was done in the past and what it is like today, and learn about the mining equipment from the last decades of the Coal Mine's development. The story is told by 18 scenes and 15 miner puppets, which come to life through modern audio-visual equipment. An antique underground train takes the visitors from the past back to the present. Also on display are a collection depicting the development of coal mining in Slovenia, a miner's apartment from 1930, the history of jumping over the skin and exhibitions of renowned artists.

In the deepest-lying underground cafeteria, visitors can enjoy a five-star experience, Velenje Underground – Štajgerjeva južna, prepared by award-winning chefs, original dishes inspired by local ingredients and mining tradition, and select wines with musical animation. With respect for the past and in cooperation with the Šalek Valley Tourism Institute (Zavod za turizem Šaleške doline), the tourist product Mysteries of Submerged Villages was created, which begins in the depths of the Museum and ends with a virtual dive in Lake Velenje and a superb culinary experience. The product is an example of sustainable development of a destination through the digitization of industrial and cultural heritage. In the last decade, the coalmine hosted a concert by the world-famous Laibach 160 m below the ground, an extreme PokerStars poker tournament in Ligi's salon, a culinary experience with the world-class chef Ana Roš, and many more. The only underground museum in Slovenia has already been visited by more than 500,000 people from around the world, as the museum's multimedia story is also available in English, German, Italian and Croatian, and it is accessible to disabled, visually impaired and hard of hearing people.

The museum has received numerous awards. The special award of the European Museum Forum, the Valvasor award, the Ford award for the preservation of technical heritage, the Chamber of Commerce and Industry of Slovenia award for the contribution to the preservation and marketing of cultural heritage, and others were joined in 2023 by the Slovenia Unique Experience quality mark and the international BIG SEE Tourism Design Award 2022. The story of the Mysteries of Submerged Villages was featured in the Green Destinations Top 100 Stories list of one hundred best sustainable practices in the world.



Figure 76. Miners' changing room in the Coal Mining Museum of Slovenia [Photo: Premogovnik Velenje].



Figure 77. The Dominion Mine Skip in the Coal Mining Museum of Slovenia [Photo: Stojan Špegel].



Figure 78. The Škale shaft - cave lift at the Coal Mining Museum of Slovenia [Photo: Premogovnik Velenje].



Figure 79. Battery ground locomotive in the Coal Mining Museum of Slovenia [Photo: Peter Marinšek].



Figure 80. The oldest functioning elevator in Slovenia in the Coal Mining Museum of Slovenia [Photo: Premogovnik Velenje].

2.4.2. Group 2 – Above-ground post-mining facilities / museums.

1) The Zagorje Mining Museum

HISTORY

The story of mining in the municipality Zagorje ob Savi is more than 250 years long and is full of interesting facts and memories carried by retired miners and their families. Until the early 1990's it gave bread to thousands of miners, and most of the industry in the main town, Trbovlje was tied to the mines. At the turn of the millennium when the brown coal began to run out only some 300 people still worked for the mines, but since then new municipal and government initiatives have been taken and technology companies like Dewesoft are emerging - and transforming the region. In 1995 the engine room of the mining shaft Loke pri Kisovcu (Loke at Kisovec) was redesigned into a small mining museum, and after 20 years, the museum was further redesigned to finally look as it always should.

AT PRESENT

The Zagorje Mining Museum first opened its doors in 1995 to commemorate 240 years of mining in the Zagorje Valley. The Municipality of Zagorje ob Savi is in charge of the preservation of mining

heritage, and in 2015, it completed its project of renovation and rejuvenation of the Mining Museum. Since September 2015, the museum boasts new additional interactive content that attracts visitors from all over Slovenia and abroad. The museum's mining heritage collection includes a large number of photographs showing the development of mining in the valley. The museum also houses a collection of tools, rocks and mining equipment that miners used in their work. Right next to the museum there is a collection of heavy mining machinery (locomotive, mining carts etc.) which illustrates the rapid progress of coal mining techniques. A great attraction is the simulated tunnel, which displays the development of the mining support and the coal mining technique. Visitors can also view a multimedia projection about mining in the Zagorje Valley. This is the first museum in Slovenia that is designed interactively, meaning that the visitors can view it on their own with the help of smart phones.



Figure 81. The Zagorje Mining Museum [24].



Figure 82. Shaft Zagorje [24].

2) The Zasavje Museum Trbovlje

HISTORY

The role of mines is of decisive importance for Zasavje, because it is safe to say that Zasavje developed industrially and economically alongside mines. In addition to their own development, the mines also developed a large part of other industries in Zasavje and built or participated in the construction of buildings of wider importance. In connection with the mines, residential, cultural, medical, educational

facilities and other infrastructure were built for the welfare of the Zasavje population, and the mines supplied the wider Slovenian area with coal for heating and electricity.

AT PRESENT

The Inter-Municipal Museum of Contemporary History, which began operating after 1990, has a long history, having operated since 1951 under the name of the Regional Museum of the People's Revolution. Despite constant spatial constraints and the ongoing improvement of museum facilities, they are rapidly implementing their new vision for development across all areas of work. The circle of visitors, material users, informants, and collectors continue to expand, and the museum's activity is most prominent in the presentation of materials and in publishing. The cornerstone of their presentation is the permanent exhibition "Srečno ... črne doline¹," housed in the main museum. Through a combination of classic and ambient arrangements, they cover ten main themes that represent the development of the Zasavje region over the last two hundred years. In addition to this permanent exhibition, they occasionally present the art collections of academic sculptor Stojan Batič and academic painter Leopold Hočevar, who have created extensive works on the themes of mining and industrial landscapes. Visitors are also offered the opportunity to tour an authentic miner's apartment in a mining colony nearby, and by arrangement, a brief presentation of other colonies with bread ovens and entrances to mining tunnels. For those politically sensitive, the Čebine memorial room of the Founding Congress of the Communist Party of Slovenia and a short exhibition on the political development between the two world wars are still available. Visitors can also view the museum collection in Hrastnik, where in addition to a puppet collection on the second floor, they can see the development of education and the events of the Second World War on the first floor, archaeological remains from Podkraj on the ground floor, and photographic displays of Hrastnik's development in the corridors.



Figure 83. The Zasavje Museum Trbovlje [26].

3) The Hrastnik Museum

HISTORY

When the first train passed by Hrastnik in 1849, the Hrastnik mine was already in operation (since 1822), but due to poor transport links with the rest of the world, it was closed. The railway opened the door to the world for coal, and it also became the largest consumer of coal for a long time. In 1852, in addition to the Hrastnik mine, the Ojstra mine began operating, but both - the Hrastnik mine in 1880 and the Ojstra mine in 1885 - were taken over by the Trboveljska premogokopna družba and immediately started with urgent modernization.

¹ Eng. Good luck ... black valleys.

AT PRESENT

The building of the Hrastnik Museum was originally a German school. In 1973, when a new school was opened in Log, the old school could be completely dedicated to a museum. In 1977, four museum collections were available in the museum: hunting, fire, Hofbauer with ethnological and historical objects and NOB and Youth Work Brigade. In 1995, the municipality decided to restore the collection, so it was closed for tours. In 2002, a collection of dolls was also installed in the attic. The museum was reopened in 2005. Today, several collections are available: Archaeological site Hrastnik - Podkraj, Hrastnik Gospôda, Glassworks Hrastnik, Chemical Factory Hrastnik, Elementary School in Zasavje, Alojz Hofbauer, Second World War, Hrastnik Coal Mine, Social and Cultural Life in Hrastnik, Agriculture in Hrastnik, Hrastnik crafts with an emphasis on shoemaking, puppets and games. In 2021, a new Mašinhauš Gallery was opened as part of the mine premises, where KRC, in cooperation with the Zasavje Museum of Trbovlje, set up the exhibition Rebellion in Zasavje. In 2022, as part of the Kamerateat film festival, the exhibition Uporništvo was supplemented with the presentation of memorabilia that marked Revirje, namely the Silent Monuments of the Past.



Figure 84. The Hrastnik Museum [11].

4) The Urbanščica Black Coal Mine

HISTORY

The black coal deposits in the Vremška Valley began to be exploited as early as 1778. Coal was mined at depths of 60 to 65 meters, extracted using winches, and in Škoflje, with a steam pump. The hard coal was highly calorific and was mainly used as cocking coal for firing industry boilers. Between 1894 and 1904, the ADRIA I, II, and III mines were established. During that time, exploration also took place at various locations along the belt between Pivka and Sežana, including Lipica. After World War II, mining was primarily conducted in the Zavrhek mine, while the Timav mine operated until 1964. After the mine's closure, workers were re-employed on the railway or at the metalworking plant Hrpelje-Kozina.

AT PRESENT

A considerable amount of information on coal mining in the Vremška Valley is preserved in the Natural History Museum in Trieste. In 2020, the TKŠD Urbanščica Society set up a coal mining museum collection in the renovated mining facility Rudnik Vreme.

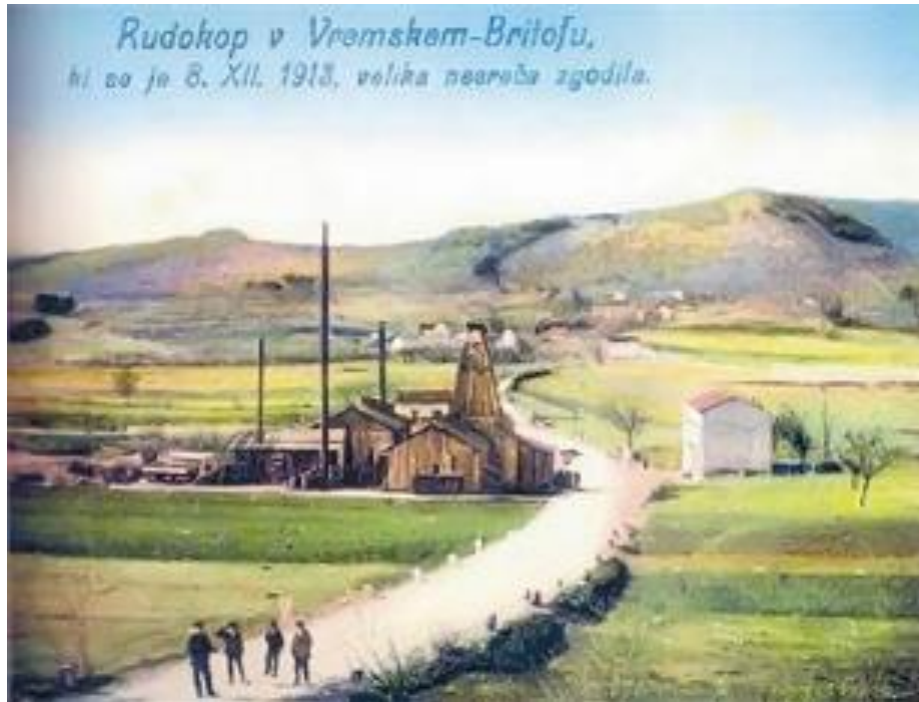


Figure 85. The Urbanščica Black Coal Mine in the Vremska Valley [10].

2.4.3. Group 3 – Examples of good practices related to the transformation of post-mining facilities not related to coal (ore mining, salt mining, oil mining, etc.)

5) The Mežica lead and zinc mine

HISTORY

The Mežica lead and zinc mine is one of the oldest mines in Europe, with the first written mentions from 1665. Mining was stopped in 1993 due to depleted ore reserves, and a lead waste smelter and a battery factory started importing lead.

AT PRESENT

In the area of the closed mine, today there is a regulated rich tourist route. A tour of part of the mine, where mining methods and mining equipment used by miners in different historical periods are presented. After the 3.5 km long Glančnik tunnel, the mine train takes you to the Moring district and the tour continues along the 1.5 km long route to where you climb the stairs one horizon higher. Cycling through abandoned tunnels, accompanied by a guide and by the light of headlamps, takes place along a more than five kilometres long underground route from one valley to another. The cycling route starts at Igrčevo (643 m.a.s.l.) above Črna in Koroška and ends in the second valley of Breg pri Mežica. Tour of the museum is located in Glančnik. The building was built in 1928 by the mine's English owners. Administrative rooms were located on the ground floor and first floor, and apartments for mining supervisors were located on the second floor. The museum includes a collection of ores, minerals and fossils, a mine model, mining maps and cave measuring instruments, the oldest of which is preserved from 1786. There is also a typical apartment of a mining family and a collection of photographs by nature photographer Maks Kunac.



Figure 86. The Mežica lead and zinc mine [2].



Figure 87. Peca Underground Activities [16].

6) The Idrija Municipal Museum

HISTORY

The Idrija Municipal Museum was founded on 21 January 1953 “... in order to preserve the heritage of Idrija Mercury Mine, to manage and maintain cultural monuments and other exhibits under the management of the museum or collected by the museum, and to arrange the following collections: the technical department of the museum, the historical section with a special division of the National Liberation War, the natural history department and the ethnographic department; to research, collect, prepare exhibitions, organise a study library and develop publicity activities ...”. The foundation of the museum was laid with the geological and ethnological collections as well as a general history collection. The protection of immovable cultural heritage has also been one of its activities since the very start.

AT PRESENT

Idrija Municipal Museum is a museum, widely recognised for its care for technical heritage of Idrija Mercury Mine, the second largest mercury mine in the world, the heritage of hand-knitting Idrija lace and the famous Second World War Partisan Hospital – Franja. They have been rewarded for 70 years of professional and dedicated work in the field of cultural heritage. In 1997, the museum received the

Luigi Micheletti award and was declared the best European museum of industrial and technical heritage. Technical heritage monuments that the museum manages, among other things, were included in the UNESCO World Heritage List in 2012 along with other mining heritage of Idrija, and Franja Partisan Hospital received the European Heritage Label in 2015 as the first site in Slovenia. The museum develops its activities in its parent unit in Idrija and a dislocated unit in Cerklje ob Krki. It manages exceptional monuments of immovable heritage which the Municipality entrusted it to manage, or were eventually brought under its auspices.



Figure 88. The Idrija Municipal Museum [18].



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2.5. France

Mining legacy in France

As the spatial consequences of three centuries of industrialization, the transformations undergone by the landscape are particularly visible in the coal mining areas, where abandoned spaces, left behind by the decline of traditional mining activities, have multiplied. The image of the "black country," with a more or less highly degraded natural, economic, and social environment, often constitutes a significant obstacle to the arrival of new activities.

One of the options available is to redesign this degraded landscape, considered valueless, by erasing as much as possible the traces of the mining past. This solution was chosen for a long time. Starting in the 1960s, the decline of mining operations and the closure of mining sites led to the complete destruction of mine buildings and headframes, while some degraded workers' housing estates suffered the same fate. Rehabilitation, therefore, initially meant the more or less complete destruction of the heritage of mining operations.

From the 1970s onwards, this trend gradually evolved towards at least partial preservation of what is now considered as legacy to be valued within the framework of the conversion process. Long treated with disdain, destroyed or in ruins, industrial buildings became the subject of a new academic discipline called "industrial archaeology", and were recognized like ancient monuments, as historical testimonies that needed to be preserved. However, it was only gradually that industrial archaeology began to take an interest in the entire landscape of regions marked by mining operations. This broadening of perspective also influenced the conception of legacy, which now encompasses not only a specific site but also an entire landscape.

In France, awareness of the value of mining heritage and the emergence of a policy to preserve certain elements of it appeared relatively late and unevenly across different mining regions, depending on the dynamics of local actors.

A policy to preserve mining heritage has developed in Lorraine, where several headframes have been preserved; most notably, the Wendel Mine Site (Petite-Rosselle) has been classified as a historical monument. Converted into a mining museum - the Parc Explor Wendel - which opened in June 2006 - it is part of a large cross-border project developed in cooperation between the Forbach Agglomeration Community, the State of Saarland, and the city of Saarbrücken.

The conservation and protection of mining heritage have also developed significantly in the Nord-Pas-de-Calais coal basin, where the Lewarde Mining History Center was created even before the closure of the last coal mine in 1990. Since then, its success has been evident, as it receives an average of more than 165000 visitors per year.

It is interesting to note that the promotion of cultural and geological mining heritage has also developed in regions where coal production was a minor activity, such as the Vendée region of western France (creation of the Faymoreau Mining Center).

In addition to these three facilities, which are BRGM's privileged partners in the CoalHeritage project, more than twenty other museums are scattered across France in the wake of former coal mining operations (Figure 90). We also provide information on the history of some of them.

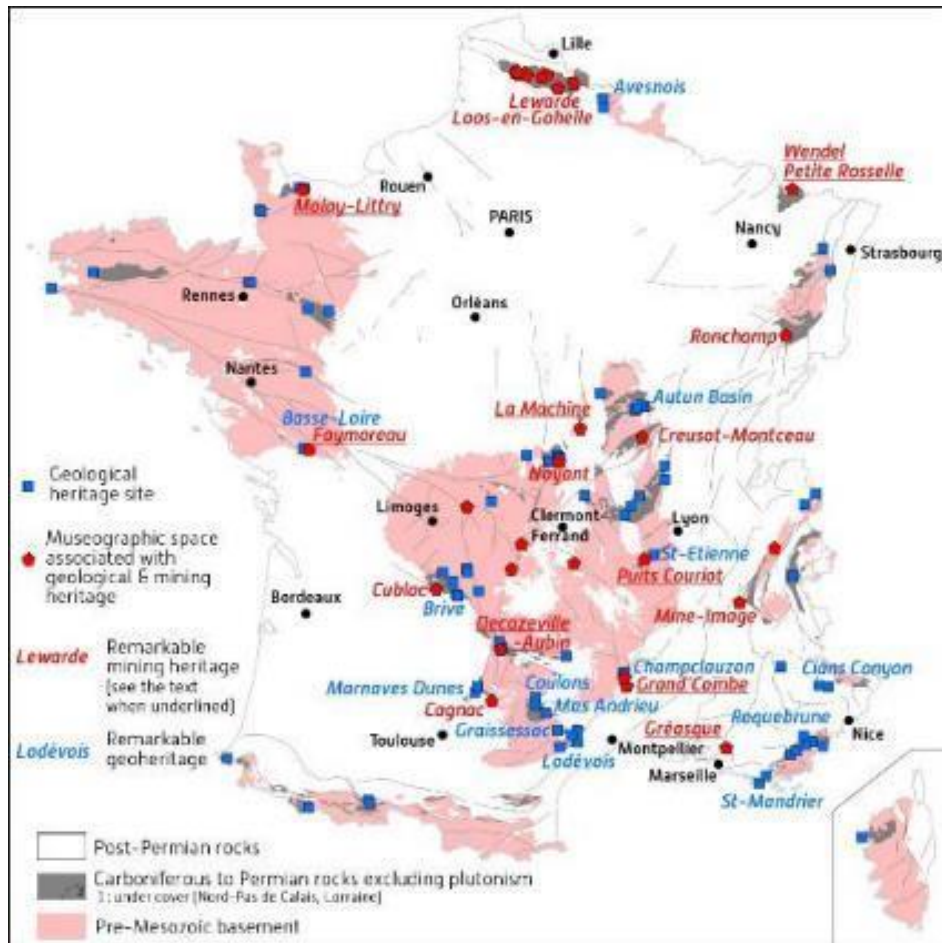


Figure 89. Geological and mining heritage of the Carboniferous and Permian basins in France (BRGM).

2.5.1. Group 1 - Coal mining facilities with underground tourist route

1) The Explor Wendel Park, Petite-Rosselle, Lorraine Coalfield

Introduction

The Lorraine coalfield is one of France's two major coalfields, located in the north-east of the Moselle department. As in all coal-mining and industrial basins, coal mining has contributed to the creation of an industrial, sociocultural (multiculturalism with, for example, almost 20000 foreigners counted in this coalfield in 1921) and economic (also linked in this region to the presence of the Lorraine iron basin, and even health-related due to a higher prevalence of silicosis in particular) "identity". This basin played a key role in Lorraine's development from the 19th century to the 1960s. The basin and its resources (coal, but also iron) also played a historic role in Franco-German relations (period of German occupation and two world wars), with the interests of heavy industry and the coal industry in the background.

The Parc Explor Wendel is located on two neighboring sites, the Carreau Wendel and the Carreau Vuillemin in Petite-Rosselle, in the historic region of Lorraine. Prior to nationalization in 1946, these two pits belonged to the Compagnie des houillères de Petite-Rosselle. Although they were neighbors, these two mining sites exploited two different deposits separated by a fault. Today, it is the most complete coal-mining site preserved in France, and one of the three French anchor points on the European Route of Industrial Heritage.

Former coal mining site created in 1862, the Wendel mine complex, which is now known as "Explor

Wendel Park”, offers leisure-time and cultural activities for the whole family. Visitors can discover the Wendel Miners Museum, the Wendel Mine, cycle paths and walking trails, and they can also enjoy a large number of activities all year round (visits to mine towns, ...). The Explor Wendel Park also makes up one of the largest and most complete complexes of coal mining buildings in Europe.



Figure 90. The Explor Wendel Park from the top of the slagheap [12].

The history of the Explor Wendel Park

First lump of coal mined in Petite-Rosselle

In June 1856, the first lump of coal was mined in Petite-Rosselle from the Saint-Charles pit, two kilometres from what would become the “Wendel headquarters”, and later the Explor Wendel Park.

After this discovery, Emile Vuillemin, a consultant engineer with the “Compagnie anonyme des mines de Stiring”, founded by Charles de Wendel and Georges Hainguerlot, suggested carrying out further drilling to the south in order to develop the operation, which was limited to the north by the border.

Closure of the first pits during the coal battle

Several pits were then closed between 1862 and 1889: Wendel 1, Wendel 2, Vuillemin 1 and Vuillemin 2 (whose headframe is still visible at the site). In 1889, the Wendel headquarters were transferred to the control of the company “Les Petits-fils de François de Wendel et Cie”.

After the Second World War, the Wendel headquarters had to take part in the coal battle by contributing to the three-fold increase of Lorraine’s production in less than 10 years. In 1946, the Wendel headquarters were integrated into the “Houillères du bassin de Lorraine”, a public company, as part of the nationalization of all French coal mines.

The development of the Wendel complex in the 1950s

The Wendel 3 pit was closed in 1952, and equipped in 1958 with the state-of-the-art washroom 3. Wendel Pits 1 and 2 were also modernized and equipped with new headframes.

After 1960, the coal recession set in in France. However, operations and investments continued at the Wendel headquarters until 1986, when the headquarters ceased to operate.

The end of mining at the Wendel headquarters

Until 1989, part of the site’s infrastructure was still used to service the other pits of the Wendel concession that were still in operation. The Wendel 1 pit was closed in 1989, Wendel 2 in 1992 and Wendel

3 in 2001. As for the headframe of the Vuillemin 2 pit, closed from 1884, still visible at the entrance to the site, it is the oldest preserved metal headframe in the former Lorraine coalfield.

The Wendel miners' museum

At the very heart of the former administrative building of the Wendel headquarters, the Wendel Miners' Museum (Figure 91) is an invitation to discover the history of coal mining in Lorraine while revealing the place occupied by miners in these emblematic settings. In a modern and attractive presentation spanning over 1800 m², over 160 objects and models, 25 audiovisual documents as well as countless photos, documents and audio terminals immerse visitors in the history of coal in Lorraine, the daily life of the miner and his family, the social policies of mining companies,...

The building

The Wendel Miners Museum is located in the "Miners' Building". This essential place for miners to pass through includes the miners' hall, offices, shower baths and hanging rooms (changing rooms), the control room, lamp store and union premises. The building, the oldest part of which dates back to 1866, was enlarged and modernized until 1977. It has not been used since 1986, when the Wendel headquarters ceased operating.

The exhibition spaces

The exhibition spaces in the Wendel Miners Museum have been located in the "Miners' Building" since July 2012. They present the history of coal in Lorraine and the daily lives of miners, as well as the history and original function of the rooms, thanks to audio terminals and trilingual explanatory panels (French, German, English).

A trip through time and history

From the miner's hall, the visitor leaps back 300 million years (Carboniferous) to discover the formation of coal. Then, in the corridor leading to the hanging men's rooms, visitors pass through the 170 years of coal mining in Lorraine, from the discovery of coal in the 1830s to the closure of the last coal mine in 2004.

The miner's daily life

The miner's daily life, punctuated by his workstations, is presented in the cloakroom. This is where visitors can discover his hobbies, his moments of rest, how he washed and ate, through everyday objects and household appliances, which gradually improved the comfort of his home.

The social environment from which the miner benefited (health, training, leisure, housing, etc.) is mentioned in the showers, and we must not forget Saint Barbara, patron saint of miners, who is celebrated by all miners on 4 December.

Underground and overground jobs

In a monumental hanging room, the work of the miners is represented by 11 underground and overground professions considered to be representative, among the some 700 trades that make up a long chain leading to the extraction of coal.

The testimonial meetings

The encounters with a former miner immerse the visitor in the daily life and work of the miners through an authentic account and anecdotes. For example, they enrich the tour of The Wendel Mine, by adding a more personal approach to the miners' experiences.

The miner talks about his first days at the mine and then his career in this particular and dangerous world. He also talks about his daily life and the social environment set up by the mine for miners and their families (housing, training, health, leisure, etc.).

The Wendel Mine

The Wendel Mine (Figure 92) is the only French mining site to present the techniques used in coal mining until the last French mine was closed in 2004 (La Houve).

The mine, an open-air building

From the outside, The Wendel Mine has the appearance of a large red open book that symbolizes the history of the mine.

A life-sized mine

Inside, discovering the miners' underground universe starts with a fluorescent model showing the basement used from the Wendel Headquarters.

The visitor then enters a cage, an essential passage for miners to get to the bottom of the mine and return to their workplace. Then Saint Barbara, the patron saint of miners, welcomes visitors before they enter the galleries.

Then follow the rock and coal digging galleries, then the mining sites in horizontal coal seams (inclination of less than 20°), slightly-sloping seams (inclination between 30° and 45°) and sloping seams.

Real machines brought up from underground

The visitor discovers equipment in situation (AM 100 digging machine, electrohydraulic loader G210, Electra 2000 cutting machine, large opening support tails, ANF roadheading machine...).

The tour ends with a film showing a miner's work day underground.

The guided tour

Visitors go on a guided tour through the Wendel Mine with a former miner who discusses the different mining techniques and shares stories about working and living underground in the mine.



Figure 91. The Wendel Mine, main building [15].

The mine complex

The mine complex is the group of surface facilities needed to operate a mine (see <https://parc-explor.com/en/le-parc-explor-wendel/the-mine-complex/> for more details).

The mining towns

On foot or by bus, tours tell the story of the mining towns of Petite-Rosselle. Visitor can discover the architecture designed by mining companies between the mid-19th century and the 1960s. Mining villages and detached or semi-detached workers' houses, engineers' and employees' houses,

dormitories, hospitals... this is what you will see as you visit the various estates known as “Wendel Nord”, “Wendel Sud”, “Leyenne” and “Urselsbach”...

Resources and collections

The Explor Wendel Park carries out heritage missions through its museums, the Wendel Miners Museum, which is labelled “Musée de France” and the Wendel Mine. They aim to conserve and highlight collections, publications and temporary exhibitions.

The Wendel Miners Museum was awarded the “Musée de France” label in 2002. It is subject to scientific and technical control by the State. The collections of the Wendel Miners Museum, featuring nearly 2000 objects and machines, were built up mainly thanks to donations of equipment by the coal mines of the Lorraine basin, which exploited Lorraine coal between 1946 and 2004. They fall into four well-represented categories: technical, geological, underground and above ground transport, and ethnographic collections. A part of these collections is on show in The Wendel Miners Museum and in the Wendel Mine. Another part of the collections is stored by the museum.

2.5.2. Group 2 – Above-ground post-mining facilities / museums

1) Center Historique Minier de Lewarde, Nord-Pas-de-Calais coalfield

Introduction and aims

The Mining History Center (Figure 93) , set on the old Delloye colliery yard, is located at the heart of the Nord-Pas-de-Calais coal-mining basin, at Lewarde in the Nord department. The Nord-Pas-de-Calais coalfield is an area in northern France, located both in the Nord and Pas-de-Calais departments. It is marked economically, socially, landscape-wise, ecologically and culturally by the intensive exploitation, from the end of the 17th century to the end of the 20th century, of the Stephanian coal found in its subsoil. It represents the western part of a deposit that extends beyond the Franco-Belgian border. The eight-hectare site includes industrial buildings covering an area of 8000m².

The Mining History Center, created in 1982 at the impetus of the nationalized mining company, opened to the public in 1984. Its aim is to conserve and promote the Nord-Pas de Calais’s mining culture, so that future generations can learn about three centuries of mining in the area.

The site is made up of three entities: a mining museum, a documentary resources center, which houses the archives of the Nord-Pas de Calais coalfield nationalized mining company, and a scientific and technical energy culture center explaining the history of coal in the context of the wider history of energy.

Gradually, the site took on its current appearance: the machine building with its glass roof, the galleries and the first themed exhibitions were set up during the 1980s. Then, in the 1990s, new editorial and events policies were implemented: each year, a new publication was added to one of the center’s two collections, and several temporary exhibitions and events were organized for visitors to the center, including the Patois Festival, Museums at Night and the Heritage Days.

During the 2000s, the Mining History Center, which had reached saturation point in terms of visitor capacity, was restructured to create 4000m² of new or renovated buildings, including a new reception building to welcome visitors in more comfortable surroundings and new exhibition areas, both permanent and temporary.

Today, 165000 people visit the site each year. The center is classified as a historic monument and is one of the remarkable sites of the mining basin listed as a UNESCO World Heritage Site. It belongs to the Nord-Pas de Calais Region and is also subsidized by the French government, Douai Urban Area and the Heart of Ostrevent local towns.



Figure 92. The entrance of the Mining Center [9].

From Delloye colliery to the Mining History Center

On 21 December 1990, the Nord-Pas de Calais coalfield nationalized mining company closed the last coal mining shaft, bringing the curtain down on three hundred years of history which had begun at Anzin in 1720. The coalfield stretches from Valenciennes to Bruay, taking in the areas around Douai (Nord), Lens and Béthune (Pas-de-Calais), a swathe 120km long but just 12km wide at its widest point. In total, two billion tons of coal were extracted from this coalfield. When the activity was at its peak between the 1930s and 1960s, an average of 200000 people were employed to extract around 30 million tons each year.

Delloye colliery belonged to the Aniche Mining Company until it was nationalized, as was the coalfield as a whole, in 1946. Work at the colliery began in 1931. During the first year, 18634 tons of coal were extracted. Production peaked in 1963, at more than 440000 tons. The seams were narrow, rarely more than a meter wide. This made mining them unprofitable, and the activity was discontinued in 1971.

At that point, the managers of the Nord-Pas de Calais coalfield nationalized mining company, and Alexis Destruys its Company Secretary in particular, wished to create a mining history center to commemorate three centuries of mining in the area. The project was validated in 1973, and Delloye colliery, which was being dismantled at the time, was chosen as the site. It was selected because it was representative of the interwar period, and thanks to its location at the center of the coalfield, close to the motorway network.

In 1982 the Mining History Center Association was created, with the involvement of the French government (Ministry of Culture), the Nord-Pas de Calais Regional Council, the Nord Departmental Council and the Nord-Pas de Calais coalfield nationalized mining company. The Center opened to the public in May 1984.

At the beginning of the 21st century, Charbonnages de France marked out the shaft heads and installed firedamp outlets. BRGM carries out annual inspections. All the buildings have been preserved and renovated, with the exception of the dynamiter and a water tower. A hangar was demolished in the early 2000s to make way for a reception area, but the new building retains its original form.

A large part of the site was listed as a historic monument by decree on September 21st 2009, twenty-five years after the museum was opened to the public. The classified items are the revenue and extraction buildings and the headframes of shafts no. 1 and 2; the compressor room; the glazed hall; the fan room; the screening room; the various walkways; the former workshop; the reception building; the administrative building and the documentation center; the building containing the administration offices, the bath/shower room, the lamp room (Figure 94), the infirmary, the bicycle garage and the toilets; the dynamite plant; the former sawmill (now a restaurant); the weighbridge building; and the janitor's house.

The Delloye pit is one of 353 elements spread over 109 sites that were inscribed on June 30, 2012 as a UNESCO World Heritage Site; it is site no. 23.



Figure 93. The mine's lamp room [16].

The museum

The Mining History Center is France's largest mining museum and one of the premier such attractions in Europe. It is set on the site of the old Delloye colliery at Lewarde. It welcomes more than 150,000 visitors each year.

With the help of audio guides available in English, German, Dutch, Polish, Italian and Spanish, people can visit the themed exhibitions to learn all about how coal was formed, the history of the mining era in the region, and the daily lives of miners and their families. Then, with a guided tour of the galleries, step into the miners' underground world, recreated by the throbbing of the machines and projected images to help visitors imagine the miners at work. It is also possible to participate to a very special "Meet a former miner" experience (in French only): the miner will tell you all about his career, working conditions, safety underground and much more.

The archive and documentary resources center

The Mining History Center's documentary resources center offers researchers, academics from all disciplines, writers, scriptwriters, producers, etc. 2.4 kilometers of archives.

These archives, from the Nord-Pas de Calais's former mining companies and the nationalized mining company, are supplemented by a rich library containing more than 7000 works, a film archive with around 1000 films, a video library with 600 cassettes and a photo library with more than 500000 slides

and negatives. These collections, and the researchers who study them, serve to extend our knowledge of the historical, social welfare, economic and technical aspects of mining. In addition to conserving and managing this collection, the documentary resource center promotes it commercially through products for museums and cultural and educational purposes.

Scientific Energy Culture Center

One thing visitors often ask at the end of a trip around the Mining History Center is why we no longer mine coal. The objective of the Scientific Culture Center is to bring knowledge on energy issues to the public, so that we can improve our understanding of the current challenges facing mining, and access information about current and future energy sources.

Energy and the issues associated with it are related to the economy, the environment and social conscience. The challenges are not always easy to understand. The Scientific Culture Center prompts reflection and curiosity and helps us to better understand these subjects, and to grasp the challenges involved in them objectively, from a cultural and educational viewpoint, so that we can all adjust our own attitudes to these issues and act as responsible citizens.

The Scientific Energy Culture Center sets the wheels in motion for reflection on the energy sources, which lie at the heart of the development of contemporary society. This work is carried out in close collaboration with scientific, technical and economic specialists, as well as representatives from companies linked to the world of energy.

The Scientific Center is a partner of the Cité des Sciences (City of Science in Paris). It is also part of the Nord-Pas de Calais regional scientific, technical and industrial culture network, alongside Nature City in Arras, Lille Natural History Museum, the Departmental Science Forum in Villeneuve d'Ascq, Forum Antique archaeological museum in Bavay, Nausicaa in Boulogne-sur-Mer, Avesnois cultural heritage museum, Dunkirk port museum, PLUS (Palace of the Universe and Science at Cappelle-la-Grande), La Coupole at Helfaut-Saint Omer and Pass interactive science museum at Frameries (Belgium).

2) Faymoreau Mining Center, Vendée coalfield

Introduction

The Faymoreau coalfield (or Vouvant coalfield) is the main section of the Vendée coalfield, stretching from the commune of Vouvant and Faymoreau and neighboring communes in the Vendée department to Saint-Laurs in Deux-Sèvres department in western France.

Coal has been known since the mid-18th century, and was mined industrially between 1830 and 1958. Numerous concessions were granted throughout the 19th century, but by the end of the century they had been consolidated by the Faymoreau collieries. Mining activity declined in the 20th century, but picked up again during the shortages of the Occupation. Total production from the deposit amounts to 1 million tons. The deposit belongs to the Vendée coalfield, which was mainly formed during the Stephanian period (dated between 307 and 299 million years ago).

The area is marked economically, socially, landscape-wise, ecologically and culturally by intensive coal mining from the second half of the eighteenth century to the mid-twentieth century. The Faymoreau mining center opened in 2000 to preserve the memory of this mining past, including several relics such as the "corons" (miners houses) and a headframe.

Mining history

1827 - A clogmaker discovers coal by chance in Marillet, near Faymoreau, while digging a well near his house. This marked the beginning of a great adventure for the whole region, from Saint Maurice des Noues (Epagne) to Saint Laurs in the Deux-Sèvres, which would last 130 years.

1836 - A glassworks is set up to consume the low-grade coal used to fuel the furnaces on site. It

produces up to a million bottles for the Cognac and Bordeaux regions, as well as jars and garden bells. Faymoreau coal is also used by other companies in the coalfield: tile factories, brickworks, lime kilns, etc.

1840 - The Société des Mines de Faymoreau, which mined coal in the Faymoreau basin, built the first coron in the commune to house miners and their families. A few years later, the mining village of Faymoreau expanded, with the construction of the management district, the miners' chapel, the upper and lower terrace corons, schools...

1869 - The railroad arrives in the region. The Angers-Niort line, which crossed the entire Faymoreau mining basin, opened up new business opportunities.

1922 - Electricity is distributed in southern-Vendée, Deux-Sèvres and northern Charente-Maritime, thanks to the construction of the Faymoreau power plant, which boosts coal production. Foreign workers poured in from all over Europe, especially Poland. The Faymoreau commune had a population of over 1000.

1950 - The power station shuts down, the coal deposit runs out...

1958 - The mine closes for good on February 28.

Presentation of the tourism and cultural project

Building on its industrial past, the Faymoreau Town Council decided in 1995 to launch a major tourism and cultural project to revive and develop the town. Below are the main steps of this process.

1999 - Renovation of the Hôtel des Mines restaurant.

2000 - Opening of the museum in the former glassmakers' dormitory. Website of the Communauté de Communes Vendée Sèvre Autise.

2001 - Creation of Carmelo Zagari's stained-glass windows in the Chapelle des Mineurs.

2001 - Development of the Etang de la Digue, a 6-hectare fishing lake, with the construction of a communal pontoon.

2002 - Creation of the "chemin de la mine", a 12 km hiking trail, and a cycle path in conjunction with "Vendée Vélo". Establishment of a Zone de Protection du Patrimoine Architectural Urbain et Paysager (now an Aire de Mise en Valeur de l'Architecture et du Patrimoine) to preserve the corons and the hedged farmland.

June 30, 2018 - Opening of the new museum.

The Faymoreau Mining Center offers four visits to go back in time.

1 - The new museum

The idea is to follow in the footsteps of the miners. Abel, Bautista, Jules, Louis, René, Stanislas, Victor... They all came to work in the Faymoreau coalfield as early as 1827 to extract coal, the black gold of the time. For 130 years, these men from near and far punctuated the life of the little working-class town until 1958, when the mines closed.

From the room of the hanged men to the "bottom" of the mine and then to the "day", visitors relive the industrial and human adventure of the region's "gueules noires" ("black faces"), discover the great history of coal from its origins to the present day and the temporary exhibition of the moment.

Stop 1: the saga of the Vendée and Deux-Sèvres coal industry: an incredible journey through the Faymoreau coalfield, from Saint Maurice des Noues to Saint Laurs in Deux-Sèvres, from the discovery of coal to its mining.

Stop 2: the miner's route. From the hanged men's room to the ventilation shaft, via the lamproom and the mine, visitors become miners; explore their career, their equipment and their working conditions deep underground.

Stop 3: the mine floor. After "descending" into the reconstructed mine, visitors discover what life was like on the Bernard shaft floor: trades, installations, production and mining techniques.

Stop 4: Coal outlets. Glassworks, power stations, lime kilns... were all built in Faymoreau and the surrounding region to use the coal extracted locally.

Stop 5: Men at work. Employees, working conditions, unions and social movements, wages... discover the life of these men at work.

Stop 6: men in the corons. The mine: an industrial history, but above all a human one. Find out about life in the workers' housing estate, housing, leisure activities...

Stop 7: geology. Coal: how it was formed and how it has been mined from yesterday to today.

2 - The village, the "corons"

The first coal deposit was discovered in 1827 at Marillet, near Faymoreau. From there to the 1920s, the Société des Mines built a workers' housing estate, organized into small neighborhoods: glassmakers' quarters, miners' families, management, shopkeepers, porions (foremen) and bachelors.

3 - The stained glass of Carmelo Zagari

Built by the Société des Mines, the Chapelle des Mineurs was inaugurated on December 4, 1876, Saint Barbara's Day, patron saint of miners. When the mines closed in 1958, the chapel remained in private ownership and was handed over to the Bishop's Office, which transferred it to the commune in 1998. At that time, Faymoreau's tourism development policy was already underway: the Mining Center museum was being planned, so the chapel was a natural fit for this project. The Town Council decided to make it a major cultural venue, while preserving its religious vocation.

After the exterior restoration carried out in 1999, thanks in part to an anonymous donation, the commune decided to brighten up the building by replacing the 18 white glass windows with contemporary stained glass (Figure 95). The windows are to be figurative, rich in color, with a mining theme and a spiritual meaning. The artist chosen was Carmelo Zagari, born in Firminy, near Saint Etienne, in 1957. The son of a miner, he was fascinated by the Faymoreau project.

To interpret his work, the commune chose the Vitrail France workshop in Le Mans, which restored the stained glass windows of the Sainte Chapelle in Paris. A close working relationship between the artist and the master glassmaker ensures that the work is faithfully transcribed onto glass.

Taken together, the stained-glass windows form a single picture that can be read in both spiritual and secular terms. The work tells the story of the family: the "Holy Family" with Christ represented by the child, or simply the family of the minor.

The stained glass windows were inaugurated on May 19, 2001, but the interior of the chapel required restoration, carried out with the help of numerous partners including the Fondation du Patrimoine and the Fondation d'Entreprise Gaz de France in 2002.

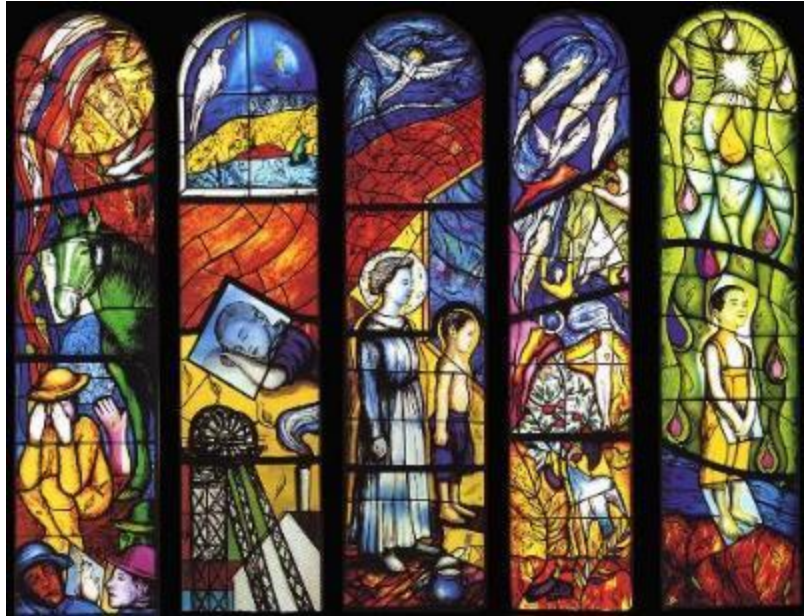


Figure 94. Carmelo Zagari's stained glass windows in the miners' chapel at the Faymoreau center [18].

4 - The Epagne headframe

Located in the commune of St Maurice des Noues, on the edge of the Mervent-Vouvant forest, the Epagne headframe (Figure 7) is one of the last vestiges of mining activity in the region.

Coal mining at Epagne operated intermittently from 1847 to 1925. In 1947, a reinforced concrete headframe replaced the original wooden one. It was never used, due to a lack of coal and subsidies from Charbonnages de France for the small Vendée mine.

Today, this 25-metre-high industrial structure, unique in the region, is owned and restored by the Conseil départemental de la Vendée.



Figure 95. The Epagne headframe is made of concrete [10].

2.5.3. Group 3 - Other examples of successful stories in France

1) Couriot-Musée de la Mine-Saint-Etienne, Loire coalfield

Mining at the Couriot pit in the heart of Saint-Etienne (Loire department) ceased in 1973. Ten years later, activity in France's oldest mining basin came to a halt. Strongly supported by the Houillères and then by an association of former miners, the city of Saint-Etienne opened a museum on the site in 1991. The site, including slag heaps, was listed as a historic monument in 2011.

Couriot-Musée de la Mine (Figure 97) offers guided tours, workshops and temporary exhibitions to some 70000 visitors a year. While the reconstructed underground gallery continues to immerse visitors underground, several digital spaces will open in 2024 to evoke the formation of coal in the Carboniferous era or the mechanism of mining disasters.

Last but not least, a vast, multi-million euros restoration plan has been launched for the site over the next five years.



Figure 96. Couriot-Musée de la Mine-Saint-Etienne [Crédits: Ville de Saint-Etienne].

2) Musée de la Mine, Puits Hély d'Oissel, Gréasque, Provence coalfield

Located between Aix-en-Provence, Marseille and Aubagne in Provence (southern France), the Musée de la Mine (Mine Museum) showcases important relics from the mining era (1919-1962), including the headframe of the old shaft and the machine building, classified as industrial historical monuments (Figure 98). A visit to the museum takes people on a journey through the world of mining, with its major themes: the history of mining, the working conditions of miners, women and children, the evolution of lamps and tools with mechanization, geology, hazards and safety in the depths of the mines...



Figure 97. The top of our headframe and Montagne Sainte-Victoire in the background [Credit: Musée de la Mine / Puits Hély d'Oïssel].

3) La Maison du Mineur, la Grand'Combe, Cévennes coalfield

The pithead of the puits Ricard (Ricard shaft) in La Grand'Combe was closed in 1978; it then became a tourist site in 1993. The "Friends of the Miner's Museum" association was founded in 1989 to manage the heritage site, and the site is listed in 2008 in the supplementary inventory of historic monuments by the DRAC Languedoc Roussillon.

La Maison du Mineur highlights the heritage and history of the La Grand'Combe coalfield, the life of the underground miner through testimonies, tools and objects, the Ricard shaft - listed as a historic monument - and the drum of the extraction machine (Figure 99), also listed, the only one of its kind in Europe. The miner's house, located in the former mine shower building, offers an exceptional overview of the surface installations used for coal production in the Cévennes mining basin.



Figure 98. Headframe of the Puits Ricard mine in La Grand'Combe (Gard department) [1].

4) Musée de la Mine Lucien Mazars, Aubin, Midi-Pyrénées coalfield

Located on the historic mining site of the former "Pays Noir", the Musée de la Mine Lucien Mazars (Figure 100) is a true mirror of the industrial history of the Aubin-Decazeville basin (Cantal and Aveyron departments). Created in 1979 and completely refurbished in 2000, it is an additional attraction for this region, which is now completely remodeling its living environment. Through archive documents, photographs and equipment, including a rich collection of mine lamps and a large series of corporate flags and banners, visitors can discover the life and working conditions of miners at different times.



Figure 99. Entrance of the Lucien Mazars Mine Museum in Aubin (Aveyron, Occitanie, France) [11].

5) The Mine Museum, La Machine, Decize-La Machine coalfield

For almost two hundred years, coal was the main resource of the town of La Machine (Nièvre department). Its exploitation, controlled after 1865 by Compagnie Schneider et Cie, led to the drilling of shafts to depths of 700 meters, the construction of several workers' housing estates and the recruitment of hundreds of "gueules noires" (miners).

When the last shaft closed in 1974, many miners wanted to preserve the memory of their trade by creating an educational, pedagogical and captivating site. Open since 1983, the Musée de la Mine comprises two complementary sites:

- The Musée de la Mine (Mine Museum), housed in the former administrative headquarters of the Houillères group, recounts the history of coal mining and the life of miners.
- The puits des Glénons (Glénons shaft, Figure 101) and its mine gallery show you the harsh working conditions of miners, women, children and animals.



Figure 100. . The Glénons shaft, complete with headframe, electric extraction machine and fan [14].

6) Musée de la mine, Molay-Littry, Littry coalfield

The Molay-Littry Mine Museum, inaugurated in 1907 is the oldest mining museums in France (Figure 102). It occupies the former mining site of the Frandemiche pit, one of the most important of the 23 extraction shafts that existed in the former Littry mining basin in western France (Calvados Department). The museum had a chaotic history until 1950. From 1955 onwards, the mining museum underwent extensive expansion and improvement work, including the opening of a reconstructed mine gallery in 1971. At the same time, the collections were enriched with objects from the coal mines of Northern France and certain iron mines in Normandy. In 1997, with the financial and scientific support of the Conseil Général du Calvados, the museum's scenography was renovated. It was completely revised and modernized in 2020 with the help of the Départemental and a sponsorship from Crédit Agricole bank.



Figure 101. Model of pit no. 5 at the Bruay mines, on display at the Molay-Littry mining museum [13].

2.5.4. References, useful resources:

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3. Conclusions

At the turning points of history, mining became the driving force of industrial development. Difficult conditions for the extraction of both coal and other minerals and ores forced the development of technology, initiating the development of many machines and technologies related to both the mining process and the protection of underground workings. One example is the use of the first steam engines to pump water - a process that protects the coal mine workings from flooding, which would make the extraction process impossible. Other examples include the development of ventilation technology related to the supply of air to underground workings, machines for transporting excavated material both horizontally and vertically, and machines for mining and crushing rocks. Many times in the past, technical solutions designed for the mining industry, after certain modifications, were adopted in other industries, e.g. expansion of the water supply network, transport of materials, tunneling, etc.

The presented facts prove that mining is a very important step in the process of industrial and technological development. Nowadays, in accordance with the policy of the European Union and the Green Deal, the importance of the mining industry is decreasing and subsequent mines are being closed down. Based on the examples presented in this document, it can be observed that in various European countries the process of decarbonization and mine closure is not uniform and each of the countries participating in the project is at a different stage in this process. The task of today is to secure and protect places related to the mining industry in such a way that future generations will have the opportunity to learn about the history of the development of this industry and its impact on the development of our civilization. Another important issues are the customs, habits, folklore, stories, legends that arose and were celebrated in mining areas; the daily life of miners, their families and entire communities living in mining areas for centuries; histories of coal mines and related sites; persons that contributed to development of coal mining technologies, coal mines or played an important role in some other way etc. All these also should be properly documented, which is carried out among others by dedicated museum exhibitions, mining tradition chambers etc.

In each of the countries participating in the project, we find examples of good practices related to the preservation of cultural and industrial heritage related to the mining industry. The examples presented may serve as a guide and a model for countries currently undergoing an energy transition process related to the liquidation of mines. The aim of presenting successful stories is to show possible ways of protecting monuments, how to revitalize or develop them in such a way that post-mining places do not lose their industrial and mining character and at the same time can be developed for the benefit of the local community as e.g. cultural meeting places, museums or other public places.