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Technical Group: TGK1

Conservation and promotion of the Coal Mining Heritage as EU's cultural legacy



Deliverable 1.1

**Comprehensive Overview of the Project
Report**

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EXECUTIVE SUMMARY

The present report provides a comprehensive overview of the RFCS objectives and the COALHERITAGE necessity. A catalogue of Horizon, RFCS and RFCS-AM projects, focusing on the preparation for just transition, challenges, and opportunities, has been curated, showcasing noteworthy outcomes. A literature review is conducted to enhance knowledge about coal mine closure, repurposing, and the Just Transition, emphasizing the unique aspects brought forth by COALHERITAGE. The analysis of primary challenges highlights the novelty inherent in the COALHERITAGE approach.

COALHERITAGE aims at the creation of a EVMJ platform that will support the transfer of the coal cultural legacy through a friendly user environment. The EVMJ platform is an interactive tool which intends to provide better knowledge of post-mining coal heritage on selected territories, through representation and visualisation of information, which will motivate stakeholders to learn more and/or visit coal mining heritage sites. CoalHeritage will identify the processes to declare a coal mining site as a national heritage on selected territories and create a clear, standardised and concise inventory of assets, as well as a specialised interregional coal heritage network and a Geodatabase to be integrated together as a specific route in the European Route of Industrial Heritage, to protect the cultural identity of coal mines. CoalHeritage network will promote the conservation of the coal mines both as tangible and intangible assets. Coal mining has played a crucial role in everyday life and states' economic and social development and it is important to be preserved for future generations. Through this project and the idea of repurposing and protecting the mines, a new concept will be provided to the citizens and the mine workers, which are the most vulnerable groups affected by the transition, providing access to re-skilling programmes and jobs in new economic sectors (e.g., tourism).

PROJECT OVERVIEW

| | |
|--------------------------------|--|
| SECTOR (COAL /STEEL): | COAL |
| TECHNICAL GROUP: | TGK 1 |
| GRANT AGREEMENT N°: | 101112138-COALHERITAGE-RFCS-2022 |
| TITLE: | Conservation and promotion of the Coal Mining Heritage as Europe's cultural legacy |
| ACRONYM | COALHERITAGE |
| BENEFICIARIES: | <p>ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS - Centre for Research and Technology Hellas ("CERTH"), Thessaloniki, Greece</p> <p>INSTYTUT TECHNIKI GORNICZEJ KOMAG ("KOMAG"), Gliwice, Poland</p> <p>PREMOGOVNIK VELENJE DOO ("PV"), Velenje, Slovenia</p> <p>BUREAU DE RECHERCHES GEOLOGIQUES ET MINIERES ("BRGM"), Orleans, France</p> <p>GLOWNY INSTYTUT GORNICTWAGŁÓWNY INSTYTUT GÓRNICWA - PAŃSTWOWY INSTYTUT BADAWCZY (GIG-PIB), ("GIG-PIBGIG"), Katowice, Poland</p> <p>DMT-GESELLSCHAFT FUR LEHRE UND BILDUNG MBH ("DMT"), Bochum, Germany</p> |
| START DATE: | 01/07/2023 |
| END DATE: | 30/06/2025 |
| PERIOD COVERED BY THIS REPORT: | 01/07/2023 to 31/12/2023 |
| MAIN RESULTS: | Overview of the COALHERITAGE project |
| ON SCHEDULE (YES /NO): | Yes |
| MAIN PROBLEMS ENCOUNTERED: | None |
| CORRECTION – ACTIONS: | None |
| PUBLICATIONS, PATENTS: | None |

1 COALHERITAGE SCOPE

CoalHeritage's primary focus lies on the coal regions in transition within the EU and on those that have already phased out coal mining or are close to this state. Due to their dependence on fossil fuels and carbon-intensive processes, these regions, along with the mining sector, are the most vulnerable to any status change. By protecting the mines and the tangible and the intangible assets of the coal mine industry, CoalHeritage aims to provide a new concept to the citizens which through repurposing and reskilling programmes will offer new opportunities for employment and revitalization of the area. The transformation of these areas in places of touristic interest, will affect not only the working staff but the entire region, providing opportunities in an emerging economic sector such as tourism.

To achieve this, 6 partners (CERTH, KOMAG, GIG, BRGM, DMT-THGA, PV) from 5 EU countries (Greece, Slovenia, France, Poland and Germany) will define the characteristics that an inventory of assets should have, using their knowledge on existing coal mine museums or other mine activity. The best practices will be identified by exchanging information and partners will visualize all these data in a EVMJ platform. Potential users (coal industry and stakeholders involved in the cultural and environmental management of such sites, research organizations, energy sector, advance material sector, socioeconomic organizations, policy makers, public health organizations, local authorities and environmental legislation consultants) will be familiarized with the developed tool.

1.1 Current status and alignment with RFCS programme

COALHERITAGE is in line with the following research objectives of the RFCS programme (URL1):

1. Supporting the just transition of the coal sector and regions (Article 4)
2. Improving health and safety (Article 5)
3. Minimizing the environmental impacts of coal mines in transition (Article 6)

COALHERITAGE addresses **Coal Annual Priority** since it inquires sustainable solutions for the re-orienting of existent assets and for the re-purposing of closed and/or abandoned coal sites in the selected areas. Specifically, various suggestions of land rehabilitation will be determined based on RES utilization.

The proposal links with the following European Green Deal Communication's element listed in the Introduction chapter of the 2023 RFCS Information Package:

- *To focus on the regions and sectors that are most affected by the transition because they depend on fossil fuels or carbon-intensive processes.*
- *To Protect people and workers most vulnerable to the transition, providing access to re-skilling programmes, and jobs in new economic sectors.*

COALHERITAGE is in parallel with the priorities of the RFCS Programme because it advances the repurposing of post-mining land and creates added value to the research results aiming in the exploitation of new products and markets regarding the coal industry.

COALHERITAGE addresses the appropriate audience within the coal mine and industrial heritage: policy makers (EU, national and regional level), social partners (industry, managers and employees), transition management institutions, civil society and NGOs, community in general, etc., as described in Work Package 5.

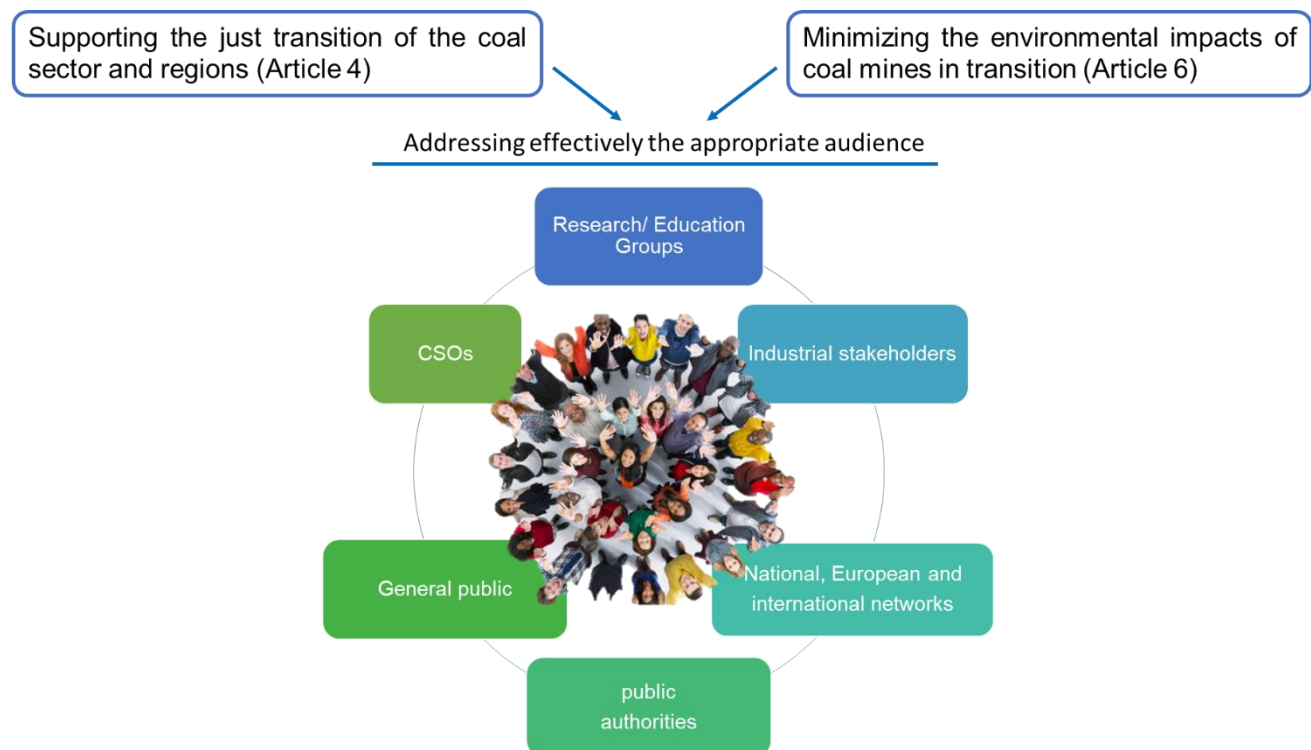


Figure 1: Conceptual diagram of RFCS framework

1.2 Just transition, closure and repurposing

The 2018 EU JRC report, titled "EU coal regions: opportunities and challenges ahead," is a Science for Policy report designed to offer scientifically backed support to the European policymaking process as part of the Coal Regions in Transition initiative. Focused on 41 locations across 12 Member States, the report investigates the impact of the declining coal industry on employment and local economies in regions with lignite and hard coal mining operations, as well as coal-fired power stations. The study reveals that the coal industry currently employs 237,000 individuals, with coal mining constituting the majority of these jobs (185,000). However, it notes a flaw in the USGS room and pillar employment model, as it fails to consider the technologies utilized in EU underground coal mining.

On a global scale, the World Bank has long been involved in mine closure and the transition of coal regions, offering both technical and financial assistance. In their publication "Managing Coal Mine Closure: Achieving a Just Transition for all," the World Bank outlines their experiences and presents nine recommendations (World Bank Group, 2018).

Just transition has gained significant attention in recent years due to the climate crisis and increased awareness of environmental and health issues. Numerous reports and publications support the concept of just transition, emphasizing its interdisciplinary perspective encompassing distributional, procedural, and restorative justice (McCauley & Heffron, 2018). However, the challenge lies in persuading key actors to prepare for such a transition.

Case studies emphasize the importance of early acceptance and preparation for a transition to ensure success, though they lack comprehensive evidence on how to encourage widespread

acceptance, especially within climate policy frameworks (Caldecott et al., 2017). The analysis by Harrahill & Douglas (2019) highlights that a just transition is not a predetermined path but depends on economic, societal, and environmental forecasts. To operationalize a just transition, a broad framework is proposed, involving worker and community participation, economic and social support, and strong government intervention at local and national levels.

To address the negative consequences of energy transitions, targeted investments in education and infrastructure in affected regions are essential (Snyder, 2018). The emphasis should not only be on climate change but also on the socio-economic well-being of regions dependent on hydrocarbon industries. The recognition of heritage, cultural tourism, and economic diversification are key aspects (Casano, 2019). Creating a post-industrial landscape requires a comprehensive approach, incorporating heritage tourism, ecotourism, rural tourism, and other productive activities (Galgoczi, 2019).

Managing transition costs is crucial, and case studies stress the need for well-financed dedicated agencies and government intervention to handle employment and economic implications (Caldecott et al., 2017; Galgoczi, 2019). Governments and stakeholders must align motivations, safeguarding against short-termist tactics that may hinder long-term interests (Abraham, 2017). Stakeholder engagement, disruptive activities, and worker control are emphasized for a balanced transition (Herpich et al., 2018).

Preserving and building human capital in former mining regions requires proactive policies that prioritize communities and workers in the decarbonization process (Harrahill & Douglas, 2019). The protection of human capital, infrastructure development, and education are crucial factors in promoting employment opportunities and avoiding long-term inactive worker status (Caldecott et al., 2017). Just transition policies focusing on community identity and tailored solutions for social justice are advocated (Mayer, 2018; Jasanoff, 2018).

Several recent studies globally have analyzed post-mining regions, highlighting the need for balanced economic, social, and environmental considerations after closure (Langer, 2019; Lu et al., 2019; Wehnert et al., 2018; Wirth et al., 2012; Strambo et al., 2019; Strzalkowski & Scigala, 2020). Repurposing coal plants with alternative energy sources is explored as a potential solution in various countries (Figueiredo et al., 2019; Krassakis et al., 2022; Staple & Slavin, 2012; Delta Institute, 2014).

1.3 Beyond the state of the art

CoalHeritage will dedicate its efforts to the advancement of coal mine and industrial heritage. To accomplish this mission, the project will create an EVMJ platform designed to facilitate the transmission of the coal cultural legacy in a user-friendly manner. The EVMJ platform represents an interactive tool with the aim of enhancing the understanding of post-mining coal heritage in selected regions by presenting and visualizing information in a way that motivates stakeholders to explore and potentially visit coal mining heritage sites or even encourage them to plan the transformation of mines in regions in transition into this concept. To the best of the consortium's knowledge, no such database for coal mines currently exists. Another aspect of the interactive management tool is that it could be extended and adapted for other coal regions in transition facing similar challenges.

The CoalHeritage database will comply with the INSPIRE knowledge base standards. In comparison to other relevant European projects, CoalHeritage distinguishes itself by its focus on defining the processes for designating a coal mining site as a national heritage site in the selected

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regions. This procedure includes the valorization of the assets of an industrial site. Thus, CoalHeritage will construct a well-defined, standardized inventory of assets. Additionally, it plans to establish a specialized interregional coal heritage network and a Geodatabase. These components will be integrated to form a unique route within the European Route of Industrial Heritage, a concept not yet introduced by similar projects. The ultimate goal is to safeguard the cultural identity of coal mines and industry. The CoalHeritage network will actively advocate for the preservation of coal mines, recognizing their significance as both tangible and intangible assets. Coal mining has played a pivotal role in daily life, as well as in the economic and social development of nations, and it is imperative to conserve this heritage for future generations.

1.4 Knowledge promotion

The following table summarizes European funded projects, Horizon, RFCS and FP7, related to COALHERITAGE scope's and describes how the experiences and know-how will be exploited in CoalHeritage:

Table 1 Related European projects

| Relevant EU projects | How the projects will feed into CoalHeritage |
|---|--|
| <p>Project Name: "Smart strategies for the transition in coal intensive regions – Tracer" (2019-2022, H2020-EU.3.3., URL2)</p> <p>Scope: Provide expert support to coal regions in transition regarding strategy development and implementation, by providing short and medium – term solutions.</p> | Provide knowledge on best practice examples, used as a tool to summarise the most important information, ideas and achievements, national policies and challenges, financing opportunities and mobilization of stakeholders for the transition process in coal-intensive regions. |
| <p>Project Name: "Sustainable Eco - Cultural Valorization of Mines and Quarries Sites in the Cross - Border Area -Terra Mine" (2019 - 2022, Interreg Greece – Bulgaria)</p> <p>Scope: Valorisation and preservation of the old mines and quarries of the cross-border area of Greece – Bulgaria and their transformation into attractive and operational visiting places.</p> | Provide recommendations on the management standards and mechanisms for the protection, valorisation and conservation of a coal mining site as well as identification of the processes needed to declare a coal mining site as national heritage. |
| <p>Project Name: "Social Platform for Holistic Impact Heritage Assessment - SoPHIA" (2020 - 2021, H2020, URL3)</p> <p>Scope: Create a Social Platform, to promote Europe's cultural heritage and assess the impact and quality of interventions in European historical environment and cultural heritage</p> | <p>Help promote collective reflection within the cultural and political sectors in Europe on the impact and quality of interventions in European historical environment and cultural heritage at urban level in order to promote a holistic impact assessment model, indicators and standards.</p> <p>Help create a visual journal to facilitate and enhance the engagement of stakeholders from different fields and disciplines with regards to cultural heritage and develop an interregional network for the protection of</p> |

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| | coal mining heritage. |
| <p>Project Name: “Revitalising Post-Mining Region – ReviRis” (2020 - 2021, EIT Raw Materials, URL4)</p> <p>Scope: Develop a participatory evaluative toolbox applied in the design and implementation of strategies for the revitalization of post-mining sites and transitionallandscapes.</p> | Provide support in the development of questionnaires that will help establish a detailed overview and understanding of public and stakeholder perception on industrial heritage (knowledge onthe history of coal mining, perception and interest in cultural heritage, acceptance of preservation measures, financial support measures etc.), highly focused on boosting the involvement and engagement of different stakeholders. |
| <p>Project Name: “Mineral Intelligence for Europe -Mintell4EU” (2018 - 2021, GeoERA, H2020 ERA-NET Cofund Action, URL5)</p> <p>Scope: Harmonize and update the Minerals4EU database (Minerals Yearbooks). Data on historic mines of touristic interest were also collected with the intention of creating a story map available from the European Geological Data Infrastructure (EGDI) platform.</p> | Help increase the degree of harmonization, communication and interaction between existing data platforms, with the ambition of reaching a fully operational and reliable data and establish collaboration with other industrial heritage networks. |
| <p>Project Name: “Reviving Industrial Heritage in Rural Areas - REFREsh” (2017 - 2020, Interreg Central Europe - URL6)</p> <p>Scope: Reuse of the industrial heritage through new forms of creative use, involving creative and other actors(the trade and service sector).</p> | Understanding of re-exploitation approaches of post-mining siteslocated in rural and non-touristic areas. |
| <p>Project Name: “Culture and Heritage for Responsible, Innovative and Sustainable Tourism Actions – CHRISTA”(2016 - 2020, Interreg Europe,URL7)</p> <p>Scope: Give prominence to cultural and natural heritage, including intangible and industrial heritage, by developing and disseminating new and sustainable strategies for touristic purposes, using digitisation and interpretation.</p> | Knowledge on the implemented Action Plans as communication and dissemination tools. |

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| <p>Project Name: “Pluggable Social Platform for Heritage Awareness and Participation-PLUGGY” (2016 - 2019, H2020-EU.3.6.3.1., URL8)</p> <p>Scope: Create a social networking platform and other pluggable applications that enable users to share their local cultural heritage as stories.</p> | <p>Knowledge on (i) techniques involving the engagement of stakeholders on cultural heritage (ii) design tools for the visualization of the user interface decisions.</p> |
| <p>Project Name: “Critical Heritages: performing and representing identities in Europe - CoHERE” (2016 - 2019, H2020-REFLECTIVE-693289)</p> <p>Scope: Explore the ways in which identities in Europe, which connect to ideas of place, history, tradition and belonging are constructed through heritage representations and performances, including cultural policy, museum display, heritage interpretation</p> | <p>Knowledge on promoting the communitarian identity of cultural heritage.</p> |
| <p>Project Name: “Space, place and the historical and contemporary articulations of regional, national and European identities through work and community in areas undergoing economic restructuring and regeneration - SPHERE” (2008 - 2011, FP7-SSH- 215985)</p> <p>Scope: One of its focuses was to limit the feeling of loss and obsolescence, and the resulting sense of degradation of life. To achieve it, the industrial heritage of certain regions as well as of Europe as a whole should be valued, accepted and acknowledged.</p> | <p>Knowledge on the structural features of economic restructuring transformations due to de-industrialisation and regeneration.</p> |
| <p>Project Name: An RFCS Accompanying Measure on European coal research in light of EU policy objectives to 2050 and future global trends in coal use - CoalTech2051, URL9</p> <p>Scope: To promote the knowledge gained from the RFCS Research Programme and share experiences with the international research community. The aim was to develop, with stakeholders, a strategic research agenda for the Programme that is aligned with the EU's Energy Union vision for 2050 and to establish a European Network of Clean Coal Technologists that complements the European Commission's targeted platform to support the</p> | <p>Knowledge gained from the RFCS projects regarding the engagement of stakeholders on cultural heritage and the design tools for the visualization at the EVMJ platform. CoalHeritage will take advantage of the strategic research agenda developed by CoalTech2051 which includes the support of coal regions in transition, the improvement of health and safety and the minimization of environmental impact of coal exploitation</p> |

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| <p>energy transition in the coal regions.</p> | |
| <p>Project Name: Web INTERactive management tool for coal Regions in transition – WINTER, URL10</p> <p>Scope: To develop a web interactive platform for the management of coal regions in transition to provide guidance and facilitate stakeholder engagement. The best practices will be identified by exchanging information and knowledge regarding the main transition challenges in each of the pilot regions representing different stages of the transition process.</p> | <p>Knowledge gained both from the stakeholder engagement and the developed web interactive platform.</p> |
| <p>Project Name: Synergistic potentials of end-of-life coal mines and coal-fired power plants, along with closely related neighbouring industries: update and re-adoption of territorial just transition plans – POTENTIALS, URL11</p> <p>Scope: To identify and assess their synergistic opportunities by means of a prospective analysis, enabling to develop business models that rely on renewable energy, contribute to the circular economy or scale energy storage, guaranteeing a sustainable and combined use of assets and resources, and supporting the update and re-adoption of territorial just transition plans.</p> | <p>Knowledge gained for the reskilling of employees in coal regions in transition.</p> |
| <p>Project Name: An interdisciplinary feasibility study on hybrid pumped-hydro power storage of excess energy in open-pit coal mines – ATLANTIS, URL12</p> <p>Scope: To assess the feasibility of transforming open-pit coal mines into hybrid energy storage projects. Hereby, repurposing of open-pit mines for hybrid pumped-hydro power storage (HPHS) of excess energy from the electric grid and renewable sources will contribute to the EU Green Deal, while increasing the economic value, stabilising the regional job market and contributing to EU energy supply security.</p> | <p>Increase of the database information for abandoned coal mines for the EVMJ platform. Synergies through projects will be created.</p> |

Project Name: MOTIV-e (MOTIV-e - Methods, tools and resources for efficient and engaging ICT-enhanced teaching within VET) No: 2020-1-PL01-KA202-082180, URL13

Scope: To develop easy to access and use training resources for VET teachers wishing to increase their abilities to integrate ICT in teaching.

Knowledge gained from the design tools for the visualization at the EVMJ platform

2 PROJECT CONSORTIUM

To achieve the objectives of CoalHeritage, a consortium of 6 partners (CERTH, KOMAG, PV, BRGM, GIG and DMT-THGA) from 5 European Countries (Fig.1) was assembled with specialised background in heritage and coal mine transition.



Figure 1 Consortium partners combining their expertise to accomplish CoalHeritage objectives.

CERTH: The Centre for Research and Technology Hellas is the largest research centre in Northern Greece and was founded in March 2000. CERTH is a non-profit organization that reports directly to the General Secretariat for Research and Technology (GSRT), of the Greek Ministry of Development. The mission of CERTH is to carry out fundamental and applied research with

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emphasis on development of novel products and services of industrial, economic and social importance in the fields of Chemical and Biochemical Processes and Advanced Functional Material, Environmental Friendly Technologies for Solid Fuels and Alternative Energy Sources, etc. CERTH has participated successfully in more than 1.000 competitive research projects financed by the European Union (EU), leading worldwide industries and the Greek Government via the GSRT. The Chemical Process & Energy Resources Institute (CPERI) operates at CERTH and is the main Greek organization for the promotion of research and technological development aiming at the improved and integrated exploitation of all types of fuels and their by-products. CERTH has been involved in research projects implementing innovative geospatial analyses and workflows in terms of GIS technologies and 2D/3D models.

KOMAG: Institute of Mining Technology is the research and development centre of organizational and proprietary structure adapted to the market activity in the European Research Area and of the organizational culture. The KOMAG's scope of activities includes research and development projects in the domain of mineral mining and processing as well as environmental protection, air and ground surface protection, waste management as well as adaptation of the research results for a practical implementation and dissemination to other natural and technical sciences. KOMAG has 66 years of experience in mechanization of mining operations in Poland. KOMAG specializes in designing, analysis and construction of mechanical equipment for the mining industry. It has achieved national and international success in this area, mainly by collaboration with manufacturers of machines and equipment for the mining industry and has very good relations with the mining companies.

PV: Premogovnik Velenje, d.o.o. (the Velenje Coal Mine, Slovenia) is a technologically advanced company with lignite mining as its primary activity. With an almost 150-year tradition in lignite mining, it is firmly rooted in the Slovenian energy economics. The company operates in accordance with the principles of sustainable development, in accordance with the quality management system, the environmental management system and the occupational health and safety system. Today, together with affiliated companies, it employs ca 2000 qualified staff. PV is also a research organization and is working very closely with various universities and research institutions. Company has participated in a number of EU funded research projects. In the industrial environment of the Šaleška valley, on reclamation areas, company create grounds for the implementation of various activities, including tourist ones. In 1957, the Museum of Slovene Mines was founded under the patronage of the Cultural Centre Ivan Napotnik Velenje and was housed in Velenje castle. At the end of 1999, the museum was relocated and upgraded with underground part in the Škale pit. At the moment it is foreseen that date of coal mine closure will be at the latest in 2033 where in any case a lot of mining infrastructure and assets will be available for future projects. This includes also execution of company mission towards promotion and extension of existing mining museum activities in terms of preserving rich cultural heritage, which is the past, the present and also the future.

BRGM: Bureau de Recherches Géologiques et Minières is the French Geological Survey, the France's leading public institution for Earth Science applications for the management of surface and sub-surface resources with a view to sustainable development. BRGM's activities are organised around scientific research, support to public policy development, international cooperation and mine safety. BRGM has many skills in the field of mineral resources and the

management of post-mining activities. In addition, BRGM participates at national and international level in the conservation of geological heritage and its recognition by a wide public. In the field of post-mining, BRGM has been entrusted with work to make former mining sites safe, monitoring mining site structures and managing the post-mining information system. These skills contribute to a good knowledge of the installations and mining sites and make it possible to identify their potential industrial heritage value. At the EU level, the BRGM has been involved for many years in research programs, support to public policy development and international cooperation. BRGM has participated in more than 110 co-funded EU projects addressing many society challenges covering all geosciences fields.

GIG: Główny Instytut Górnictwa-Państwowy Instytut Badawczy is one of the major Polish research institutions, subordinates to the Minister of State Assets and a research institute of the A category. Since 1925, the Institute has been associated with the mining industry and the region of Upper Silesia. The mission of GIG is to conduct scientific research as well as implementation and service activities aimed at shaping beneficial man – industry – environment relationships. Human subjectivity is a priority in these activities. The activities of the Institute cover the most important aspects of mining and geoengineering, industrial workplace safety, and environmental engineering, in particular, environmental protection against the effects of industrial activities. As a result of GIG work, organisational and technical solutions to minimise hazards and to increase the improvement of safety at work in the industry are implemented. An important part of GIG is the “Barbara” Experimental Mine in Mikołów, where gas explosions and dusts in real conditions are tested. GIG maintains extensive contacts with foreign enterprises and institutions as part of scientific and technical cooperation, joint research projects and the export of services and equipment, implements projects under the European Union Framework Programs, the European Coal Call and Steel Community Program and many others. GIG analysis and reports correspond with the aim of the project to describe the current state of the mining heritage in the EU and worldwide and to define the concept of cultural and industrial heritage. It will build the awareness of the stakeholders and prepare them to understand the input of mining sites into global heritage in the perspective of the process of transformation. Best practices will present successful histories of the transformation of coal mining areas and sites into industrial heritage sites.

DMT-THGA: The Technische Hochschule Goerg Agricola University is part of the DMT LB GmbH – a non-profit organization for education and culture – and was founded in 1816 as a school of mining. Since then, it focuses on the education and training of mine workers and mine managers. In 2015, the Research Center of Post-Mining was established. Research is carried out in 4 areas: (1) “Mine water management”; (2) “Geomonitoring in Post-Mining”; (3) “Material sciences for industrial heritage” and (4) “Reactivation and Transition”. Research projects are focused on coal mine water rebound processes, underground water monitoring systems, separation of contaminants from mine water as well as satellite and remote monitoring of abandoned coal mine sites and on the development of risk assessment systems. In the research area “Geomonitoring in Post-Mining”, DMT-THGA emphasizes on the development of monitoring and risk management systems in post-mining areas. The activities consist of the integration of satellite-bound technologies, drones and in-situ sensor applications. Currently the research centre is involved in the different RFCS project like POTENTIALS, GreenJOBS and WINTER, all focussing on the just transition of coal mining regions.

3 PROJECT MAIN CHALLENGES

It is expected that during the implementation of CoalHeritage, some challenges may be faced and the experience of the consortium will be used to solve any raised issue (Figure 2). One of the main challenges CoalHeritage partners will meet is the availability of the data concerning the tangible and intangible assets of the coal mine and industrial heritage. CoalHeritage's envisioned database will be designed to encompass information from both private mining companies and publicly available data sources. In cases where industrial partners may be reluctant to disclose their data, the selection of data from literature and publicly accessible sources will ensure open and continuous access and processing as well as higher data validity.

Another challenge that will be faced is the homogenization of data, as there is no unique template or guidelines from EC that coal heritage assets should have. Consequently, the participating countries have not performed the same practices concerning their regions in transition and mine closure. Many regions have managed this transition process in an effective way, so the policies and management practices implemented can serve as guidance for other regions. In other cases, helpful examples from other types of mining heritage can be adopted and transferred appropriately in coal heritage concept.

After gathering all the data and before their visualization the EVMJ platform, it is highly possible that the data types and formats concerning to various types of mines from different countries, industries and public bodies may vary greatly. To ensure consistency, specific standards will be set and implemented by all partners during the data collection, homogenization, and presentation processes, tailored to the type of the data, such as maps, text, images, and more.

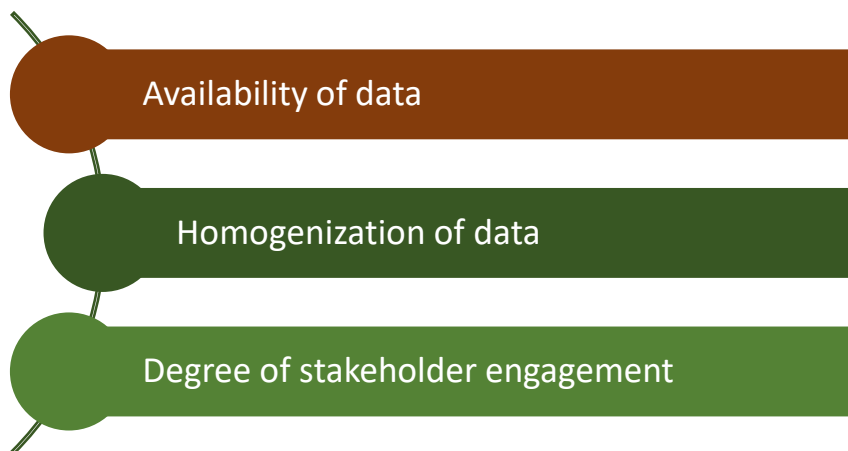


Figure 2 Main challenges of CoalHeritage

An extra challenge identified is the lack of stakeholder engagement. Stakeholders play a significant role at the success of this project. Coal industry, regional / local authorities, tourism industry and the collaboration with other industrial heritage networks will accelerate the conversion of a mining site into a heritage site and amplify its impact. CoalHeritage will build trust and intimacy between the stakeholders themselves, the managing authorities and the local communities. Since heritage addresses what people want to protect and save, what they have inherited from past generations and wish to pass on to future, it is essential to ensure the sustainable and profitable operation of these sites and attractions. All partners will exploit their

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expertise and network to attract the stakeholders' interest through dissemination activities such as social media posting, newsletters and conference organization.

4 PROJECT OBJECTIVES

The specific **objectives** of COALHERITAGE are as follows:

Objective 1- Identification processes needed to declare the coal sites as heritage areas supporting the just transition of the coal sector and regions:

To comprehensively examine the transition in the case study regions, it is crucial to assess both its environmental and socioeconomic aspects. CoalHeritage will identify the best practices and success stories, as well as areas of difficulties and space for designing and delivering more effective policies. For this, it is essential to define the awareness level of the stakeholders on industrial heritage and specifically assessing their knowledge of the historical significance of coal mining, their perception of and interest in cultural heritage, their level of support for preservation initiatives and financial support measures.

Objective 2- Enhanced management in the coal regions in transition supporting the just transition of the coal sector and regions, improving health and safety and minimising the environmental impacts of coal mines in transition:

Provide evidence-supported tools and guidance to inform the policy makers (EU, national, and regional level), as well as industry stakeholders, transition management institutions, and local communities for the successful implementation of a fair transition process and foster greater societal acceptance of this transition.

Objective 3- Design and develop a European Visual Map Journal (EVMJ) supporting the just transition of the coal sector and regions:

Enhance our understanding of the post-mining coal heritage in selected regions by creating visual maps, informative textual content, and utilizing existing geospatial data, all in alignment with its historical evolution. Facilitate the transfer of knowledge about the coal cultural legacy through a user-friendly environment, by representing and visualising this information to engage a diverse set of stakeholders, encouraging their interest and potential visits.

Ensure that both the spatial and non-spatial database infrastructure designed for this purpose remains up-to-date throughout and beyond the project's completion. Maintain the produced inventory available for ongoing use and for potential future applications. This objective is crucial for the sustainability of the coal heritage route infrastructure.

Objective 4-: Dissemination and network development supporting the just transition of the coal sector and regions:

Promote the widespread dissemination of project outcomes and their replicability in different contexts by identifying fundamental design principles that can be customized. This effort aims to offer valuable insights to a significant number of EU regions currently undergoing or will be undergoing the just transition in the years to come.

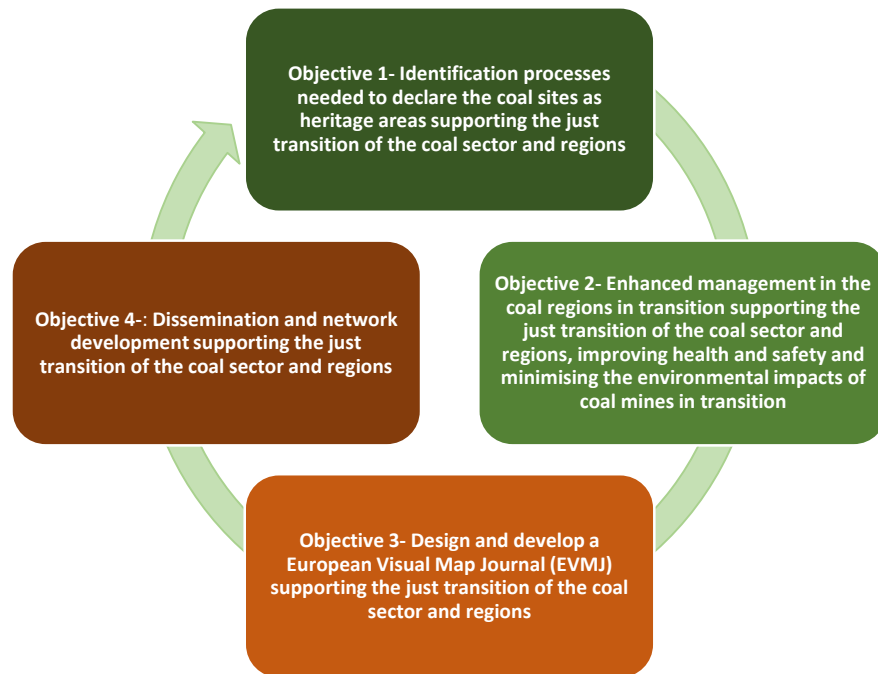


Figure 3 COALHERITAGE objectives

5 METHODOLOGY

The CoalHeritage project employs a four-stage methodology designed to comprehensively address various aspects of coal mining heritage in Europe. The four stages include (Figure 4):

1. **Description of Current Situation:**

To understand the current state of coal mining in Europe, focusing on coal mine strategy, criteria for declaring a site as national heritage, and stakeholders' awareness of industrial heritage.

Method: Reviewing global and EU mining heritage, defining cultural and industrial heritage concepts, and exploring UNESCO's World Heritage Convention.

2. **Inventory and Management Standards:**

To create an inventory and recommend management standards for coal mining sites.

Method: Assessing geological and industrial aspects, considering the dual nature of mining heritage (geoheritage and industrial heritage), and utilizing SWOT analysis for qualitative assessment.

3. **European Visual Map Journal (EVMJ) Development:**

Integrating findings from previous stages into a geodatabase and an interactive storytelling map.

Method: Utilizing data from inventory and management standards to create an EVMJ featuring multimedia content, spatial information, and narrative texts.

4. **Stakeholder Engagement and Dissemination:**

To promote and disseminate project results through stakeholder engagement.

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Method: Identifying and involving relevant stakeholders, including national and local authorities, industries, and the public, to ensure the project's success and sustainable impact.



Figure 4 CoalHeritage scientific approach

The key concepts that are explored throughout the project are:

- **Cultural and Industrial Heritage:**

The project recognizes the dual nature of mining heritage, combining cultural and natural elements. It encompasses tangible and intangible assets, emphasizing the historical, social, and economic aspects of industrial sites.

- **Legislative Considerations:**

Legislative frameworks for cultural heritage protection in partner countries, such as Greece and Poland, are explored. The EU's limited regulatory capacities and funding programs for cultural heritage preservation are highlighted.

- **GeoHeritage and Geotourism:**

Emphasis is placed on the geological aspects of post-mining sites, promoting interdisciplinary valorization for tourism purposes. The SWOT analysis is used to assess qualitative values, and various economic valuation methodologies are explored.

- **European Heritage Label:**

The European Heritage Label, recognizing sites with European significance, is discussed. Criteria for declaring a region as a cultural landscape and transforming mines into cultural sites are explored.

The CoalHeritage project aims to not only preserve and protect coal mining heritage but also to promote tourism, regional development, and economic sustainability. Through a comprehensive and multidisciplinary approach, the project seeks to create a lasting impact on the cultural and economic landscape of the participating regions.

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6 PROJECT STRUCTURE AND MANAGEMENT

An interdisciplinary approach is needed to accomplish a synthesis or balance of multiple perspectives to achieve the objectives of COALHERITAGE. The methodological approach takes into consideration: the environmental and sustainable development dimension, the scientific and the socioeconomic dimension. This approach is transferred into 5 Work Packages, as follows:

Work package 1: Coordination

To ensure the successful execution of the project, the coordinator will play a pivotal role in overseeing and managing the activities of all project partners. The coordinator's responsibilities include:

1. Management and Oversight:
 - Take charge of coordinating the efforts of all project partners to ensure the project's objectives are met.
 - Monitor and evaluate progress regularly to ensure timely completion of tasks and milestones.
2. Communication and Collaboration:
 - Foster open and effective communication channels among project partners.
 - Encourage collaboration and information sharing to enhance the overall efficiency of the project.
3. Meeting Organization:
 - Organize and manage regular meetings to discuss project progress, challenges, and strategies.
 - Ensure the participation of project partners in progress meetings and internal report deliveries.
4. Timely Delivery:
 - Monitor and enforce timely delivery of reports and project deliverables by all partners.
 - Facilitate a proactive approach to address any potential delays.

WP1 activities are divided into 2 tasks as it is shown in the Table 2. WP Leader is CERTH and all partners are participating. During WP1, 2 deliverables will be performed and 2 milestones will be achieved. Details for the latter are mentioned in Chapter Deliverables and Milestones.

Table 2 WP1 Tasks and timeline.

| Work package | Work package title | Participants | 1 st year | | | | 2 nd year | | | |
|--------------|--|--|----------------------|------|-----|-----|----------------------|-----|-----|------|
| | | | I | II | III | IV | I | II | III | IV |
| WP1 | Coordination | CERTH KOMAG PV BRGM GIG DMT | MS1 | MS2 | | MS3 | | MS4 | | |
| Task 1.1 | Project management and evaluation of the results | | | D1.1 | | | | | | |
| Task 1.2 | Monitoring of project activities | | | | | | | | | D1.2 |

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Work package 2: Status quo of coal mining heritage in Europe

This work package aims to comprehensively understand the current state of coal mining heritage in Europe. Key activities include:

1. Transition Strategy Analysis:
 - Assess the transition strategies from coal mining in each country (Greece, Germany, France, Poland, and Slovenia) for each project partner.
 - Detail the actions taken, processes undergone, and present status of coal transition.
2. Legislative Considerations:
 - Investigate processes for declaring coal sites as national heritage areas, emphasizing legislative considerations.
 - Analyze ownership and legal processes related to facility transfer.
3. Heritage Value Assessment:
 - Evaluate the national heritage value of coal sites through social value assessments and SWOT analysis.
 - Develop questionnaires for stakeholder analysis to gauge awareness levels on industrial heritage.

WP2 activities are divided into 4 tasks as it is shown in the Table 3. WP Leader is GIG and all partners are participating. During WP2, 4 deliverables will be performed and 2 milestones will be achieved. Details for the latter are mentioned in Chapter Deliverables and Milestones.

Table 3 WP2 Tasks and timeline.

| Work package | Work package title | Participants | 1 st year | | | | 2 nd year | | | |
|--------------|--|--|----------------------|------|-----|----|----------------------|----|-----|----|
| | | | I | II | III | IV | I | II | III | IV |
| WP2 | Status quo of coal mining heritage in Europe | GIG CERTH KOMAG PV BRGM DMT | MS5 | | MS6 | | | | | |
| Task 2.1 | Identification of the transition strategy in each collaborate country and its status - transformation process analysis | | | D2.1 | | | | | | |

| | | | | | | | | | | |
|-----------------|--|--|--|--|-------------|-------------|--|--|--|--|
| Task 2.2 | Identification of the processes needed to declare the coal sites as national heritage areas | | | | D2.2 | | | | | |
| Task 2.3 | Experiences and insights from European countries that already declared mining regions as cultural/industrial heritage | | | | | D2.3 | | | | |
| Task 2.4 | Public perception of industrial heritage in coal regions | | | | | D2.4 | | | | |

Work package 3: Inventory of assets and management of sites

The objective of this work package is to create a standardized inventory of mine assets and define mechanisms for heritage site management. Key tasks include:

1. Data Standards Identification:
 - Identify international core data standards for immovable and movable assets.
 - Define categories of data essential for creating a clear and concise inventory.
2. Management Standards and Financial Support:
 - Establish standards and rules for the management of heritage sites.
 - Devise mechanisms for financial support for conservation work.

WP3 activities are divided into 2 tasks as it is shown in the Table 4. WP Leader is KOMAG and all partners are participating. During WP3, 2 deliverables will be performed and 1 milestone will be achieved. Details for the latter are mentioned in Chapter Deliverables and Milestones.

Table 4 WP3 Tasks and timeline.

| Work package | Work package title | Participants | 1 st year | | | | 2 nd year | | | |
|--------------|--|-------------------------------|----------------------|------------|-----|----|----------------------|----|-----|----|
| | | | I | II | III | IV | I | II | III | IV |
| WP3 | Inventory of assets and management of sites | KOMAG CERTH PV | | MS7 | | | | | | |

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| | | | | | | | | | | |
|-----------------|--|--------------------|--|--|------|--|------|--|--|--|
| Task 3.1 | Identification of the international core standards depending on type of assets (immovable, movable) and of the available data for the inventory | BRGM GIG DMT | | | D3.1 | | | | | |
| Task 3.2 | Definition of the standards, rules and other mechanisms for the management of the heritage sites | | | | | | D3.2 | | | |

Work package 4: Creating a European Visual Map Journal for coal heritage

This work package aims to integrate findings from WP2 and WP3 to develop a geodatabase and a European Visual Map Journal (EVMJ). Activities include:

- Geodatabase Development:
 - Integrate data from WP2 and WP3 to create a geodatabase for coal heritage sites.
 - Ensure the database is clear, standardized, and easily navigable.
- EVMJ Creation:
 - Utilize results from WP2 and WP3 to produce an interactive storytelling map through the CoalHeritage EVMJ.
 - Include narrative texts, spatial content, and multimedia presentations for effective communication.
- Database Maintenance:
 - Establish a plan for maintaining the database during and after the project for future reference.

WP4 activities are divided into 2 tasks as it is shown in the Table 5. WP Leader is CERTH and KOMAG, PV, GIG and DMT-THGA are the participant partners. During WP4, 2 deliverables will be performed and 3 milestones will be achieved. Details for the latter are mentioned in Chapter Deliverables and Milestones.

Table 5 WP4 Tasks and timeline.

| Work package | Work package title | Participants | 1 st year | | | | 2 nd year | | | |
|--------------|---|---------------------------------------|----------------------|----|-----|-----|----------------------|----|------|----|
| | | | I | II | III | IV | I | II | III | IV |
| WP4 | Creating a European Visual Map Journal for coal heritage | CERTH KOMAG PV GIG | | | | MS8 | MS9 | | MS10 | |

| | | | | | | | | | | |
|-----------------|---|------------|--|--|--|--|-------------|--|--|-------------|
| Task 4.1 | Development of a geodatabase for coal heritage sites | <i>DMT</i> | | | | | D4.1 | | | |
| Task 4.2 | CoalHeritage Visual Map Journal | | | | | | | | | D4.2 |

Work package 5: Development of a network for the promotion and protection of the mining heritage

This work package focuses on promoting project results and engaging stakeholders. Key activities include:

1. Promotion and Dissemination:
 - Conduct thematic presentations, workshops, and participate in conferences to raise awareness of mining heritage.
 - Showcase the immovable/movable assets' heritage values.
2. Interregional Network Establishment:
 - Develop an interregional network for the protection of coal mining heritage.
 - Collaborate with existing industrial heritage networks.
3. Results Exchange:
 - Exchange project results with policymakers on EU, national, and regional levels.
 - Facilitate collaboration and information sharing with other stakeholders.

WP5 activities are divided into 3 tasks as it is shown in the Table 6. WP Leader is PV and all partners are participating. During WP5, 3 deliverables will be performed and 2 milestones will be achieved. Details for the latter are mentioned in Chapter Deliverables and Milestones.

Table 6 WP5 Tasks and timeline.

| | | | | | | | | | | |
|-----------------|---|--|-------------|--|--|--|--|--|----------------------|-------------|
| WP5 | Development of a network for the promotion and protection of the mining heritage | <i>PV CERTH KOMAG BRGM GIG DMT</i> | | | | | | | MS11 MS12 | |
| Task 5.1 | Promote awareness on the heritage values of the immovable/movable assets of the areas | | D5.1 | | | | | | | |
| Task 5.2 | Engagement of stakeholders and development of an interregional network for the protection of coal mining | | | | | | | | | D5.2 |

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| | | | | | | | | | | |
|-----------------|--|--|--|--|--|--|--|--|--|-------------|
| | <i>heritage protection</i> | | | | | | | | | |
| <i>Task 5.3</i> | <i>Getting publicity and public attention to the mining heritage</i> | | | | | | | | | <i>D5.3</i> |

By systematically addressing each work package's goals and tasks, the project aims to comprehensively explore, document, and promote the rich mining heritage in Europe. The interconnection between all WPs is depicted in Figure 5.

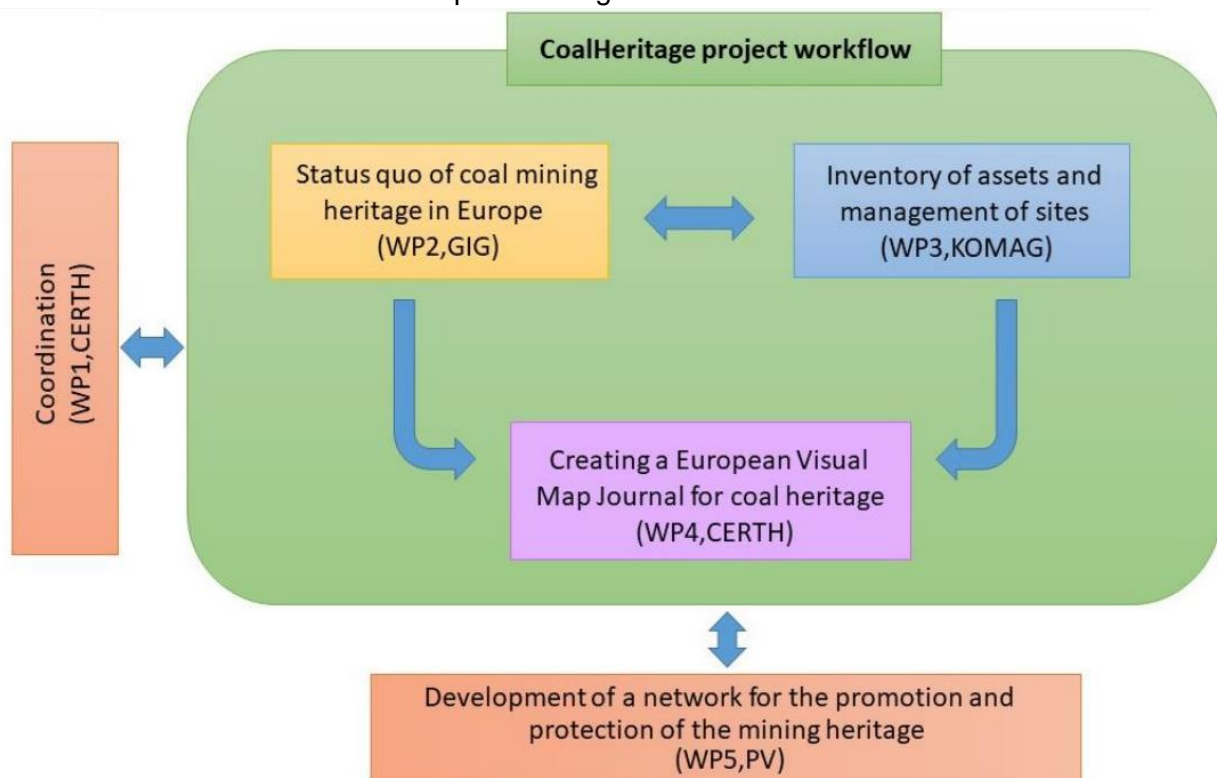


Figure 5 CoalHeritage workflow and interdependencies between the work packages.

7 DELIVERABLES AND MILESTONES

CoalHeritage has in total 13 deliverables that are dispersed throughout the project's duration. All deliverables are public, except Deliverable 3.1 Catalogue of the collected assets from the partners' country, which is sensitive. At Table 7 all the deliverables and the relevant responsible partners are mentioned. However, the coordinated contribution of all partners is required for their delivery. This fact reinforces the necessity of each participant partner to the project and guarantees its smooth progress.

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Table 7 The 13 deliverables of CoalHeritage and their timeline.

| Deliverable | Title | WP | Leader | Type Level | Due Date |
|-------------|--|----|--------|-------------------|----------|
| D1.1 | Comprehensive overview of the project | 1 | CERTH | R - PU | 6 |
| D1.2 | Public Publishable Report | 1 | CERTH | R - PU | 24 |
| D2.1 | Report on the coal transition strategy of the European countries | 2 | GIG | R - PU | 6 |
| D2.2 | Description of the processes for the identification of the coal sites as national heritage areas | 2 | BRGM | R - PU | 9 |
| D2.3 | Report on the questionnaires and first results on the public perception | 2 | DMT | R - PU | 12 |
| D2.4 | Successful stories of transforming coal mining sites and areas into industrial heritage objects | 2 | KOMAG | R - PU | 12 |
| D3.1 | Catalogue of the collected assets from the partners' country | 3 | KOMAG | R - SEN | 9 |
| D3.2 | Report on the standards and mechanisms for the management of the heritage sites | 3 | CERTH | R - PU | 15 |
| D4.1 | Coal heritage geodatabase | 4 | CERTH | R, DATA - PU | 15 |
| D4.2 | Visual Map Journal based on geospatial and attribute data | 4 | CERTH | R, DEC, DATA - PU | 24 |
| D5.1 | Dissemination, Communication and Exploitation plan | 5 | CERTH | DMP - PU | 3 |
| D5.2 | Report on awareness raising and promotion of the heritage values carried within the project | 5 | KOMAG | R - PU | 24 |
| D5.3 | Report on the stakeholder engagement | 5 | GIG | R - PU | 24 |

Along with the deliverables, 12 milestones will be performed that will define the successful implementation of the project. These milestones are also dispersed during the entire duration of CoalHeritage and their timeline is depicted in Table 8.

Deliverable 1.1 Comprehensive Overview of the Project

Table 8 The 12 milestones of CoalHeritage and their timeline.

| No | Title | WP | Leader | Means of verification | Due Date |
|---------|--|----|--------|---|-----------|
| 1 | Kick-off meeting | 1 | CERTH | Minutes of the meeting | 1 |
| 2, 3, 4 | Quality check and progress monitoring | 1 | CERTH | Minutes of web-meetings | 6, 12, 18 |
| 5 | Identification of the stakeholders | 2 | CERTH | Internal workshop | 3 |
| 6 | Draft of the questionnaires | 2 | DMT | Workshop with stakeholders | 8 |
| 7 | Internal workshop to determine the categories for the inventory | 3 | KOMAG | Minutes of the meeting | 6 |
| 8 | Define and discuss the collected and homogenised geospatial data for the web application | 4 | CERTH | Minutes of the internal meetings, results of questionnaires | 10 |
| 9 | Analyse and discuss the development of the EVMJ for the selected coal mines | 4 | CERTH | Minutes of the internal meetings | 15 |
| 10 | Define and create the ideal of micro-adventure | 4 | CERTH | Minutes of the internal meetings | 20 |
| 11 | Articles, promotion materials (multimedia, presentations etc) | 5 | KOMAG | Open access articles | 20 |
| 12 | Open event at GIG's Experimental Mine Barbara | 5 | GIG | Minutes of the event/ Film documenting the event | 20 |

8 STUDY AREA DESCRIPTION

CoalHeritage is dedicated to addressing coal regions in transition within the European Union and other areas that have either already ceased coal exploitation or are near mine closure. These regions, deeply interconnected with the coal mining sector, are the most affected by the transition, as they relied on fossil fuels and carbon-intensive processes for their economic viability for a very long time.

Through this project and its innovative approach to repurposing and protecting former coal mines, a novel concept will be introduced to benefit the local citizens and mine workers, who are among the most vulnerable groups affected by the ongoing transition. The initiative will facilitate access to re-skilling programs and job opportunities in emerging economic sectors, such as tourism.

The CoalHeritage study areas for the EVMJ will be chosen from an original set of 53 candidate coal regions/sites, from each partner country, using a specific set of criteria as there will be defined in WP2. Table 9 lists the number of regions/coal sites that will be considered from each country:

Table 9 Number of CoalHeritage Candidate sites per country

| Country | No. of candidate coal regions/sites for consideration |
|----------|---|
| Greece | 5 |
| Poland | 22 |
| Germany | 21 |
| Slovenia | 2 |
| France | 3 |

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A description of each country's candidate sites follows in the next subchapters.

8.1 Greece - Western Macedonia

The candidate sites for Greece will be derived from Western Macedonia region. Western Macedonia region has served as Greece's primary energy hub for many years and has played a pivotal role in the country's energy landscape since 2019 when a government mandate led to the closure of numerous lignite-powered plants by 2028. Western Macedonia holds significant importance and necessitates the implementation of a just transition plan aimed at restructuring its industrial base. Such a plan is essential to mitigate the potential social and economic repercussions and to facilitate the attraction of fresh investments, particularly in the realm of Renewable Energy Sources (RES).

With a unique blend of industrial and agricultural activities, Western Macedonia's prominence traces back to the 1960s when abundant lignite deposits in Kozani and Florina fueled power generation. This strategically valuable energy source is concentrated in the region, covering 9471 km² with 283,689 residents (Fortsakis et al., 2016). Unlike other Greek regions, Western Macedonia lacks a coastal border but shares land boundaries with two neighboring Balkan countries. Its predominantly mountainous terrain holds a significant share of national surface water resources, renowned for high-quality agricultural products and unique ecosystems (Tranoulidis et al., 2022).

The shift away from lignite-based activities is poised to impact employment significantly. Around 5,000 individuals are employed directly or indirectly by the Public Power Corporation (PPC) in lignite-related roles. Notably, Western Macedonia experienced an 8.8% decline in Gross Value Added between 2018 and 2019, in stark contrast to the national average growth of +2% (Hellenistic Statistical Authority, 2022).

The National Plan for Energy and Climate outlines Greece's ambition for complete decarbonization by 2028. Aligned with the European Strategy for Climate Neutrality, as articulated in "The European Green Deal", the plan emphasizes phasing out greenhouse gas emissions by 2050. This strategic roadmap not only ensures the stability of Greece's power generation system but also aligns with broader European efforts to enhance energy security and combat climate change (European Commission, 2019).

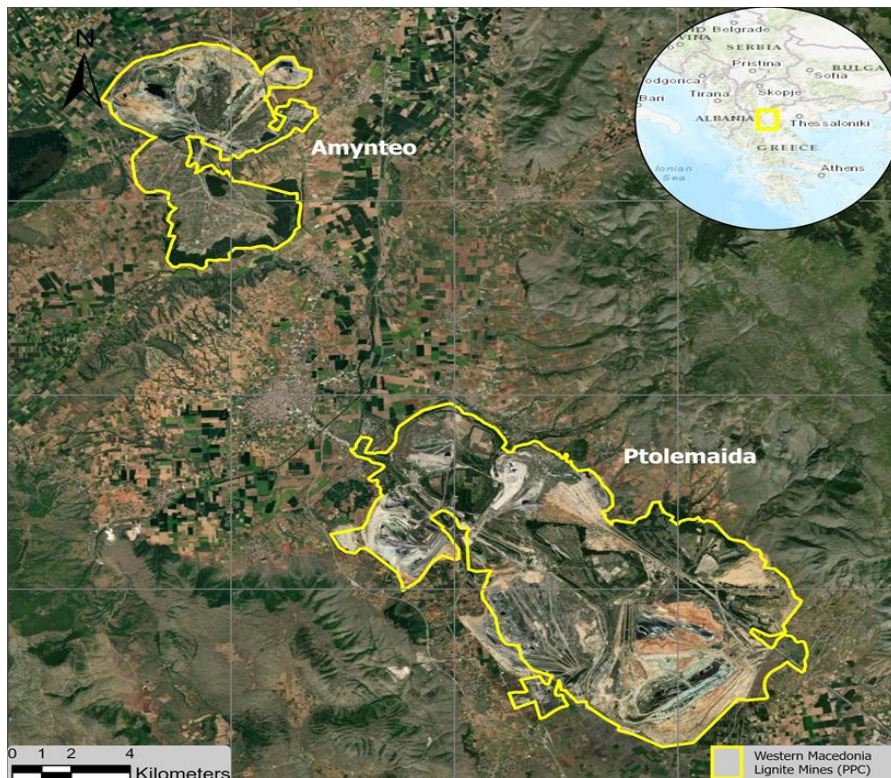


Figure 6 Satellite view of the western Macedonia Lignite Centre, with the red curves indicating the two mining areas: Amynteo (NW) and Ptolemaida (SE) (Esri, FAO, NOAA, USGS, Earthstar Geographics, USGS)

8.2 Poland- Konin Area

Defining mining heritage areas in Poland can begin by considering various aspects of mining, history and culture of the region. Below is a defined list of mining heritage areas with examples that are candidates for inclusion in the CoalHeritage project:

1. **Historic mines:** This group includes mines with underground tours in which both the history of mining and the technologies used in coal mines are shown. Currently, underground tourist routes in coal mines are made available in the following places:

Candidate 1. - GUIDO Coal Mine in Zabrze



Figure 7: GUIDO Coal Mine in Zabrze (URL14)

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Candidate 2 – Queen Louise Adit in Zabrze



Figure 8: Queen Louise Adit in Zabrze (URL15)

Candidate 3 - Former Nowa Ruda Mine



Figure 9: Former Nowa Ruda Mine (URL16)

Candidate 4 - “Former Mine” Science and Art Centre in Wałbrzych



Figure 10: “Former Mine” Science and Art Centre in Wałbrzych (URL17)

Candidate 5 - Training Mine of the Sztygarka City Museum in Dąbrowa Górnicza



Figure 11: Training Mine of the Sztygarka City Museum in Dąbrowa Górnicza ([URL18](#))

2. **Mining settlements:** Sites depicting urban layouts related to the life of mining-related communities.

Candidate 6 - Nikiszowiec (Katowice): Unique mining estate with distinctive architecture



Figure 12: Nikiszowiec in Katowice, a Unique mining estate ([URL19](#))

Candidate 7 - Giszowiec (Katowice): Another estate with a unique character, designed for industrial workers



Figure 13: Giszowiec (Katowice): Another estate with a unique character ([URL20](#))

Candidate 8 – Ruda Śląska Ficus Workers' Colony is a historic workers' settlement on Kubina Street in Ruda Śląska - Wirek.



Figure 14: Ruda Śląska Ficus Workers' Colony ([URL21](#))

It was built between 1860 and 1867 for the workers of the Gottessegen mine. The colony consists of 16 buildings, each of which had four flats - with a vestibule, a kitchen and a small room. Ficus had the character of a rural-industrial colony.

3. **Museums and educational sites:** Embrace mining museums, exhibitions and educational sites that maintain and exhibit mining heritage.

Candidate 9 - Coal Mining Museum in Zabrze; known for its rich collection of exhibits related to the history of coal mining



Figure 15: Coal Mining Museum in Zabrze (URL22)

Candidate 10 - Bytom City Museum



Figure 16: Bytom City Museum (URL23)

Candidate 11 – Mining Memorial Chamber of the Rydułtowy Coal Mine



Figure 17: Mining Memorial Chamber of the Rydułtowy Coal Mine (URL24)

Candidate 12 - Chamber of Mining Memory of Chwałowice Coal Mine



Figure 18: Chamber of Mining Memory of Chwałowice Coal Mine (URL25)

Candidate 13 – Mining Memorial Chamber of the Marcel Coal Mine



Figure 19: Mining Memorial Chamber of the Marcel Coal Mine (URL26)

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Candidate 14 - Mining Tradition Chamber in Knurów Coal Mine



Figure 20: Mining Tradition Chamber in Knurów Coal Mine (URL27)

Candidate 15 - Silesian Center for Freedom and Solidarity - Museum Chamber of Memory of the "Wujek" Mine.



Figure 21: Silesian Center for Freedom and Solidarity - Museum Chamber of Memory of the "Wujek" Mine (URL28)

4. **Industrial Monuments:** Publicly accessible places where you can see industrial relics related to mining, such as mining machinery,

Candidate 16 – square in front of the Guido mine in Zabrze, where several interesting old mining machines, including a locomotive powered by compressed air are presented



Figure 22: Square in front of the Guido mine in Zabrze (Szewerda, K. (2023), private collection of K. Szewerda)

Candidate 17 – square in front of the Queen Louise adit - which showcases some interesting old mining machines, including a cutting machine



Figure 23: Square in front of the Queen Louise adit (Szewerda, K. (2023), private collection of K. Szewerda)

Candidate 18 – Open-air museum of steam machinery in Tarnowskie Góry, which presents, among other things, 3 steam hoisting machines used in coal mines



Figure 24: Open-air museum of steam machinery in Tarnowskie Góry (Szewerda, K. (2023), private collection of Kamil Szewerda)

Candidate 19 – Mini open-air mining museum in Radzionków



Figure 25: Mini open-air mining museum in Radzionków (URL29)

5. Old mining shafts/ adapter as placed for cultural events:

Candidate 20 - Maciej Shaft in Zabrze



Figure 26: Maciej Shaft in Zabrze (URL30)

Candidate 21 - Wilson Shaft in Katowice



Figure 27: Wilson Shaft in Katowice (URL31)

Candidate 22 - President shaft in Chorzów - Sztygarka Complex



Figure 28: President shaft in Chorzów - Szttygarka Complex (URL32)

Candidate 23 - Towers of KWK Polska mine in Świętochłowice

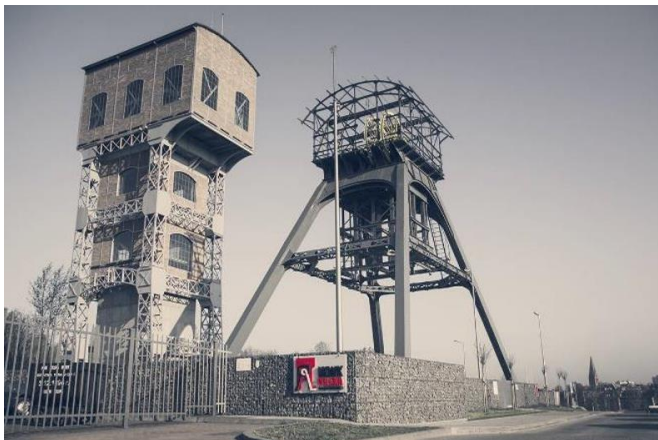


Figure 29: Towers of KWK Polska mine in Świętochłowice (URL33)

8.3 Slovenia

SAŠA region Area

The area of influence in the SAŠA coal region consists of ten municipalities from the Upper Savinja and Šaleška valley. To clearly understand the current situation and the area, which will be exposed to the greatest socio-economic pressures and environmental challenges in the next steps of the transition, a clear distinction is needed between the narrower and the wider area of influence. The data on environmental impacts, employment structure and indirect connection of

economic entities (businesses) with coal mining and energy, show that the narrower area of influence is formed by three municipalities. Those are from the so-called Šaleška Valley, which includes Velenje, Šoštanj, and Šmartno ob Paki.

When it comes to environmental impacts of the coal industry, coal mining significantly changed and is still changing the region's surface, which resulted in three artificial lakes and the loss of a significant proportion of the region's flat land, suitable for housing and farming. This so-called extraction area is in the municipalities of Velenje (48.3 %) and Šoštanj (51.7 %) with a total size of 1104 hectares. Considering the actual situation on the ground, future impacts on the surface and its degradation are planned especially in the Municipality of Šoštanj or northern and north-eastern shores of Lake Družmirje.

The embankment between Lake Velenje and Družmirsko Lake plays an important role in ensuring flood safety in the valley against the negative effects of coal mining in the Šaleška valley. The dam is bounded on the west by Družmirsko Lake, which is still exposed to sinking, so its final image is still in the making. The embankment prevents the lakes from merging in the future, but the dam area is not stable. Despite the constant remediation and elimination of the consequences of subsidence, subsidence and displacement of the barrier occur, posing a potential flood risk.

Given the strong coal-dependency of the local socio-economic environment, thoughtful transition steps need to be taken while being comprehensively aligned with both local and national contexts.

When it comes to environmental challenges, operations that are addressing surface remediation, decommissioning of coal-related infrastructure, and repurposing of coal-related infrastructure should be addressed as early in the process as possible. This will provide new investment opportunities and can be recognized not only as a foundation for a future quality living environment but also for the economic and social transition of the region. Repurposed facilities will provide conditions where new social programs could take place, offering employees in the coal-mining industry and other region's residents re-skilling, training, and other career-related services. On the other hand, with a highly skilled labour force available, new investment areas and incentives for economic development in place, the region will be able to attract important greenfield and brownfield investments. In addition, the region's energy transition should also be addressed at this point of time, namely through initial efforts related to the sustainable transition of district heating system (from fossil to renewable generation) and R&D activities related to e-mobility and alternative sources of energy.

The biggest challenge will be the management of redundant workers, many of which will still have to pursue their careers and work in other sectors.

Strategies of transition include preparation of a vision for the revitalization of coal-related heritage. These includes tearing down abandoned coal-related infrastructure, restoration, and revitalization of industrial heritage, conducting landscaping and civil engineering activities around such premises and providing sufficient municipal infrastructure for further economic repurposing of the location. Repurposing of buildings on degraded areas also includes equipping such buildings for their educational, social, economic, and R&D purposes aligned with the energy-efficient and circular economy principles.

Now there are multiple locations within the region where decommissioning and repurposing of abandoned coal-related infrastructure needs to take place before further socio-economic development can be pursued. Repurposing of such locations can be recognized as an important foundation for the region's further participation in the just transition process since transition project

ideas for many locations are already developed (Ministry for environment, climate and energy, 2021). These locations include:

- Old power-plant (Velenje)
- Cooling tower of Block 4 (Šoštanj)
- Klasirnica Pesje – coal processing and transport facility (Velenje)
- Location of Blok 1-3 and 4 (Šoštanj)

The Velenje Coal Mine, in Slovenia is a technologically advanced company with lignite mining as its primary activity. With an almost 150-year tradition in lignite mining, the company plays an integral role in Slovenia's energy landscape. The company operates in accordance with the principles of sustainable development, in accordance with the quality management system, the environmental management system the Asset management system and the occupational health and safety system. Today, in conjunction with its affiliated companies, the Velenje Coal Mine, together with the affiliated companies HTZ, Sipoteh, PLP employs a workforce of ca. 2000 qualified staff. PV is also a prominent research institution and is working very closely with various universities and research organizations. The company has actively participated in numerous research initiatives funded by the European Union.



Figure 30: Lignite seam in Saleska valley (Internal PV material).

The mine has extracted more than 263 million tonnes of lignite, while today around 2.4 Mt/year are extracted. The Velenje mining method is an internationally protected patent or brand and is proven to be the most productive method for excavating thick layers of coal. Particularly, in 2007, Velenje Coal Mine received an award for innovation from the Chamber of Engineers of Slovenia.

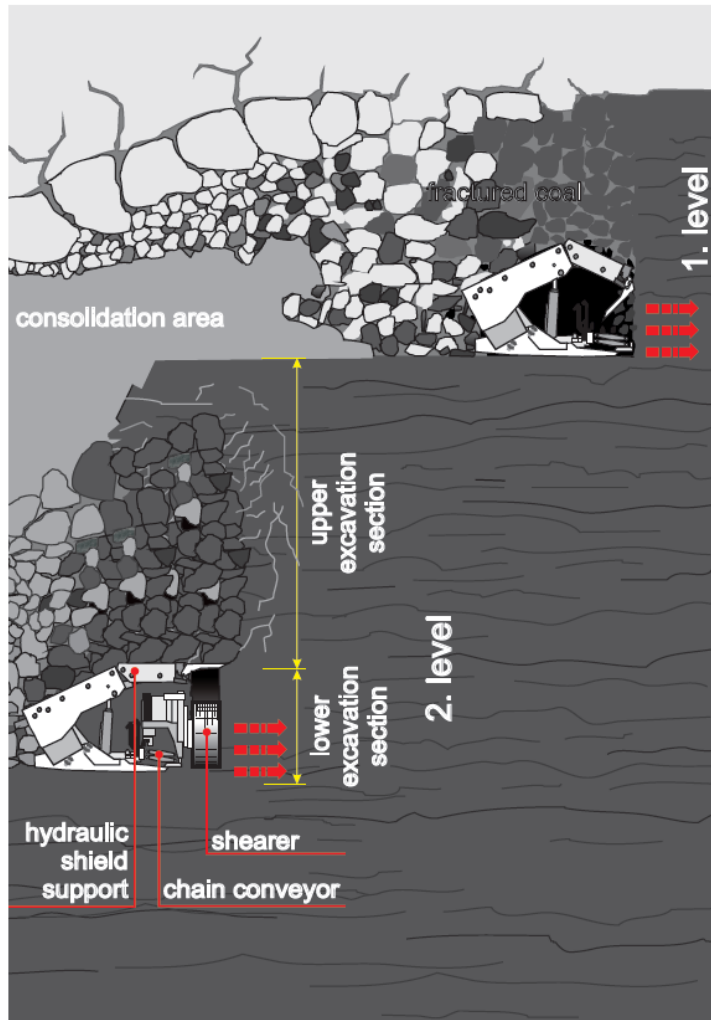


Figure 31: The innovative Velenje Mining Method. (Vrankar, L., 2019)

ZASAVJE REGION

The exit from coal has started in 1999 when referendum results did not support the construction of the third unit of Trbovlje Thermal Power Plant (hereafter: TET). As the business logic of the near-by Trbovlje-Hrastnik coal mine (hereafter: RTH) was closely connected with TET, the decision to close the mine was made. At the request of the Government of the Republic of Slovenia, the leadership of RTH published a study, which estimated the costs of closing the RTH by the end of 2015. The assessment was based on the conceptual designs of existing methods of mine closing and ecological and spatial remediation of the surface. In 2000, the Act of Regulating Gradual Closure of Trbovlje-Hrastnik Mine and Economic Restructuring of the Region was adopted (and later amended). In 2005, the closure works started and in 2013, the mining activities stopped. Shortly after, the TET closed as well.

In 2020, all necessary closure and rehabilitation works were carried out. Due to a larger than foreseen scope of works and costs in the medium-term program, some less-necessary closure and rehabilitation works have remained - mainly in the field of infrastructure renovation. The strong coal mining industry transformed the region from a rural area to an industrial area. In

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addition to coal mining, other industries developed (including glass, zinc, ceramic, chemical and bricks). Currently, the glass industry is still largely present in the region. In the transition from coal, the socio-economic transition on the regional level was not finished.

One of the objectives is also revitalization of the coal-related technical heritage. This could include tearing down abandoned coal-related infrastructure, restoration, and revitalization of industrial heritage, conducting landscaping and civil engineering activities around such premises and providing sufficient municipal infrastructure for further economic repurposing of the location. Repurposing of buildings in degraded areas also includes equipping such buildings for their economical and R&D purposes aligned with the energy-efficient and circular economy principles (Ministry for environment, climate and energy, 2021). Specifically, two proposed areas for such activities will be:

- Location of Trbovlje Thermal Power plant
- Location of “coal mine”

For e.g. technology parks, business parks, recreation ...



Figure 32: TET Power Plant. (URL34)



Figure 33: Rudnik RTH (Coal Mine Trbovlje-Hrastnik) (URL 35)

8.4 France

Coal mining regions in France are mainly located in the north and east of the country. The best-known regions, where the three chosen sites are located, are Nord-Pas-de-Calais, Lorraine and Auvergne-Rhône-Alpes. For decades, coal has played a crucial role in the economy of these regions, providing employment for many people and contributing to local economic development. The reconversion of coal mining regions has become a necessity to ensure their economic survival and the maintenance of the quality of life of their inhabitants. 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.

The region of Nord-Pas-de-Calais has successfully reconverted itself thanks to significant investments, particularly in renewable energies. Wind farms have been built on former mining sites, which has created new jobs in the clean energy sector. Regarding coal heritage, many sites (including the Lewarde Mining History Center, one of the three selected site) have been preserved and classified as historical monuments with its listing in 2012 as a UNESCO World Heritage site under the category of "evolving and living cultural landscape".

In Lorraine, the former Moselle coal basin has been transformed into a technological park specializing in high-tech industries and innovation. Technological companies have established themselves on this former mining site, thus creating numerous jobs in fields such as robotics, biotechnology, and advanced materials. A policy to preserve mining heritage has also developed in Lorraine, where several headframes have been preserved and, most notably, the Wendel Mine Site (Petite Rosselle, one of the selected sites) has been classified as a historical monument. Converted into a mining museum, 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. This project, called the "Development Park of the Rosselle

Valley," aims to rehabilitate, enhance, and convert the mining and industrial heritage of the Saar-Lor-Lux coal basin. It also aims to promote the establishment of new economic activities, particularly within the framework of the first cross-border technopole between France and Germany, where PeMtech, the first high-tech company, established itself in 2003.

In coal's heyday in this part of Burgundy, there were 200 collieries employing over 13,200 men around Blanzey and Montceau-les-Mines in Burgundy. Exploited since the Middle Ages, but industrially exploited from the 19th century onwards, until 1992 for underground mining and 2000 for open-cast mining, the coalfields enabled the development of the region's iron and steel industry. Some mining sites have been rehabilitated and transformed into tourist attractions, offering visitors the opportunity to discover the history and mining culture of the region. This is for instance the case of the Blanzey-Le Creusot area, one of the three French selected sites.

8.5 Germany

The coal and industrial heritage of Germany is closely tied to the economic and social development of each of its regions, particularly in the post-World War II era. The industrialization of West Germany, especially in the Ruhr region, played a critical role in the country's recovery and emergence as an economic powerhouse. The Ruhr region, located in North Rhine-Westphalia, was the heart of West Germany's coal mining industry. This area housed numerous coal mines and steel mills, contributing substantially to the country's industrial output. While coal played a crucial role in West Germany's industrialization and economic recovery, the country underwent a transition toward cleaner energy sources in the later decades. This transition was driven by environmental concerns, and policies were implemented to reduce dependence on coal in favor of renewable energy.

The transformation process already started in the late 1950s, with first coal mine closures. At the peak of the mining activities, the coal mining companies in this area employed more than 500.000 people in numerous coal mines. Due to the substitution of coal by other fossil fuels like oil and gas and nuclear power, the number of mines decreased with an accompanying reduction of mine workers. For example, until 1963 already, 33 coal mines were closed with an annual total output of 10 million tons. In 2008, the German government announced the planned phase-out of hard coal mining by 2018. The last hard coal mine in the Saar Region was closed in 2012, and then the last two remaining hard coal mines in Northrhine-Westphalia, Prosper-Haniel in Bottrop (Ruhr Area) and Ibbenbüren (Osnabrück Region), at the end of 2018, as shown in Figure 34.

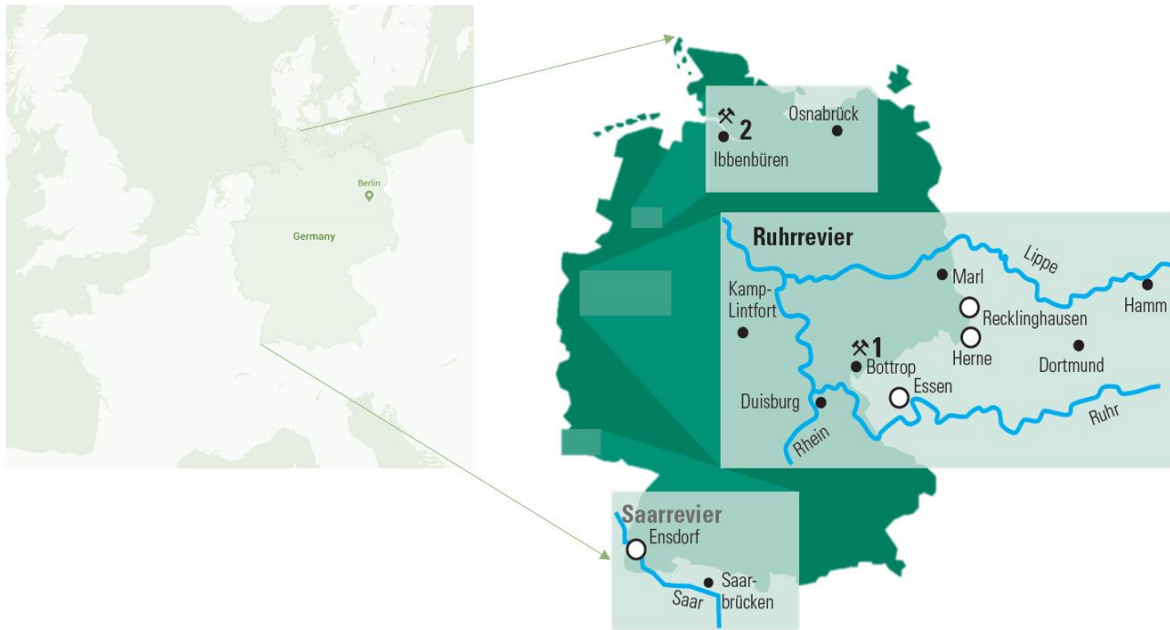


Figure 34: Location of hard coal mines in Germany (GvSt, 2017).

This decision enabled the coal mining regions in Germany, the Saar and the Ruhr area to be prepared for the post coal mining era within this period of 10 years. In the metropolitan Ruhr area, the challenge was and continues to be, the successful transformation of the former mining region. So, the cities and districts in the Ruhr area joined forces to cooperate and to initiate an intercommunal decision making and dialogue process.

The first step in this transformation journey involved the development of a strategic vision for the region's next decade. Building upon past urban development policies, the so called "concept Ruhr" took up the future challenges and turned into operation in regional development concepts and master plans. These concepts and plans, in turn, served as the base for applying and receiving EU regional development funding. A key component of the "concept Ruhr" was the "site precaution" in the context of the coal reduction, allowing for the early assessment and mitigation of the potential adverse regional impacts arising from mine closures. This approach considered both immediate and long-term closures, including a total of 15 mine sites throughout the region, indicating a real opportunity in this ten years lasting anticipation process.

The second step in this transformation process was to assess the joint implementation of the medium and long-term concepts in more than 40 cities and communities in the Ruhr area. The primary goal was first to secure the areas affected by mining operations, and afterwards to foster their sustainable development. The focus is on coordinated research and technology valorization efforts. The regional association Ruhr RVR (consisting of Ruhr cities), the Ministry of Economics NRW and the coal mining company RAG and its subsidiary RAG Montan Immobilien (the Real Estate company) are the leading stakeholders of this transformation process.

9 BEST PRACTICES

Examining successful transformations of mining regions into industrial heritage sites will provide CoalHeritage with valuable insights and best practices. These findings will be instrumental in developing effective management plans to address unemployment challenges. As agreed between the partners, the countries that do not have yet an exemplary case, they will take ideas from museums of different mining activities. All the appropriate sites that could be used as an example of good practice in coal mine heritage will be defined under the progress of WP2 and WP3. At first stage, each partner demonstrated the most notable examples of mining/industrial heritage from their countries.

9.1 Greece

Greece has not yet any mining heritage site concerning coal mining. However, there is the case of Fokis bauxite mines – Vagoneto Fokis Mining Park, which can function as an exemplary case.

The bauxite mines of Fokis sprawl across the terrain nestled between the Ghiona, Parnassos, and Oiti mountains in central Greece. Commencing in 1924, the initial exploration activities paved the way for the characterization of the discovered material as bauxite, specifically karstic bauxite, in 1927. The inception of bauxite mining in the region took shape in 1933-4 with the establishment of the first mining company, "Bauxites Parnasse S.A." By 1935, the company initiated the sale of bauxite, initially to the French company Lafarge for aluminous cement production and subsequently to other countries. Production soared to 180,000 tons annually by 1938, prompting the construction of a new 15 km aerial transportation system linking the mines to the port of Itea. During the German occupation in 1941, the mines changed hands to Hansa Leichtmetall Aktien Gesellschaft. Bauxites Parnasse S.A. reclaimed ownership in 1950, and the Greek state leased the mines in 1952. In the 1960s, bauxite supply shifted to the new Aluminium de Grèce (Pechiney) plant, relocating the mining center from Topolia to the 51st km of the Lamia-Amfissa National Road, where it stands today (URL36).



Figure 35 : Vagoneto Fokis Mining Park (URL36)

The Vagoneto Fokis Mining Park, a distinctive theme park in Greece, is situated within the Ghiona mountain on the grounds of Imerys Bauxites S.A. The focal point of the park is Gallery 850, situated at an elevation of 850 m, which commenced operations in 1967 and ceased in 1972. S&B Industrial Minerals S.A. initiated the construction of the museum at the company's premises in 1998, and the park has been operational since September 2003. The park aims not only to showcase the operational facets of a mine but also to inform, entertain, and educate new generations about the history of bauxite exploitation and the individuals who contributed to it. It pays homage to and promotes the mining history of Fokis. The Vagonetto tour provides visitors with a step-by-step insight into the bauxite mining process. The exploration of bauxite history begins in an old underground gallery, Gallery 850, where visitors board the actual train used by miners. The journey continues with a tour of the Mining History Exhibition Area and concludes with a visit to the Digital Technology Wing (URL36).

9.2 Poland

Poland has already two exemplary sites concerning coal mining, Zabrze - an industrial city in Silesia with spectacular mining heritage (Guido Mine, Queen Louise Adit, Water Tower and Maciej Shaft) and the Experimental Mine 'Barbara' in Mikołów. The first one has more characteristics as a museum, while the second one has found a repurpose for scientific reasons.

The Guido mine

The Guido mine, also known as Zabytkowa Kopalnia Węgla Kamiennego, stands as a significant historic coal mine and museum in Zabrze, Silesia, Poland. Designated as an Anchor point on the European Route of Industrial Heritage, this site holds cultural heritage status in the registry of the Silesian Voivodeship (A/1342/87 dated 1987-02-26) and is recognized as a cultural monument in Poland (ID 641754).

Established in 1855 by Guido Henckel von Donnersmarck, the Guido mine initially supplied coal for the Donnersmarck mills. In its prime, it achieved maximum production in 1885, extracting 312,976 tonnes of coal. Transitioning over the years, the mine continued operations even after coal depletion, focusing on water extraction from adjacent mines. By the 1930s, its functionality declined, leading to its closure in 1960. In 1967, it reopened as a test mine for colliery machines, receiving listed status in 1987.

Facing technical challenges such as sand and the Saara tectonic fault, the early mine encountered setbacks, including the abandonment of the Barbara shaft at 30m. The Concordia shaft, later renamed the Guido shaft, faced difficulties at 80m due to faulting, with water encountered at 117m. Financial support from the Upper Silesian Railway Association aided in Guido's drainage, and a new shaft, the Railway shaft, was dug for exploitation at the 170m level.

Mergers and expansions marked Guido's history, including its integration with the Queen Louisa Mine in 1887 and later merging with the newly built Delbrück mine and coking plant in 1912. The complex ownership continued through various partitions and transfers, with the Guido shaft closing in 1928, and the Railway shaft repurposed for crew and material transport.

Today Zabytkowa Kopalnia Węgla Kamiennego it composed of two former mines, Guido and Queen Louise. They have been converted to underground museums join with the underground water route.

Guido Coal Mine hosts exhibitions about historic and modern mining technology and practice. Guido Coal Mine offers sightseeing of two excellently preserved mining levels are waiting for you 170 and 320 metres below the ground. The oldest available regions at the 170 level tells about the toil of work from the beginning of the 20th century which was the time of mechanization,

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technological progress but also the cult of St. Barbara in Silesian coal mining. St. Barbara's chapel also the main point of this level. It catches attention thanks to the architectural qualities: raw brick, steel constructions and industrial climate are mixed with monumentality which is well-known from neo-gothic brick churches so often appearing in Silesia. The biggest attractions of the 320 level are the large scale mining machines presented in operation and the ride in suspended electric rail. The experience at 320 level is mostly connected with exploring the development of mining technology from the end of the 19th century up to modern times. A part of the route at 320 level is covered with suspended electric rail. It is the only rail of this type in the world that has been made available for the tourists. The tour of Guido Coal Mine ends in the deepest located pub in Europe, in the Pump Hall. It offers specialty of the house, "Guido" beer and Silesian kitchen (URL37).



Figure 36 : Guido Coal Mine, Zabrze (URL37)

Queen Louise Adit (Sztolnia Królowa Luiza)

The Queen Louise Mine sightseeing starts off at ground level where tourists find chunky pieces of machinery, pistons, dials, pipes, photo displays and other industrial detritus clustered around the old 'Karnall' shaft. The underground sections are split into three levels for visitors, the first of which is a boat trip along an underground river spanning 1130m, while a guide explains the history and culture of the mine. The 2nd level 40m below ground shown the technologies used for mining over the last 200 years, right up to the huge machinery of the 21st century. The third level is family orientated, specifically for kids, with multimedia elements teaching the history of the mine and the people who worked there. The Museum also offers a unique space for rent, 320 meters underground, for conference and cultural events.

One of the most unique offers is the Water Route in Queen Louise Adit, hidden under the streets of the Zabrze city. A fragment of underground excavations are on foot here, and 1,100 meters is a unique, underground rafting by boat, meeting the legendary Treasurer or Utopka of Upper Silesia. There are also underground ports, passing places, sounds of dripping water and unique chiaroscuro prevailing in the entire underground. This trip has been awarded by the European Commission with the European Heritage Award/Europa Nostra Award 2019 and with the Tourist Facility of the year 2019 by Polish Chamber of Tourism (URL38).



Figure 37 : Water Route in Queen Louise Adit, Zabrze (URL38)

Water tower

Built in 1909, the water tower in Zabrze is no ordinary structure, combining a technical building with residential and office space. As a result of the revitalization works, the tower became a facility for social, educational, scientific and cultural activities. In 2022, an interactive exhibition was opened here. CARBONEUM – the coal knowledge centre is a modern exhibition that combines the functions of a science centre and a classic educational exhibition.

Maciej Shaft /Zabrze

Maciej Shaft (Szyb Maciej) the part of the former Concordia Coal Mine, is the most modern of Zabrze's industrial heritage sites. It gives an untouched air of authenticity with a possibility to taste the local cuisine in restaurant, which is placed in the Silesian Tastes Gastronomic Route and relax during summer chillout weekends (URL39, URL40).



Figure 38 : Carboneum exhibition, Zabrze (URL39)

The primary sights are the hoist tower with the original twin-drum hoisting machine by Siemens-Schuckertwerke which visitors have the opportunity to steer themselves.



Figure 39 : Maciej Shaft, Zabrze (URL40)

The Experimental Mine 'Barbara'

The Experimental Mine 'Barbara' in Mikołów used to operate as an ordinary coal mine but after the WW II it has become the only research and scientific post in Poland with an experimental range for testing devices, equipment, materials and procedures in real-scale underground conditions.

It was founded in 1925 and its main functions were to be the Central Office of Mining Rescue and the Magnetic Observatory. In 1945 became a part of Central Mining Institute. The underground workings were then modernized and adapted to conduct the research in the field of new mining solutions. At present the underground infrastructure enables numerous types of innovative research and projects, especially orientated on effectiveness and safety in mining as well as on environmental protection.

Nowadays the network of underground experimental galleries is a world class test stand for a real- scale testing. In these workings, large explosions of dusts and gases are carried out. Modern equipment, experienced personnel and the facility itself, all of these conditions create a unique test site and can be used as a base for research work in all aspects related to safety in construction works, industrial buildings (factories, warehouses, etc.), as well as in public transport (subway, tunnels) and many others.

Distinguished as the sole research and scientific outpost in Poland and Europe, the Experimental Mine "Barbara" boasts a unique experimental range. This facilitates real underground testing of devices, equipment, materials, and procedures, contributing significantly to safety advancements in mining and various industries. Main topics, of great importance to the global ecology and economics, dealt at the EM 'Barbara' recently, are ventilation air methane reduction from the ventilation shafts, carbon dioxide sequestration and enhanced coalbed methane recovery in the coal seams, research in the field of radioactivity hazards, underground coal gasification and cybersecurity and data center.

The Experimental Mine 'Barbara' is a remarkable testing site in Poland with access not only to experimental testing facilities on the surface but also specialised equipment, materials and procedures to conduct research in large scale underground conditions. The underground workings are located on two levels: 30 m and 46 m. The system of experimental headings includes

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several mining excavations, out of which the most important are the two underground experimental galleries of 400 m and 200 m.

Extensive net of experimental workings makes it possible to conduct tests in multiple configurations: chambers, niches, intersections as well as underground galleries with openings to the surface. In the galleries of EM 'Barbara' very strong dust explosions have already been generated, including detonations of a dust-air mixture. These experiments are probably the first and so far the only examples of detonation of the dust-air mixture in large scale. Moreover, research on methane explosions and burnings took place at EM 'Barbara' with some great results (URL41).



Figure 40 : The EM 'Barbara' yesterday and today (URL41).

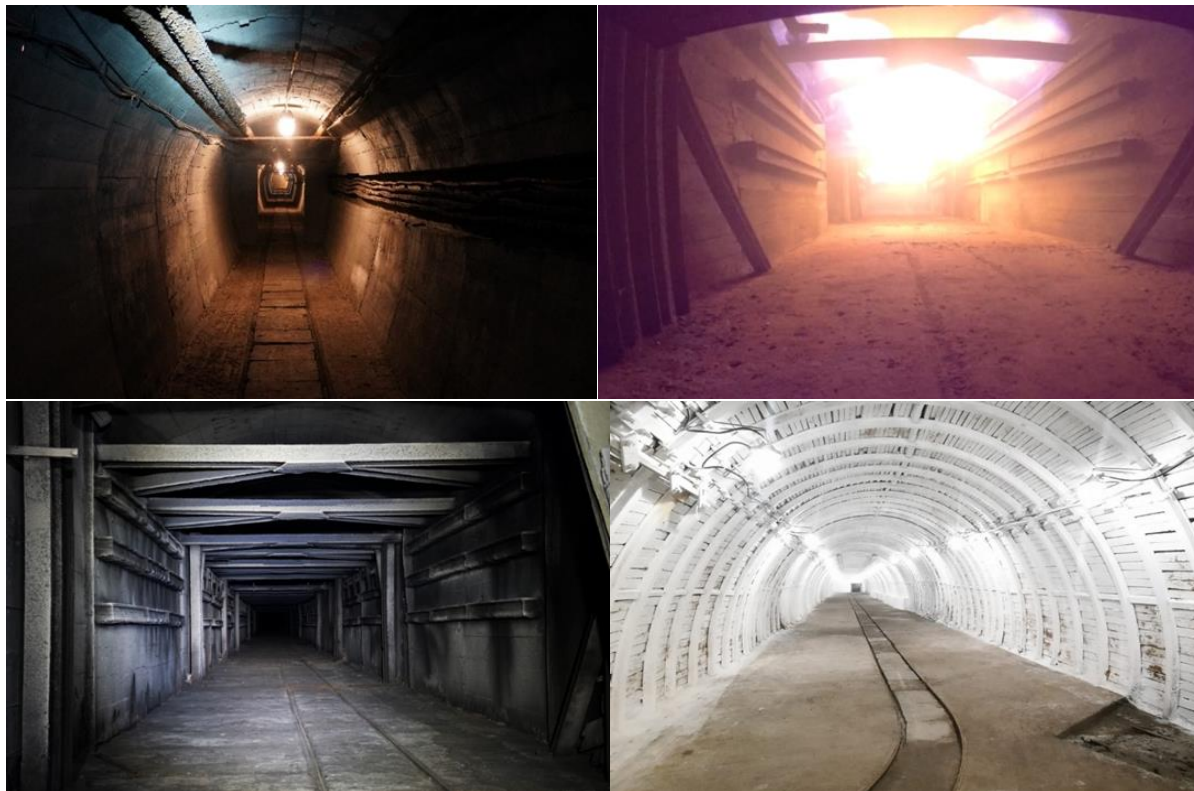


Figure 41 : The EM 'Barbara' underground workings (URL41).

9.3 Slovenia

In the industrial environment of the Šaleška valley, on reclamation areas, the company create grounds for the implementation of various activities, including those of a tourist nature. In 1957, the Museum of Slovene Mines was founded under the patronage of the Cultural Centre Ivan Napotnik Velenje and was housed in Velenje castle. At the end of 1999, the museum was relocated and upgraded with underground part in the Škale pit and today represent Coal Mining Museum of Slovenia. It is anticipated that the coal mine's closure will occur at latest 2033 . This transition, however, brings with it a wealth of mining infrastructure and assets that will be available for future projects. This includes also execution of company's mission to preserving the rich cultural heritage encapsulated within the past, present, and future, exemplified through the expansion and promotion of its mining museum activities.

In parallel with the coal the excavation, Velenje Coal Mine takes care of the rehabilitation and recultivation of degraded areas. A city stadium and a TRC with a caravan park were built along the lakes. Many trails allow for walking, running and cycling in the natural environment, and in winter also cross-country skiing. In the immediate vicinity of the excavation fields, a space suitable for sports activities, rest and recreation is being created for the local population / visitors / tourists.



Figure 42: Transformation of mine facilities into opportunities for recreation activities.(URL42)

The Coal Mining Museum of Slovenia, is the only underground museum in Slovenia, which allows experiences also to disabled, weak-sighted and partially deaf people. In the museum, the visitors will enter the coal mine exactly as the miners did last century, at 160 meter depth, through the Old shaft from 1888, dressed in mining clothes, overcoat, with a helmet on head and with a snack in hand. In the underground tunnels visitors see in an hour and a half a vivid demonstration of how the miners work looked like in the past and how it does today. A story in the museum is created by scenes and puppets of miners who come to life with modern audio-visual equipment, so visitors become acquainted with the mechanisation of the mine in recent decades of the development of Coal Mine Velenje. The visit continues with a ride on the underground railway. At last the audience visit the museum on the surface with an exhibition on the development of coal

mining in Slovenia, a coal miner's apartment before 1930, the history of the legendary “jump over the skin” and exhibitions of famous artists. The interesting multimedia story is also available in English, German, Italian and Croatian languages to ensure our foreign guests a perfect experience.

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 shaft supports 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.

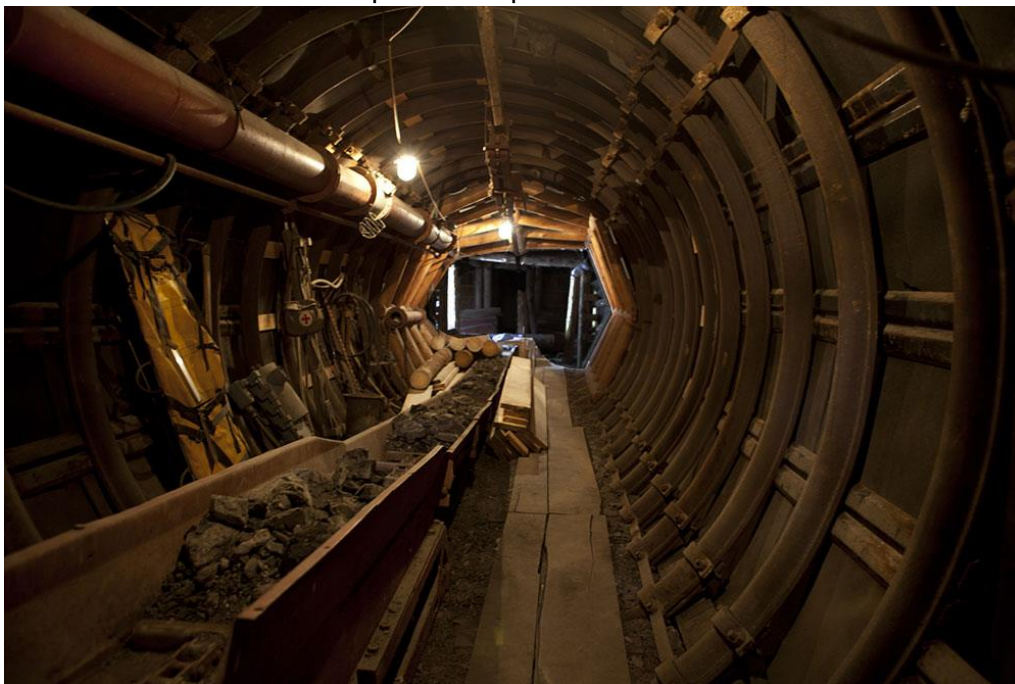


Figure 43: Mine roadway with chain conveyer at Mining Muzeum Zagorje. (URL43)

9.4 France

Mining History Center, Lewarde - Nord-Pas-de-Calais Coal field

Nestled in the coalfield's core, just 8km from Douai in the Nord département, the Mining History Centre (URL44) finds its home on the historic Delloye colliery yard at Lewarde. Spanning eight hectares, this site comprises expansive industrial structures that extend across 8,000m². Established in 1982 under the initiative of the nationalized mining company, the Mining History

Deliverable 1.1 Comprehensive Overview of the Project

Centre opened its doors to the public in 1984. Its primary objective is to preserve and showcase the mining culture of Nord-Pas de Calais, ensuring that the forthcoming generations gain insights into three centuries of mining history in the region. On 21 December 1990, the Nord-Pas de Calais coalfield nationalised 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, covering 1/12th of the Nord-Pas-de-Calais's total surface area. 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 200,000 people were employed to extract around 30 million tons each year.

Delloye colliery belonged to the Aniche Mining Company until it was nationalised, as was the coalfield as a whole, in 1946. Work at the colliery began in 1931. During the first year, 18,634 tons of coal were extracted. Production peaked in 1963, at more than 440,000 tons. The seams were narrow, rarely more than a metre wide. This made mining them unprofitable, and the activity was discontinued in 1971.

At that point, the managers of the HBNPC, the Nord-Pas de Calais coalfield nationalised mining company, and Alexis Destruys its Company Secretary in particular, wished to create a mining history centre 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 centre of the coalfield, close to the motorway network. As the various collieries in the coalfield closed, equipment and documents from them flooded into the Delloye colliery.

In 1982 the Mining History Centre 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 nationalised mining company. The centre opened to the public in May 1984.

Comprising three integral components, the site features a mining museum, a documentary resources center housing the archives of the nationalized mining company of Nord-Pas de Calais, and a scientific and technical energy culture center that delves into the history of coal within the broader context of energy history.

Over time, the site evolved into its present state, with developments such as the construction of the machine building featuring a glass roof, the establishment of galleries, and the introduction of themed exhibitions during the 1980s. In the 1990s, the center adopted new editorial and event strategies, introducing annual publications to its collections and organizing various temporary exhibitions and events for visitors, including the Patois Festival, Museums at Night, and the Heritage Days.

In the 2000s, recognizing its limitation in visitor capacity, the Mining History Centre underwent restructuring, resulting in 4,000m² of new or renovated buildings. This included a modern reception building for enhanced visitor comfort and expanded exhibition areas, both permanent and temporary. Presently, the site attracts 150,000 annual visitors and holds the distinction of being classified as a historic monument.

The Mining History Centre holds a collection of 15,000 objects relating to the Nord-Pas de Calais coalfield. Three domains are particularly well represented: the history of mining techniques, which is undoubtedly the strong point of the collections, ethnology, with representations of the miners' daily lives and geology, with a significant collection of coal fossils and rock samples discovered while prospecting for coal.

The Scientific Culture Centre aims to bring knowledge on energy issues to the general public, so that we can improve our understanding of the current challenges facing mining and access information about current and future energy sources.

The Mining History Centre is among the remarkable sites of the mining basin recognized as a UNESCO World Heritage Site. The center falls under the jurisdiction of the Nord-Pas de Calais Region and receives subsidies from the French government, Douai Urban Area, and the local towns within the Heart of Ostrevent (URL44).



Figure 44: Aerial view of the Mining History Center in Lewarde (URL45).

Parc Explor Wendel, Petite-Rosselle - Lorraine Coal field

The Wendel mine complex (URL46), 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.

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

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 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. 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.

At the very heart of the former administrative building of the Wendel headquarters, the Wendel Miners Museum invites people 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 1,800 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 Explor Wendel also aims to conserve and highlight collections, publications and temporary exhibitions. The collections of the Wendel Miners Museum, featuring nearly 2,000 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 are organized into four categories: technical collections, geological collections, collections on transportation on the seabed and in the open air, and ethnographic collections.

The Wendel Mine 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 Wendel Washhouse made up of several modules built between 1891 and 1961. This monumental building was designed for sorting and processing coal before it was packaged and delivered by rail to customers (industries, private individuals, etc.).

The mine complex is the group of surface facilities needed to operate a mine. The Wendel 2 shaft is one of three shafts at the Wendel site. It was created in 1871 shortly after the discovery of coal on the site in 1865, and reaches a depth of 773 metres and has a diameter of 5 metres. It is topped by a 54-metre high headframe, dating from 1949, which is the visible infrastructure of the "surface" building. It was closed in 1992 and its headframe has been included in the inventory of historic monuments since 1998. The Museum is labelled "Musée de France" by the Direction des Musées de France. The Parc Explor Wendel is part of the European Route of Industrial Heritage (ERIH), co-funded by the Council of Europe (URL46).



Figure 45: From the outside, The Wendel Mine has the appearance of a large red open book that symbolizes the history of the mine (URL47)

The Mining Museum, Blanzay - Saône-et-Loire Coal field

On the site of the former coalmine Saint-Claude in Blanzay (exploitation: 1857-1882), the Mining Museum (URL48, URL49) bears witness to the mining history of the whole region. Preserved and re-equipped by volunteer former miners noting the loss of objects and equipment testifying to mining activity, the museum presents the life and the working conditions of miners in the region of Montceau-les-Mines. In coal's heyday in this part of Burgundy, there were 200 collieries employing over 13,200 men around Blanzay and Montceau-les-Mines and a hundred men on the pit of Saint-Claude at the peak of its activity. This coal powered the growth of the local iron industry in Le Creusot from the mid-eighteenth century. Other industries such as the brick, tile and terracotta works of Ecuisses or Monchanin also needed coal.

To respect the memory of the site, the restoration of the site was done to the size of the old mine floor, bearing in mind that there were only a hundred miners on the Saint-Claude shaft at the time of its full activity. The installations and buildings range from their original period (around 1860) to the contemporary period from the 1950s to 2000.

The museum opened in 1978 and is labelled "Musée de France" by the Direction des Musées de France. It offers an exhibition gallery, on the first floor of the main museum building, presenting the evolution of miners' work from the mid-18th century onwards, through objects, photographs and engravings. The Lamp room and its collection of lamps in rows and ready to use reflect the evolution of underground lighting. In the engine room, you can see the steam machine and its imposing reels dating back to 1885, various old models of exhaustion pumps and electric motors. The different mining techniques are presented, from the peak and jackhammer from the beginning of coal mining to the state-of-the-art technologies used until 1992. The museum also offer the possibility to discover the buildings, machines and facilities in the 200m gallery (URL48, URL49).



Figure 46: Underground gallery and narrow railway equipped with wagons and trolleys conveying coal to the surface (URL49)

9.5 Germany

As previously described, integrating new sustainable and economically viable standards for the transition goals in the coal mining German regions has been a complex and multifaceted process. The history and industrial powerhouse of the Ruhr Region has impulse the integration of coal mining heritage as a key fundamental factor for transitioning away from mining and heavy industry based economy toward a more sustainable and diversified economy.

The Industrial Heritage Trail (in German "Route der Industriekultur"), part of the European Route of Industrial Heritage, is one of the transformation strategies for the region, linking tourist

attractions related to the industrial heritage in the Ruhr area in Germany (Figure 21). Over a distance of 400 kilometers the tourist themed route connects the most important and tourist-attractive industrial monuments in the Ruhr area. The “Route” consists of a network of industrial heritage sites and themed routes that allows visualizing the history of coal mining, steel production, and industrialization in the Ruhr Area. The route network provide visitors with a unique heritage of the Ruhr metropolis to explore, including the Ruhr area's only UNESCO World Heritage Site, Zollverein in Essen, and 27 anchor points, locations with particular historical significance and tourist appeal. In addition, 17 viewpoints, 13 settlements and numerous themed routes are part of the Industrial Heritage route. These sites include former coal mines, steel mills, museums, and other industrial landmarks, and they are connected by a system of signage and information to create a comprehensive experience for visitors interested in the region's industrial history.

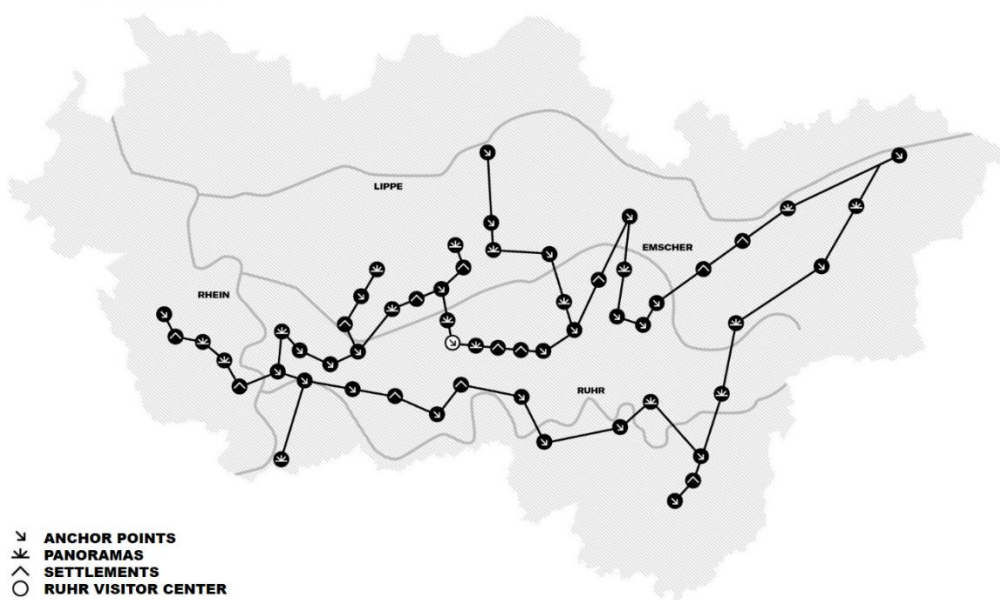


Figure 47: Map of Industrial Heritage Trail “Route der Industriekultur” in the Ruhr Region of Germany (Modified from Route der Industriekultur, 2023).

For the purpose of this project, the main coal mining sites that have become heritage are mainly located in the Ruhr and Saarland area; such tourist attractions and best practices are listed below.

1. **Zollverein Coal Mine Industrial Complex (Essen):** This UNESCO World Heritage Site is one of the most iconic industrial heritage sites in the world. It was a large coal-mining complex that is now a museum and cultural center. The site includes the former coal-mine, coking plant, and other industrial buildings.
2. **Duisburg-Nord Landscape Park (Duisburg):** This former ironworks and steel mill has been transformed into a public park. It features illuminated blast furnaces, industrial installations, and green spaces, making it a unique blend of industrial heritage and modern recreation. The Duisburg-Nord Landscape Park is an anchor point on the European Route of Industrial Heritage as well as the Route of Industrial Culture.

3. **Zollern Colliery (Dortmund):** This well-preserved colliery complex offers insight into the coal mining industry and the lives of miners. The site's striking architecture makes it a significant industrial heritage landmark.
4. **Hansa Coking Plant (Dortmund):** The coking plant has been registered in the monuments list of the city of Dortmund since 1998. It played a critical role in the production of coke, which was essential for steelmaking. The coking plant is a significant industrial heritage site that highlights the technology and processes involved in coking, a crucial step in converting coal into coke for use in steel production.
5. **LWL Museum Nightingale Colliery (Witten):** This former coal mine is now a museum that illustrates the history of coal mining in the Ruhr Area. It includes preserved buildings, mining equipment, and exhibitions on the life of miners.
6. **Colliery Ewald (Herten):** Colliery Ewald (in German Zeche Ewald) is a significant coal mining complex located in Herten, a town in the Ruhr Area of Germany. Like many other coal mining sites in the Ruhr region, Colliery Ewald played a vital role in the industrial history of the area.
7. **Friedrich Heinrich Colliery Park (Kamp-Lintfort):** The Friedrich Heinrich Colliery, or Zeche Friedrich Heinrich in German, was a coal mine that operated in the region. It played a significant role in the coal mining industry of the Ruhr Area during the 19th and 20th centuries. Within the park, it is possible to find remnants of the former coal mining operations, including preserved buildings, machinery, and industrial infrastructure. These elements provide a glimpse into the industrial past of the region.
8. **North Star Park (Gelsenkirchen):** It is located on the compound of former mine of Zeche Nordstern. After the closure of the mine in 1993 the area was redeveloped. An amphitheater is located near the canal of Rhein-Herne-Kanal, where music festivals and other cultural events are taking place, among them the annual Rock Hard Festival.
9. **Maximilian Park (Hamm):** Maximilian Park was originally an industrial site that was transformed into a park. It was once home to the Maximilian coal mine, which operated from the late 19th century until the mid-20th century. The park boasts extensive green areas, gardens, and walking paths, making it a popular destination for leisurely walks, picnics, and outdoor activities. The landscape design integrates both natural and cultivated elements.
10. **Völklinger Hütte (Völklingen, Saarland):** Another UNESCO World Heritage Site, Völklingen Hütte is a preserved ironworks that offers insight into the iron and steel industry. Visitors can explore the blast furnaces, production halls, and exhibitions on site.

10 PROJECT'S EXPECTED OUTCOMES

CoalHeritage aims to offer accessible tools for promoting and enhancing stakeholders' awareness of industrial heritage. All project outputs will be accessible in an open-access area, fostering collaboration and knowledge exchange. The anticipated scientific results aligning with EU goals are expected to be shared and integrated, thereby contributing to the dissemination of knowledge regarding coal energy production and its role in the production process. Notably, the project envisions at least two peer-reviewed scientific publications and the enrichment of

knowledge for at least 25 scientific researchers through multi- and interdisciplinary collaboration among European institutions.

In economic and technological terms, CoalHeritage endeavors to identify best practices for transforming sites and areas into industrial heritage objects. This identification is anticipated to attract private funding agencies for converting mines into museums, ultimately providing new services. The economic growth of transitioning coal regions is envisioned through the reskilling of former mine workers to counteract job losses from mine closures. Incorporating best practices during transition processes contributes to the digital and circular transformation of Coal Communities. The project will launch a European Visual Map Journal (EVMJ), facilitating fund transfer to mining municipalities for post-mining area transformation, preparing them for new investments and fostering long-term economic growth.

CoalHeritage is poised to create new job opportunities in local tourism for former mining industry employees through private funding agencies' support for transforming mines into museums. The project emphasizes processes for identifying coal sites as national heritage areas, adopting best practices for site transformation into industrial heritage, and creating an interregional network dedicated to safeguarding coal heritage. The reskilling of former mine workers mitigates job losses, and the emergence of new services from coal transformation improves working conditions, including health and safety, with societal impacts.

The project contributes to the overall improvement of the environment by preserving cultural heritage in industrial spaces. This is achieved through the application of knowledge gained from the transformation of mining sites into industrial and cultural heritage during transition phases. The outcomes include the identification of coal sites as national heritage areas, the study of best practices for site transformation into industrial heritage, and the reskilling of former mine workers to improve working conditions and eventually declare coal mines as national or international cultural heritage sites.

The expected result of CoalHeritage is the development of a Coal Heritage Geo-database, co-created with the interregional stakeholder network, to collect geospatial and text data from selected coal mines based on specific criteria. This collaborative effort integrates the interregional coal mining heritage network and the geodatabase as a specific theme route in the European Route of Industrial Heritage (ERIH). The ultimate goal is the formal declaration of coal mines as national or international cultural heritage sites, reinforcing the importance of identifying and diagnosing local identities as a foundation for building a sense of belonging and activating social activity through the preservation of cultural heritage.

11 PROJECT'S EXPECTED IMPACT

CoalHeritage's outcomes are leading to the project's scientific, techno-economic and societal positive impact.

It is evident that the long-term outcomes of CoalHeritage (CoalHeritage Impacts) align closely with the anticipated impact outlined in Table 10. CoalHeritage will make a substantial contribution to the broader impacts specified in the RFCS call, particularly I1: Address all the relevant actors required for the Just transition of the Coal regions and I2: Suggestions on possible policy initiatives to contribute to the digital, greening and circular transformation of the Coal communities.

Table 10 CoalHeritage's Expected Impacts.

| Call Expected Impact #1: Address all the relevant actors required for the Just transition of the Coal regions. | | |
|--|--|--|
| CoalHeritage Impacts (Sc: Scale) (Si: Significance) | Scientific | <ul style="list-style-type: none"> • Diffusion of knowledge about coal-based energy production, role of coal in production processes (Sc.) |
| | Diffusion of knowledge about coal-based energy production, role of coal in production processes (Sc.) Industrial/economic/technological | |
| | Societal and environmental | <ul style="list-style-type: none"> • Declaration of the coal mines as national/international cultural heritage sites (Si.) • Strengthening the need to identify and diagnose local identities as a basis for building a sense of belonging and activating social activity through the process of preserving cultural heritage in industrial space (Sc.) |
| Call Expected Impact #2: Suggestions on possible policy initiatives to contribute to the digital, greening and circular transformation of the Coal communities | | |
| CoalHeritage Impacts (Sc: Scale) (Si: Significance) | Scientific | |
| | Industrial/economic/technological | <ul style="list-style-type: none"> • Provide new services by transforming the coal mines into museums (Sc.) • Economic growth of the coal regions in transition by attracting private funding to convert the regions from industrial to touristic (Sc.) • Re-skilling of the former mine workers counteract the loss of jobs from the closure of the mines (Sc.) |
| | Societal and environmental | <ul style="list-style-type: none"> • Creation of new workplaces in local tourism for employees from mining industry (Sc.) • Better working conditions with regard to health and safety (e.g. museums) (Si.) • General improvement in the quality of the environment (e.g., reduction of water, air pollution, rationalization of waste management, reduction or improvement of noise protection, etc.) through the process of preserving cultural heritage and industrial space (Sc.) |

The alignment of project's expected outcomes and impacts is evident. The scientific impact of CoalHeritage is generated through short-term, mid-term and long term results. As far as the scientific impact is concerned, the short-term results include the publication of at least 2 peer reviewed articles and the identification of stakeholders on industrial heritage. These activities themselves, set the ground for the mid-term results, which have as main theme the systemization of knowledge about coal mines, mining processes and related technologies along with the knowledge exchange between the stakeholders and the long term results which is the diffusion of knowledge for the role of coal in energy production (Call impact 1).

The short-term results of Economic & Technological Impact of CoalHeritage include:

- The best practices of transformation of sites and areas into industrial heritage objects.
- The launch of the European Visual Map Journal that will allow the users to have access to the coal mining history.

The above results with their turn generate mid-term results and long term results that include:

- The provision of new services by transforming the coal mines into museums (Call impact 2)
- The economic growth of the coal regions in transition by attracting private funding to convert the regions from industrial to touristic (Call impact 2)
- The re-skilling of the former mine workers which will counteract the loss of jobs from the closure of mines (Call impact 1)

The societal impact of CoalHeritage though, is the most outstanding and consists the greatest between the other kinds.

The Short-term Results concerning societal aspect are:

- Identification of the processes for characterization of the coal sites as national heritage areas
- Identification of the best practices of transformation of sites and areas into industrial heritage objects
- Development of a Coal Heritage Geo-database to geospatial and text data from the selected coal mines under specific criteria
- Creation of an interregional stakeholder network dedicated to the safeguarding of coal heritage (approx. 30)

The Medium-term results include:

- Incorporation of best practices regarding transformation of mining sites and places into industrial and cultural heritage - while carrying out of transition processes
- Up-take by private funding agencies for the transformation of the mines into museums
- Integration of the interregional coal mining heritage network and the Geodatabase as a specific theme route in the ERIH

The Long-term results and their contribution to the Expected Impacts of the project are:

- General improvement in the quality of the environment through the process of preserving cultural heritage in industrial space (Call impact 2)
- Re-skilling of the former mine workers counteracts the loss of jobs from the closure of the mines (Call impact 2)
- Declaration of the coal mines as national/international cultural heritage sites (Call impact 1)
- Creation of new workplaces in local tourism for employees from mining industry (Call impact 2)
- Provide new services by transforming the coal mines into
- Museums (Call impact 2)
- Better working conditions with regard to health and safety (Call impact 2)
- Strengthening the need to identify and diagnose local identities as a basis for building a sense of belonging and activating social activity through the process of preserving cultural heritage in industrial space (Call impact 1)

12 MEASURES TO MAXIMISE IMPACT

The primary objectives of CoalHeritage promote coal mining heritage, with the EVMJ serving as the primary tool. The project's outcomes will be effectively disseminated, communicated, and leveraged through a range of strategies. These efforts will not only establish an interregional stakeholder network but also ensure its sustained operation beyond the conclusion of the project.

The consortium will utilize a plethora of activities and dissemination tools to successfully convey the outcomes of CoalHeritage to a wide range of audiences, including the scientific community, industrial and economic stakeholders, as well as the general public (Table 11).

Table 11 CoalHeritage's dissemination tools.

| | Dissemination | Communication | Exploitation |
|---|---|--|---|
| R1. European Visual Map Journal (EVMJ) | workshop with the network | promotion of the EVMJ through a special open event at GIG's Experimental Mine Barbara during Industriada | Use during workshops and thematic group meetings, local touristic organizations, local authorities and their visitors, also use by tourists |
| R2. Coal Heritage Geodatabase | Scientific publications | website, social media, newsletter | sharing of the database with other European platforms (e.g EGD) |
| R3. Interregional stakeholder network | Workshops for the creation and strengthening of the network | website, newsletters | Support of transformation activities into industrial heritage objects |
| R4. Processes for the identification of the coal sites as national heritage areas | Website, mailing campaign to provide the report to parties involved in the transition | social media, website, newsletter, articles, brochures | Use by parties, local, regional and national authorities, as well as CSOs involved in the transition |
| R5. Best practices of transformation into industrial heritage | Website, mailing campaign to provide the report to parties involved in the transition | social media, website, newsletter, articles, brochures | Use by parties, local, regional and national authorities, as well as CSOs involved in the transition |
| R6. Identification of the awareness level of the stakeholders on industrial heritage | Website, mailing campaign to provide the report to parties involved in the transition | social media, website, newsletter, articles, brochures | Use by parties, local, regional and national authorities, as well as CSOs involved in the transition |
| R7. At least 2 peer reviewed articles | Scientific and technical publications, poster presentation at conferences | articles, social media, website, newsletter | Direct and indirect use of methodology and results by future interested parties |

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