Co-funded by the European Union

Research Fund for Coal & Steel

waste2CRM

Determination of the potential for sourcing critical raw materials from mining wastes, and development the method for their effective recovery

Research Fund for Coal and Steel	
Project acronym	Waste2CRM
Project title	Determination of the potential for sourcing critical raw materials from mining wastes, and development the method for their effective recovery
Grant Agreement N°	101157810 — Waste2CRM — RFCS-2023

Deliverable – D2.2

Database on coal mining waste

Co-funded by the European Union

Co-funded by the European Union

Research Fund for Coal & Steel

waste2CRM

Determination of the potential for sourcing critical raw materials from mining wastes, and development the method for their effective recovery

Deliverable number – D.2.2	
Due date of deliverable	28th February 2026 / updated: 10th March 2026
Deliverable responsible partner	UP Patras has overall responsibility for the deliverable.
Dissemination level	Public
Work-package	WP 2- Sampling and assessment of the content and spatial distribution of selected critical raw materials in mining waste deposited on heaps and from current production
Task	Task 2.1 - Inventory of mining waste streams
Authors	Stavros Kalaitzidis, UP Patras (Greece) Agnieszka Klupa, Dagmara Sobczak, Magdalena Cempa Główny Instytut Górnictwa - PIB (Poland) Michał Rejdak, Małgorzata Wojtaszek-Kalaitzidi, Bartosz Mertas, Instytut Technologii Paliw i Energii (Poland) Łukasz Skrzypiec, IMN - Łukasiewicz Research Network - Institute of Non-ferrous Metals (Poland) Amanda Gomez Marfil, Systra Subterra (Spain)

Table of contents

1. Introduction

A comprehensive and critical analysis of the available databases concerning hard coal mining waste deposited on heaps in Poland and Spain, as well as waste related to lignite mining in Greece, has been carried out. The work focused on assessing the scope, quality, and applicability of existing datasets for the evaluation of the occurrence and recovery potential of critical raw materials (CRM), including rare earth elements (REE).

The starting point for the analysis and selection of representative sites was the database developed within the SUMAD project, comprising information on 152 facilities in Poland. The dataset included data on location, ownership, volume, operational and environmental status (reclamation, fire events, burnout, ongoing or past exploitation), and characterization of the deposited material. This database was systematically reviewed, updated, harmonized, and supplemented to ensure consistency and completeness of the key parameters relevant for further assessment and field investigations.

For hard coal mining waste, the database was extended to include lithostratigraphic information on coal seams from the Upper Silesian Coal Basin in southern Poland. This basin is an orogenic structure filled with molasse deposits, where Upper Carboniferous formations are coal-bearing and overlain by Permian, Triassic, Miocene, and Quaternary strata. From a lithostratigraphic perspective, the Kraków Sandstone Series, Mudstone Series, Upper Silesian Sandstone Series, and Paralic Series were distinguished. The lithostratigraphic affiliation of coal seams was incorporated as a key parameter due to its significant influence on chemical composition, including the potential concentration of valuable elements. Consequently, both the lithostratigraphic group of the exploited seams and the volume of individual heaps were adopted as primary criteria for the selection of sites for further investigation and sampling.

In parallel, a detailed database inventory of current coal-exploitation wastes in Western Macedonia, Northern Greece, was compiled, with particular focus on the Prosilio coal-bearing basin and, based on publicly available data, the Ptolemais basin. The geological framework of these basins—hosting Miocene and Pliocene lignite-bearing sequences, respectively—was taken into account. Updated lithostratigraphic and available quality data were integrated for both the Miocene (xylite-rich lithotype, approximately 20 m thick) and Pliocene (matrix lithotype, approximately 150 m thick) sequences exposed in open pits. The inventory covered both organic-rich and inorganic strata, with special attention given to volcanic layers (notably in the Ptolemais basin) and strata significantly influenced by detrital material derived from the ultramafic basement (particularly in the Prosilio basin), due to their potential relevance for REE concentration.

The inventory of coal waste dumps in Spain has been compiled based on the information published by the Geological and Mining Institute of Spain (IGME) in 1989.

Furthermore, the database was expanded to include information on backfill zones and heap areas, including the type of deposited waste (e.g., overburden, fly ash, bottom ash). The integrated geological, lithological, mineralogical, geochemical, and spatial datasets provide a robust basis for defining sampling criteria and target sites. This comprehensive inventory enables targeted planning of investigations of both deposited wastes and selected in situ strata, supporting a more in-depth understanding of the distribution and behavior of critical raw materials, particularly rare earth elements (REE).

2. Database in Poland

Systematisation, update and supplementing existing database of heaps

The work was undertaken in accordance to The Work Package 2 titled “Sampling and assessment of the content and spatial distribution of selected critical raw materials in mining waste deposited on heaps, backfill areas and from current production”. Systemization, update and supplementing concerned the database that had been developed earlier as a part of SUMAD project. This database contains information regarding 152 sites and includes information such as location, ownership, morphology and characterisation of deposited material, as well as information regarding the state and actual conditions of the object.

The exact aim was to implement lithostratigraphic information regarding deposited material of each heap object.

Waste heaps as a product of deposition post-mining waste materials

Waste heaps, also known as waste dumps, are accumulations of mining waste materials that result from the extraction and processing of minerals, including hard coal. These heaps are a common sight in the Silesian region of Poland, where mining activities have historically been extensive. The presence of these waste heaps poses significant environmental and health risks. They can lead to the contamination of groundwater through leachates, increase dust pollution, and even cause wildfires. Despite efforts to manage and repurpose mining waste, only a small fraction is utilized for other purposes, such as construction aggregates. The ineffective supervision of these sites further exacerbates the problem, as it may lead to the illegal disposal of hazardous waste. Consequently, waste heaps not only mar the landscape but also pose ongoing threats to the environment and local communities.

The obligations of EU member states concerning the management of post-mining waste facilities are delineated in Directive 2006/21/EC on the management of waste from extractive industries. According to this directive, EU countries are tasked with several responsibilities related to waste heaps from decommissioned mines. These include creating an inventory of closed waste sites and conducting preliminary risk assessments to identify those that may present significant environmental or health hazards. Furthermore, member states must continuously monitor the environmental impact of these closed waste heaps and report their findings to the appropriate authorities.

Despite the requirement for each EU country involved in this project to compile an inventory of waste heaps, the availability of this data remains scarce. Although there is awareness of the existence of such databases and they should theoretically be easily accessible, most of this information has not been publicly released and is challenging to obtain by any means.

Revitalization involves the transformation of post-industrial areas by assigning them new economic, natural, or recreational functions. This process is essential as it addresses environmental damage and threats posed by degraded areas, including waste heaps and dumps, thereby enhancing the region's capacity to support new functions. Local governments possess a comprehensive set of instruments to facilitate revitalization; however, these tools are dispersed across various regulations, particularly those related to economic issues and spatial planning. Despite the availability of these instruments, the statutory obligation to focus solely on public utility tasks can impede the effective implementation of revitalization initiatives.

Future directions for this process include recognizing revitalization as a primary responsibility of municipalities to elevate its significance. It is also imperative to establish clear principles for development programs that encompass long-term financing and to formalize cooperation between local governments and other entities. These measures are crucial to overcoming barriers and ensuring a comprehensive and integrated approach to revitalization, ultimately transforming degraded areas, including waste heaps and dumps, into valuable spaces for development.

In Task 2.1, the existing database from the SUMAD project was utilized and enhanced with new lithostratigraphic data. This data was obtained by searching online for information on post-mining waste landfills and exploitation activity of Polish mines, reviewing existing European projects and scientific articles on this topic and browsing through accessible historical and current reports from mine owners.

The creation of the database was also associated with the knowledge of lithostratigraphic conditions prevailing in the Silesian coal basin and numerous scientific studies on this subject.

Lithostratigraphic composition in the Upper Carboniferous Formations of the Upper Silesian Coal Basin

The Upper Silesian Coal Basin (GZW) is situated in the southwestern region of Poland. This area, represents the youngest and easternmost part of the Silesian-Moravian structure. It is the largest coal mining hub in Poland. Coal seams are found in the stratigraphic units of the Upper Carboniferous, ranging from the marginal layers to the Libiąż layers. The entire Basin is considered a single deposit area, with sections of the deposits administratively divided and allocated to specific mines or regions. The geological structure within these divisions varies due to complex geological conditions. The number and total thickness of seams in the GZW area differ across individual mines, depending on the stratigraphic position of the productive layers available for mining.

The bedrock of the Upper Silesian Coal Basin is composed of Precambrian, Cambrian, Devonian and partly younger Carboniferous rocks.

The coal content within the Carboniferous deposits varies based on the thickness and arrangement of these deposits, ranging from several meters to several dozen meters. The richest coal deposits are found in the Upper Silesian sandstone series (Saddle and Ruda layers) and the mudstone series (Załęże layers). However, numerous overlapping factors have led to a diverse distribution of coal types both vertically and horizontally.

Exploitation subjects coal seams occurring within all Upper Carboniferous formations, that includes four series: Cracow Sandstone Series, Mudstone Series, Upper Silesian Sandstone Series and Paralic Series. The presence and the access to specific series depends on the location of mining operations, and has been studied, analysed and mapped before widely.

Those analysis, studies and literature have been gathered and investigated. The main part of the veritable data was often presented in tabular or graphical form, as shown on figures 1 ÷ 6.

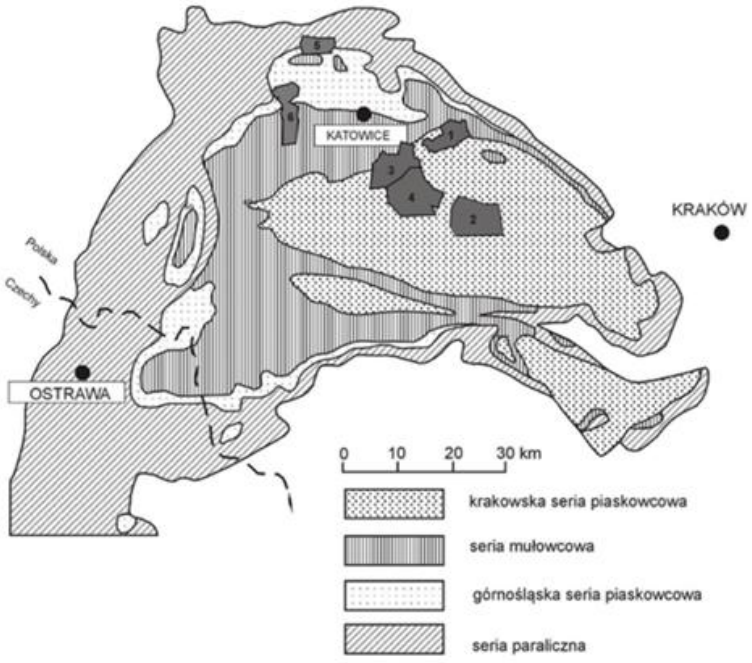


Figure 1. Lithostratigraphy and geological sketch-map of the Upper Silesia Coal Basin with the location of the 1 – Jan Kanty, 2 – Janina, 3 – Wesoła,4 – Ziemowit, 5 – Powstańców Śląskich, 6 – Zabrze-Bielszowice Coal Mines; [Misiak 2017]

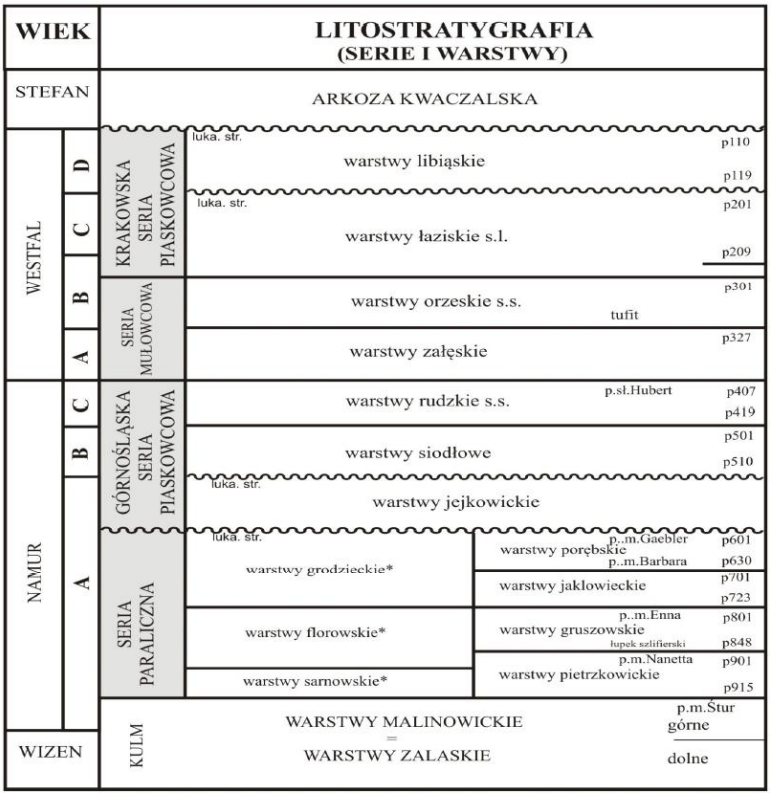


Figure 2 Lithostratigraphic division of productive carbon of the Upper Silesian Basin [Poniewiera, Jelonek, Gąsior 2015]

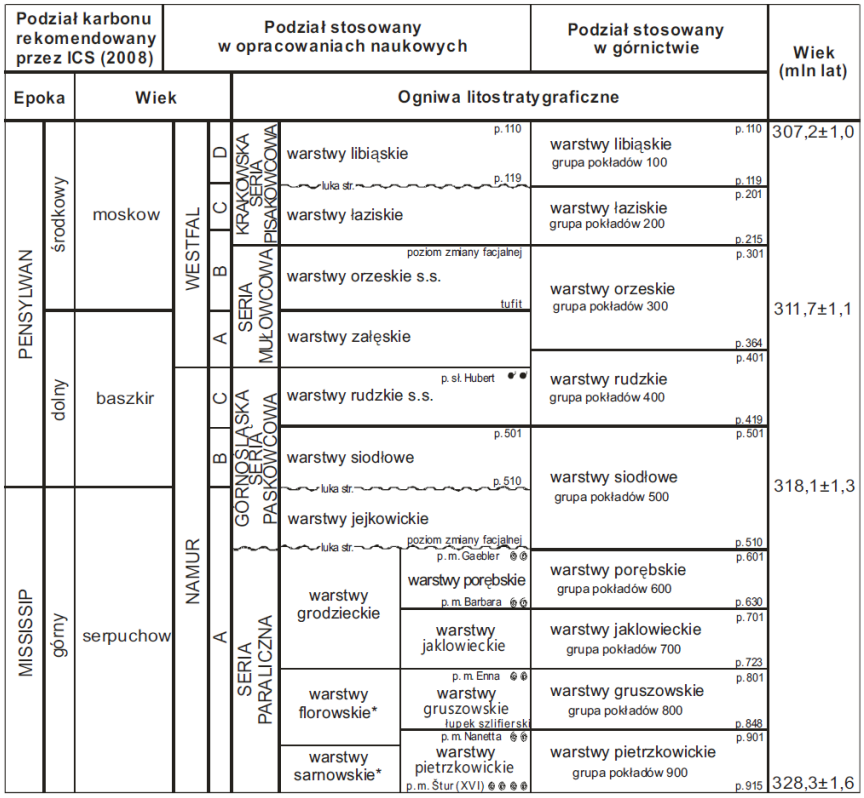


Figure 3. Lithostratigraphic division of Carboniferous coal deposits in The Upper Silesian Coal Basin, [Jureczka, J. 2009]

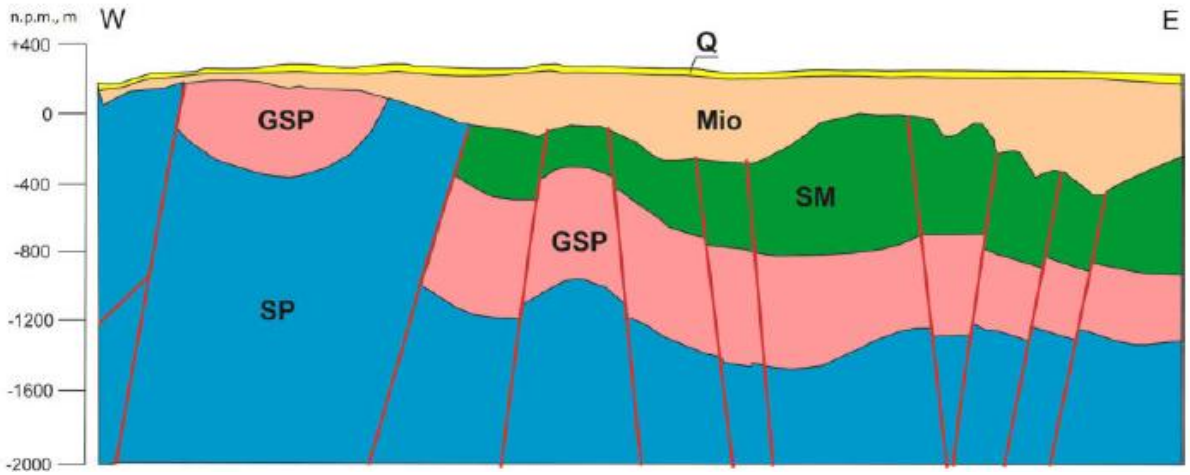


Figure 4. Geological cross-section through the south-western area of the Upper Silesian Coal Basin in the W-E direction, where: Q - Quaternary, Mio - Miocene, SM - Mudstone

Series, GSP - Upper Silesian Sandstone Series, SP - Paralic Series (based on W. Krieger) [Pluta S. 2023]

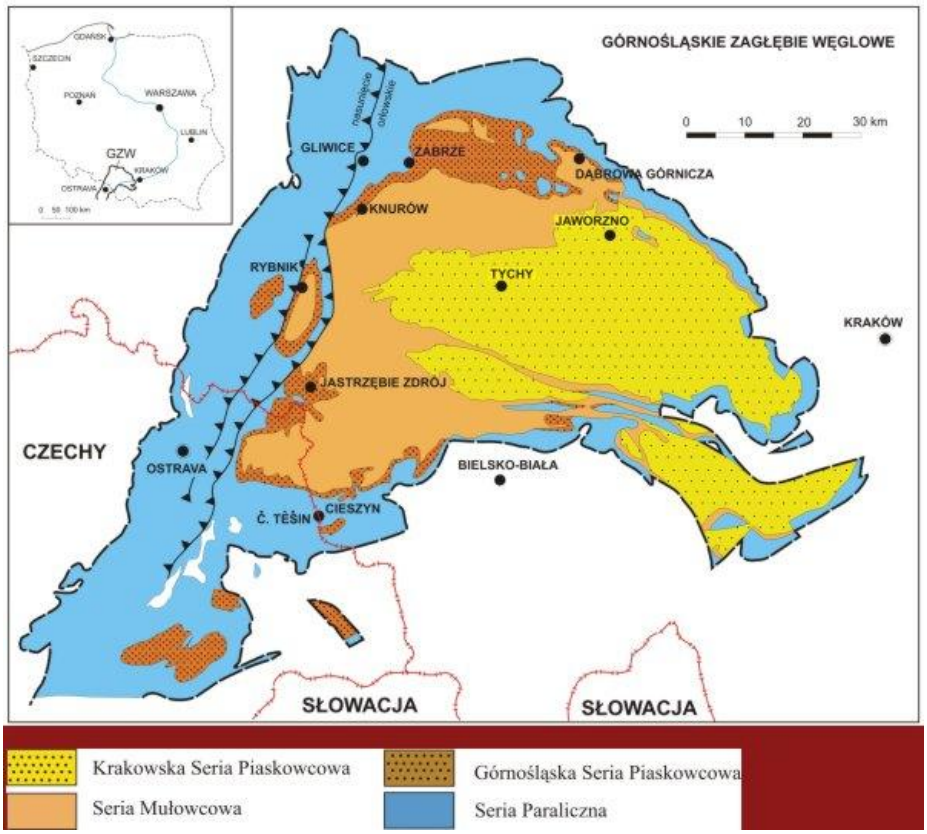


Figure 5. Geological sketch-map of the Upper silesia coal Basin [https://geoportal.pgi.gov.pl/zrozumiec_ziemie/wycieczki/jura_krakowsko_czestochowska_1/teoria/E2670F3AB87370D4E0430A00037570D4

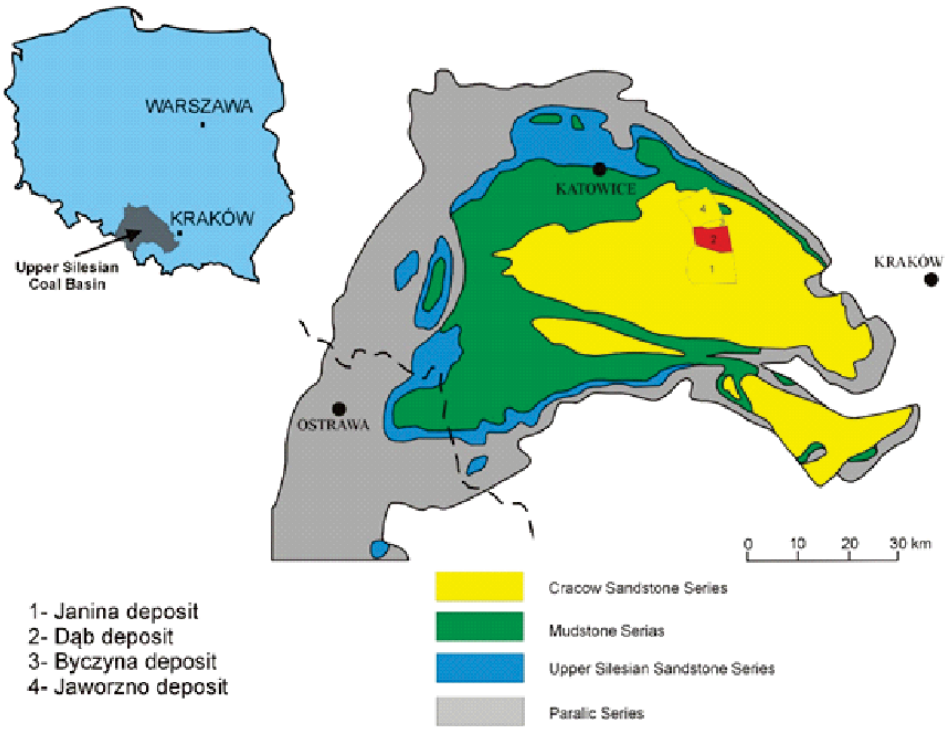


Figure 6. Location of the research area in the USCB [Misiak J. 2017]

Undertaken work

Implementing lithostratigraphic information into the existing database of SUMAD project literally came down to work grounded in literature mentioned above and on the knowledge of the location of mining operations.

Assigning each database record to the appropriate geological layer was carried out through the systematic collection and verification of a range of information. For every individual waste heap object, this process incorporated some or all of the following data:

- geographical location,
- period of formation,
- name of the mining operator active at the time,
- depth of coal extraction during the relevant period,
- designation of the exploited coal seam,
- name of the corresponding lithostratigraphic unit.

The analysis was undertaken basing on the publicly available data obtained from literature, scientific journals, research studies and broad sources available on the Internet.

In view of the total number of 152 records representing waste heap objects, information on lithostratigraphic series was obtained in this way for 151 items. Known presence of any lithostratigraphic series from: Cracow Sandstone Series, Mudstone Series, Upper Silesian Sandstone Series and Paralic Series was noted in the database. Individual records were assigned from one, up to four different series.

A	C	I	J	K	N	Q	R	S	T	U
No	Location	Location	Location	Location	Morphology	Lithostratigraphic_ Series	Lithostratigraphic_ Series	Lithostratigraphic_ Series	Lithostratigraphic_ Series	Lithostratigraphic_ Series
	Country	N coordinate	WE coordinat	Area, ha	Material typ	Strat_Name	1_Crac_San	2_Mudston	3_Upp_Siles_S	4_Paralic
1	Poland	50 12 8,05	18 40 39,53	437.3	Hardcoal	Mudstone Series,Upper		2	3	
2	Poland	50 21 32,64	18 58 48,62	10.6	Hardcoal	Upper Silesian Sandstone Series			3	
3	Poland	50 2 47,88	18 24 3,99	8.2	Hardcoal	Paralic Series				4
4	Poland	50 0 49,89	18 26 35,32	3.2	Hardcoal	Paralic Series				4
5	Poland	49 59 40,74	18 17 44,94	44	Hardcoal	Paralic Series				4
6	Poland	50 18 43,68	18 56 5,78	2.8	Hardcoal	Upper Silesian Sandstone			3	4
7	Poland	50 19 10,44	18 57 38,16	9.6	Hardcoal	Upper Silesian Sandstone			3	4
8	Poland	50 14 38,32	18 49 49,18	25.5	Hardcoal	Mudstone Series,Upper		2	3	
9	Poland	50 20 9,61	18 52 25,28	4.4	Hardcoal	Upper Silesian Sandstone			3	4
10	Poland	50 20 53,87	18 53 6,14	13	Hardcoal	Upper Silesian Sandstone			3	4
11	Poland	50 20 52,40	18 51 36,11	16	Hardcoal	Upper Silesian Sandstone			3	4
12	Poland	50 21 16,40	18 52 57,09	2.36	Hardcoal	Upper Silesian Sandstone			3	4
13	Poland	50 21 11,30	18 49 23,91	32	Hardcoal	Upper Silesian Sandstone			3	4
14	Poland	50 21 50,57	18 53 32,01	14.6	Hardcoal	Upper Silesian Sandstone			3	4
15	Poland	50 20 9,88	18 56 50,02	8	Hardcoal	Upper Silesian Sandstone			3	4
16	Poland	50 8 27,93	18 51 20,68	30	Hardcoal	Mudstone Series		2		
17	Poland	50 8 30,78	18 52 47,01	18.3	Hardcoal	Mudstone Series		2		
18	Poland	49 59 3,64	19 11 0,16	13.2	Hardcoal	Cracow Sandstone,Mudsto	1	2	3	4
19	Poland	49 59 54,54	19 10 41,89	34.2	Hardcoal	Cracow Sandstone,Mudsto	1	2	3	4
20	Poland	49 58 24,26	19 9 47,69	30	Hardcoal	Cracow Sandstone,Mudsto	1	2	3	4
21	Poland	49 58 54,93	19 7 21,69	30.25	Hardcoal	Cracow Sandstone,Mudsto	1	2	3	4
22	Poland	49 58 27,76	19 11 22,88	43.7	Hardcoal	Cracow Sandstone,Mudsto	1	2	3	4
23	Poland	49 54 12,48	19 1 46,48	14.1	Hardcoal	Cracow Sandstone,Mudsto	1	2	3	4
24	Poland	49 56 32,25	19 2 19,97	14.6	Hardcoal	Cracow Sandstone,Mudsto	1	2	3	4
25	Poland	49 56 48,96	19 0 37,36	4.76	Hardcoal	Cracow Sandstone,Mudsto	1	2	3	4
26	Poland	49 56 36,09	19 1 12,65	3.83	Hardcoal	Cracow Sandstone,Mudsto	1	2	3	4
27	Poland	50 19 54,19	18 54 13,05	3	Hardcoal	Upper Silesian Sandstone			3	4
28	Poland	50 19 32,91	18 52 59,17	3.2	Hardcoal	Upper Silesian Sandstone			3	4
29	Poland	50 19 31,02	18 53 11,34	2.4	Hardcoal	Upper Silesian Sandstone			3	4
30	Poland	50 21 11,91	18 53 19,29	10	Hardcoal	Upper Silesian Sandstone			3	4
31	Poland	50 3 33,28	18 32 46,94	14.1	Hardcoal	Upper Silesian			3	4

Figure 7. Part of the database of waste heaps in Poland including lithostratigraphic information regarding deposited material of each heap object (columns R, S, T, U)

Data from the updated database were used to identify the most suitable locations for collecting waste samples representing individual lithostratigraphic series. Additionally, information such as:

- site accessibility
- technical feasibility of sample collection
- the possibility of using the mine's technical infrastructure

An illustrative map of the waste sampling locations in relation to the extent of individual lithostratigraphic series of the GZW is shown in Figure 8.

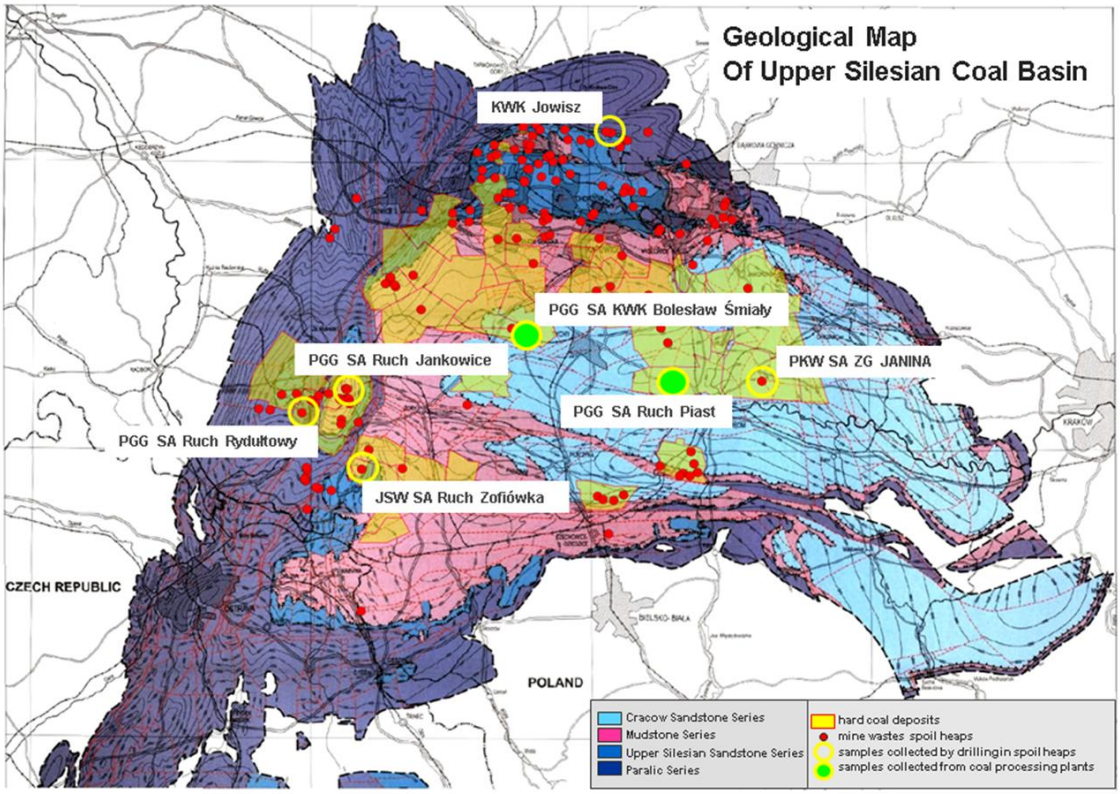


Figure 8. Locations of hard coal mine waste sampling points on the lithostratigraphic map of the Upper Silesian Coal Basin.

3. Database in Spain

The inventory of coal waste dumps in Spain has been compiled based on the information published by the Geological and Mining Institute of Spain (IGME) in 1989. The scarcity of current data is mainly due to the fact that, at present, Spain does not have any active coal mines, as a result of new sustainability policies and the transition towards renewable energy sources.

Coal mining in Spain began in the mid-19th century during the Industrial Revolution. The most important mining basins, with the largest coal deposits were located in Asturias, León, Palencia, Teruel, Zaragoza, Córdoba and Seville.

Figure 9. Main coal basins of Spain. 1: Asturias, León, Palencia; 2: Teruel, Zaragoza; 3: Córdoba, Seville.

The sector expanded throughout the 19th and 20th centuries, and after the Spanish Civil War (1936-1939), coal mining became a strategic resource for the self-sufficiency policies of the Franco regime. During the 1940s and 1950s, coal production reached its peak, becoming Spain's main energy source. From the 1970s onwards, oil and other energy sources began to replace coal. Moreover, Spain's entry into the European Coal and Steel Community (ECSC) in 1986 meant the integration of resources within the coal and steel industries, based on a common market, shared objectives, and joint institutions, with the aim of promoting economic expansion and employment development. The ECSC was dissolved in 2002, with its functions and responsibilities being incorporated into the European Community (later the European Union).

By the early 21st century, the Spanish coal industry had decreased considerably, both in terms of production and workforce. This decline culminated in the agreement reached in 2018 between the Spanish government, miners' unions, and coal companies, which established a definitive plan for the closure of most remaining coal mines by December 2018. This agreement included financial support for miners, investment in alternative employment and economic regeneration programs in affected regions, and environmental restoration commitments for former mining sites. Today, coal extraction in Spain has ceased almost completely, marking the end of an era that played a crucial role

in the country's industrial and social development. The legacy of coal mining remains evident in the form of numerous waste dumps and altered landscapes throughout the historic mining basins.

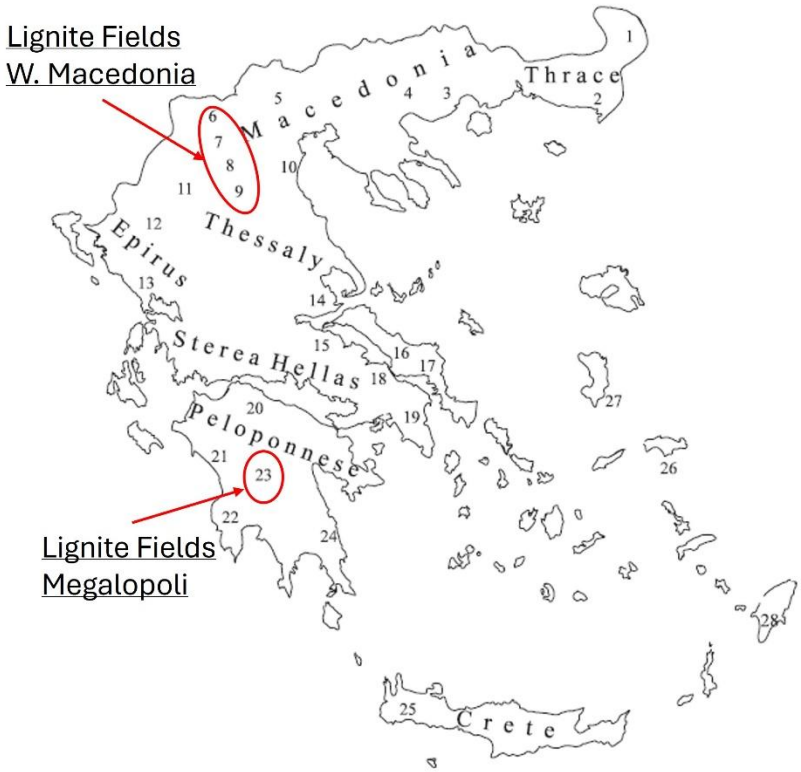
For this task, the locations recorded in the 1989 IGME database were systematically processed, and the georeferenced dataset comprising the coal mine waste dumps of the Iberian Peninsula. A total of 141 coal waste dump sites were inventoried in Spain. A fragment of the Spanish waste heap database is shown in Figure 10.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
No	Basic information	Location	Location	Location	Location	Location	Location	Location	Location	Location	Morphology	Morphology	Morphology	Hazards	Reclamation	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series
	Owner	Country	Voivodeship	City	Colliery	X coordinate (WGS84	Y coordinate (WGS84	N coordinate	E coordinate	Area, ha	Volume, m³	Mass, mg	Material type	Fire	Status	Strat_Name	1_Crac_Sand	2_Mudstone	3_Upp_Siles_Sand	4_Paralic
1	Encasur	Spain	Fuente Obejuna	Córdoba	Mina Cervantes	-5,326	38,312				1600000		Hard coal (Antracite)		Reclaimed					
2	Encasur	Spain	Fuente Obejuna	Córdoba	Mina Cervantes	-5,331	38,304				1100000		Hard coal (Antracite)		Reclaimed					
3	Encasur	Spain	Fuente Obejuna	Córdoba	Mina Cervantes	-5,322	38,318				900000		Hard coal (Antracite)		Reclaimed					
4	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San	-5,31	38,312				850000		Hard coal		Reclaimed					
5	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San	-5,312	38,311				450000		Hard coal (Antracite)		Reclaimed					
6	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San	-5,316	38,31				40000		Hard coal (Antracite)		Reclaimed					
7	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San	-5,314	38,306				85000		Hard coal (Antracite)		Reclaimed					
8	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San	-5,309	38,308				110000		Hard coal (Antracite)		Reclaimed					
9	Encasur	Spain	Peña-Pueblonuevo	Córdoba	Minas de Santa Elisa	-5,267	38,292				11500		Hard coal		Reclaimed					
10	Encasur	Spain	Peña-Pueblonuevo	Córdoba	Minas de Santa Elisa	-5,267	38,291				17000		Hard coal		Reclaimed					
11	Encasur	Spain	Peña-Pueblonuevo	Córdoba	Mina Antolin	-5,25	38,287				100000		Hard coal		Reclaimed					
12	Encasur	Spain	Peña-Pueblonuevo	Córdoba	Mina Ana	-5,253	38,295				500000		Hard coal		Reclaimed					
13	Encasur	Spain	Bélmez	Córdoba	Mina Antolin	-5,237	38,294				100000		Hard coal		Partly reclaimed					
14	Encasur	Spain	Bélmez	Córdoba	Mina Antolin	-5,233	38,291				3000		Hard coal		Reclaimed					
15	Emergicar, SL	Spain	Henarejos	Cuenca	Minas Henarejos	-1,471	39,79				8000		Hard coal		Partly reclaimed					
16	EMERGICAR, SL	Spain	Henarejos	Cuenca	Minas Henarejos	-1,471	39,789				6000		Hard coal		Partly reclaimed					
17		Spain	Cestona	Guipuzcoa	Minas de	-2,236	43,245				12000		Brown coal (Lignite)		Reclaimed					
18		Spain	Sallent de Gallego	Huesca	Mina Millor	-0,402	42,766				150000		Hard coal (Antracite)		Reclaimed					
19		Spain	Sallent de Gallego	Huesca	Mina Millor	-0,405	42,766				60000		Hard coal (Antracite)		Reclaimed					
20		Spain	Sallent de Gallego	Huesca	Mina Millor	-0,405	42,765				20000		Hard coal (Antracite)		Reclaimed					
21		Spain	Castigaleu	Huesca	Mina Eulalia	0,625	42,278				150000		Brown coal (Lignite)		Partly reclaimed					
22		Spain	Castigaleu	Huesca	Mina Eulalia	0,624	42,277				8000		Brown coal (Lignite)		Partly reclaimed					
23	Lignitos de Meirama, SA	Spain	Cerceda	La Coruña	Mina de Meirama	-8,442	43,204				21000000		Brown coal (Lignite)		Reclaimed					
24	Lignitos de Meirama, SA	Spain	Cerceda	La Coruña	Mina de Meirama	-8,429	43,166				40000000		Brown coal (Lignite)		Reclaimed					
25	Lignitos de Meirama, SA	Spain	Cerceda	La Coruña	Mina de Meirama	-8,427	43,194				1000000		Brown coal (Lignite)		Reclaimed					
26	ENDESA GENERACIÓN, SA	Spain	Puentes de Garcia Rodriguez	La Coruña	Mina As Pontes	-7,926	43,463				242000000		Brown coal (Lignite)		Reclaimed					
27	Unión Minera del Norte, SA (UMINSA)	Spain	Toreno	León	Mina Alinos	-6,527	42,739				600		Hard coal (Antracite)		Partly reclaimed					
28	Juan Bautista, Garcia Losa	Spain	Igüeña	León	Mina Igüeña	-6,269	42,714				3500		Hard coal (Antracite)		Partly reclaimed					

Figure 10. Part of the database of waste heaps in Spain.

4. Database in Greece

Coal-forming conditions prevailed in Greece since the onset of the Cenozoic era. In earlier times, almost the whole territory was covered by the sea. Some thin benches of Permo-Carboniferous hard coal occur in the coastal sediments of Chios island (Figure 11, no. 27), on Central Evia (no. 16) and in Peloponnese (no. 24). However, the largest deposits of lignite rank have been formed during Miocene-Pliocene and Pleistocene and particularly those of Ptolemais (no. 6-7) and Megalopolis (no. 23). Prosilio (no. 8) was formed during Miocene to Pliocene and includes both xylite-rich (bottom) and matrix (upper) seams (Figure 11).



(1) Orestias, (2) Alexandroupolis, (3) Drama, Kormista, Eliokomi, Proti, (4) Serres, (5) Almopia, (6) Florina basin (Vevi, Achlada, Lofi), (7) Ptolemais basin (Amyntaeo, Anargyri, Vegora, Komnina, Kariochori, Ptolemais), (8) Kozani basin (Trigoniko, Prosilio, Lava, Servia), (9) Elassona, (10) Moschopotamos, Katerini, (11) Middle Hellenic trough, (12) Ioannina, (13) Preveza, (14) Almyros, (15) Zeli, (16) Paliouras, (17) Aliveri, Kymi, (18) Biotia, (19) Attiki, (20) Kalavryta, (21) Pyrgos, Olympia, Vasilaki, (22) Chomatero –Koroni, (23) Megalopolis, (24) Monemvasia, (25) Kandanos, (26) Samos, (27) Chios, (28) Rhodos

Figure 11. Schematic map of Greece with the main lignite deposits (Christanis, 2004).

Coal mining in Greece has historically been associated almost exclusively with lignite (brown coal), which constitutes the country's only significant domestic fossil fuel resource. The first attempts to exploit lignite deposits date back to 1873, when mining

activities began in Aliveri on the island of Euboea. However, large-scale exploitation of lignite did not occur until the mid-20th century, when the rapid electrification of the country required a reliable domestic energy source.

A decisive milestone was the establishment of the Public Power Corporation (PPC) in 1951, which undertook the systematic development of lignite mining and lignite-fired power generation. During the 1950s and 1960s, extensive mining operations were developed in the Ptolemaida–Amyntaio–Florina basin in Western Macedonia, which contains the largest lignite reserves in Greece and accounts for the majority of the country's deposits. The exploitation of this basin led to the creation of one of the largest lignite mining complexes in Europe and became the backbone of the Greek electricity system for several decades.

In parallel, another major lignite centre was developed in Megalopolis in the Peloponnese, where systematic exploration began in the late 1950s and large-scale mining commenced in 1969–1970 to supply the newly constructed Megalopolis lignite-fired power plants. Over time, several open-pit mines (including Thoknia, Choremi, Kyparissia and Marathousa) were developed in the area, supplying lignite for electricity generation and contributing significantly to regional economic development.

From the 1970s to the early 2000s, lignite became the dominant fuel for electricity production in Greece, at times supplying more than 60–70% of the country's power generation. During this period, lignite mining expanded considerably, with annual production reaching tens of millions of tonnes and providing employment for thousands of workers, particularly in the regions of Western Macedonia and Arcadia. In total, more than 2 billion tonnes of lignite were extracted from Greek mines during the second half of the 20th century and the early decades of the 21st century.

However, from the late 2000s onwards, the Greek lignite industry entered a period of rapid decline due to stricter environmental regulations, rising carbon emission costs under the European Union Emissions Trading System, and the gradual shift toward renewable energy sources. National decarbonization policies adopted during the late 2010s accelerated the closure of lignite-fired power plants and the associated mines. As a result, lignite production decreased sharply, and most mining operations were progressively shut down as part of the country's energy transition strategy.

Today, lignite extraction in Greece has largely ceased, marking the end of an industry that played a central role in the country's post-war industrialization and energy security. Nevertheless, the legacy of lignite mining remains evident in the extensive open-pit mines, waste dumps, and heavily modified landscapes that characterize the former

mining regions of Western Macedonia and Megalopolis, where large-scale environmental restoration and economic transition programs are currently underway. However, there is a scarcity of recent data regarding the waste deposits, and/or handling of them, as well as of a systematic recording of the waste-dumps in a state repository. The herein inventory of coal waste dumps in Greece has been compiled based on the information provided by internal company data, available in published reports from Public Power Corporation (PPC) and personal communication, Kozanis' Mining Co G.P., and published data from Antoniadis et al. (2022) (Figures 12 and 13).

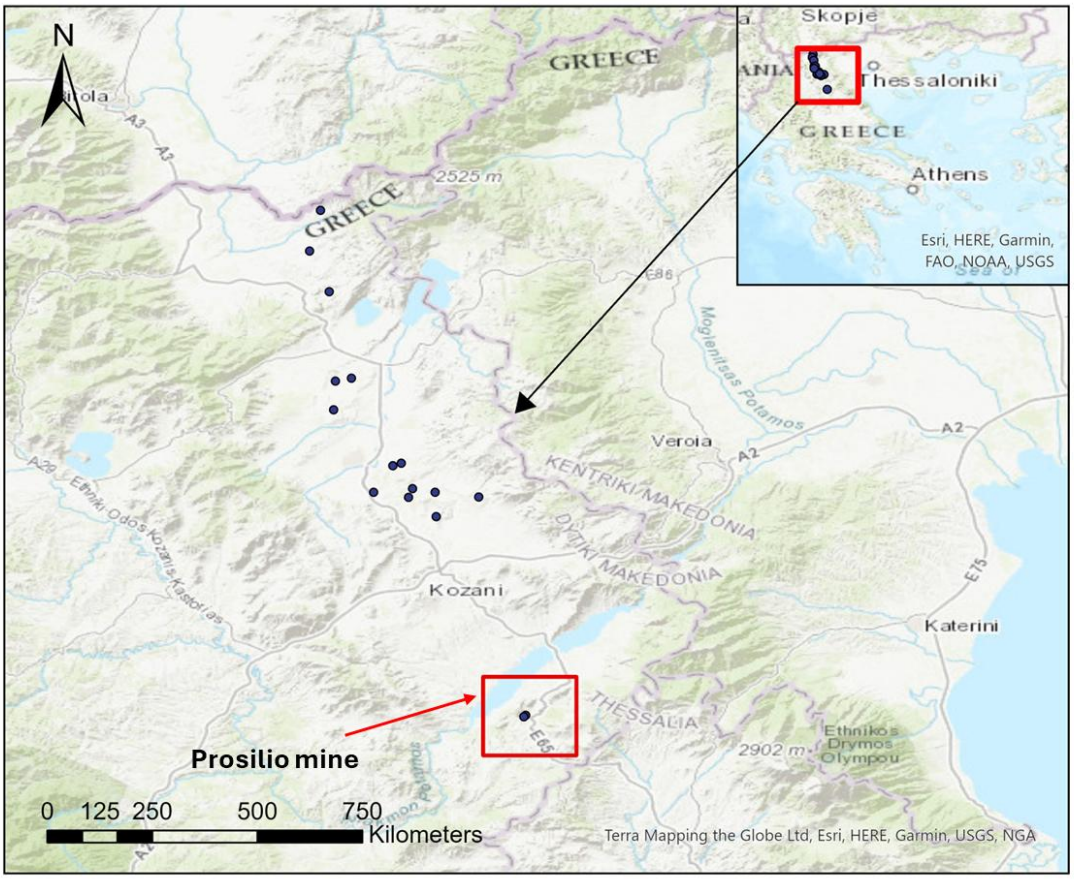


Figure 12. Location of the inventoried lignite-mining waste heaps in Greece.

The available data were systematically processed, and the georeferenced dataset comprising the coal mine waste dumps of the Western Macedonia. A total of 16 coal waste dump sites were inventoried in Greece (and more specifically northern Greece in Western Macedonia), shown in Figure 12. All of the waste heaps and dumps are located

within the ining leases and represent both backfilling of open cast mines as well as external heaps. The majoprity contain exclusively mining wastes, meaning overburden and interburden lithologies, whereas some dumps of PPC contain also wastes from the power plants, i.e. bottom and fly ashes.

The recorded data for each waste dump refers to geographical location, available quantities and characteristics of the infilled sediments, and their lithostratigraphic origin, information on any risk and reclamation status, and finally dumping periods (Figure 13).

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U		V	W
No	Basic information	Location	Location	Location	Location	Location	Location	Location	Location	Location	Morphology	Morphology	Morphology	Hazards	Reclamation	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Dumping Period	Dump Height (m)
	Owner	Country	Voivodeship	City	Colliery	X coordinate (WGS84)	Y coordinate (WGS84)	N coordinate	E coordinate	Area, ha	Volume, m^3	Mass, mg	Material type	Fire	Status	Strat_Name	1_Clastic and sandy clays	2_Marls	3_sands	4_gravels	5_Conglomerates	Dumping Period	Dump Height (m)
1	Kozanis' Mining Co G.P.	Greece	W. Macedonia	Kozani	Prosilio	21,9307	40,13607			180	60000000		Xylite-rich Lignite	Yes (has happened a few times)	Not reclaimed	Komnin on Fm.							100
2	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	North Field	21,7484	40,50671						Xylite-rich Lignite	Yes (has happened a few times)	Reclaimed	Komnin on Fm.	1	2				1987-2006	70-100
3	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Kardia	21,7979	40,46382						Matrix Lignite	Yes (has happened a few times)	Reclaimed	Ptolemais Fm.	1	2	3	4		1979-2019	80-130
4	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Kardia	21,8622	40,45709						Matrix Lignite	Yes (has happened a few times)	Reclaimed	Ptolemais Fm.	1	2 (calcareous)	3			1980-2019	30-120
5	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Kardia	21,7996	40,42803						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.	1	2				2006-2019	100-130
6	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	North Field	21,7359	40,50282						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.	1	2				2002-2017	90-120
7	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Mavropigi	21,7076	40,464						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.		2		4	5	2011-2019	20-50
8	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Mavropigi	21,7587	40,45662						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.	1	2				2009-2018	40-60
9	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Mavropigi	21,7648	40,46912						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.	1	2	3			1989-2001	40-80
10	Kozanis' Mining Co G.P.	Greece	W. Macedonia	Kozani	Prosilio	21,9283	40,13364			30	2500000		Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.	1	2	3				25
11	Achlada Lignite Mines S.A.	Greece	W. Macedonia	Achlada	Achlada	21,6294	40,87888			46,9		Xylite-rich Lignite and Matrix Lignite				Komnin on Fm.	1	2	3	4	5		
12	Achlada Lignite Mines S.A.	Greece	W. Macedonia	Achlada	Achlada	21,6133	40,81868			110		Xylite-rich Lignite and Matrix Lignite				Komnin on Fm.	1	2	3	4	5		
13	Public Power Corporation (PPC)	Greece	W. Macedonia	Vevi Kleidi	Kleidi	21,6421	40,75889			256			Matrix Lignite			Ptolemais Fm.	1	2	3	4	5		
14	Public Power Corporation (PPC)	Greece	W. Macedonia	Amintaio	Amintaio	21,6515	40,62755			1056			Matrix Lignite			Ptolemais Fm.	1	2	3	4	5		
15	Public Power Corporation (PPC)	Greece	W. Macedonia	Amintaio	Amintaio	21,6752	40,63186			48,4			Matrix Lignite			Ptolemais Fm.	1	2	3	4	5		
16	Public Power Corporation (PPC)	Greece	W. Macedonia	Amintaio	Amintaio	21,6485	40,58504			2017			Matrix Lignite			Ptolemais Fm.	1	2	3	4	5		

Figure 13. Extract of the database of waste heaps in Greece.

Based on the geological frame and the potentiality for REE enrichements, as well as supportive logistics from the operative companies, the Prosilio mining area was selected for sampling purposes (Figure 14). Prosilio deposit belongs to the >140-km-long tectonic trench of western Macedonia extending in a NNW–SSE direction from Northern Macedonia to the North, towards the Kozani-Servia basin, located southern of Aliakmon River, in the south. The margins and the basement of the basin consist of crystalline rocks of the Pelagonian nappe and the Axios geotectonic zone (Kilias and Mountrakis, 1989). A group of normal faults oriented NW–SE was active during the post-alpidic extension tectonic phase and formed a Middle Miocene–Early Pliocene trench. The composite sedimentary section displayed within the lignite mine of Prosilio is almost 200 m thick and consist of lacustrine, fluvial and alluvial sediments, including marls, xylite-rich and matrix lignite layers, clays, diatomites, sands, silts and conglomerates.

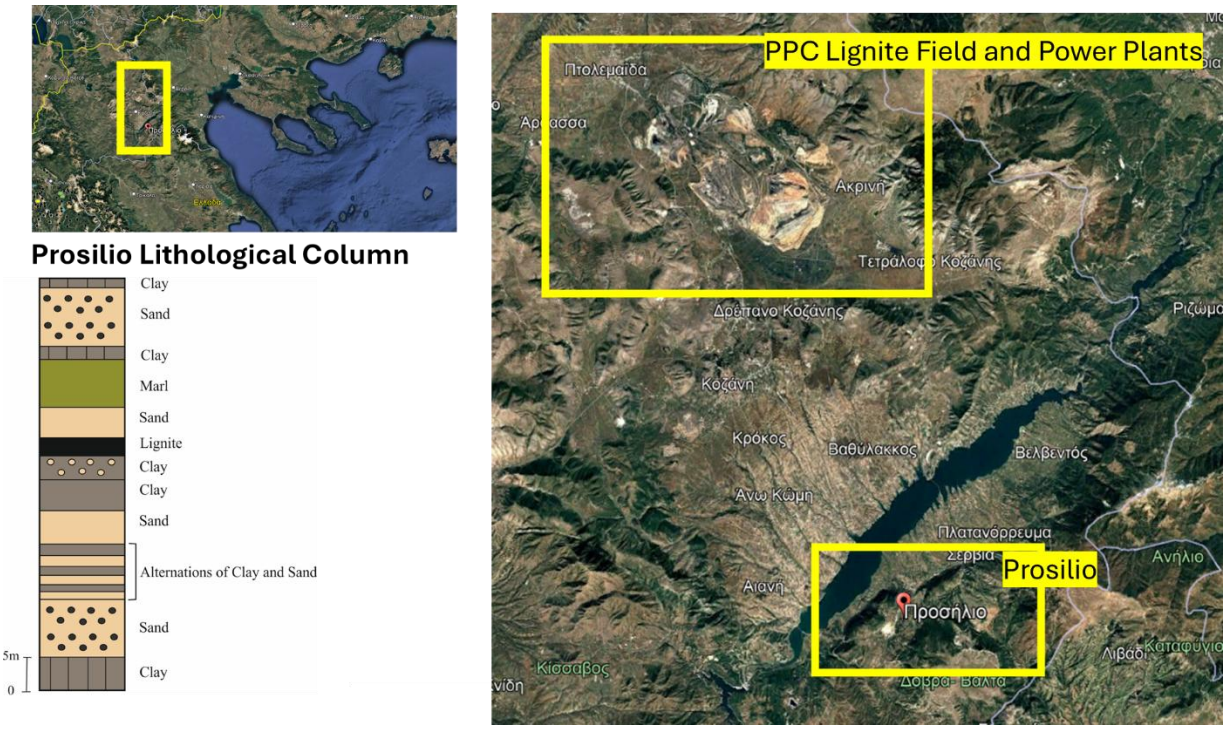


Figure 14. Location and lithological column of Prosilio mine.

5. Summary

A comprehensive inventory and critical analysis of coal mining waste in Poland, Spain, and Greece were carried out, integrating geological, lithostratigraphic, quality, and spatial data.

In Poland, the existing SUMAD database, covering 152 waste heap sites, was systematically updated and supplemented with lithostratigraphic information on coal seams. This allowed for the identification of representative locations for waste sampling, taking into account both the diversity of lithostratigraphic series and the morphological characteristics of the heaps. Detailed lithostratigraphic mapping of the Upper Silesian Coal Basin enabled precise linking of individual waste heaps to the corresponding geological units, which is essential for assessing the distribution and recovery potential of critical raw materials.

In Spain, due to the absence of active coal mines, the inventory was based on historical data from the 1989 IGME database. This resulted in the documentation of 141 coal waste dump sites, covering the main historic coal basins in Asturias, León, Palencia, Teruel, Zaragoza, Córdoba, and Seville. The georeferenced dataset allows for further analyses,

planning of field investigations, and assessment of the potential for recovering valuable materials from historic coal waste.

In Greece, a detailed inventory of exploitation waste in Western Macedonia was compiled, considering Miocene and Pliocene lignite-bearing sequences. A total of 16 sites were inventoried. Lithostratigraphic and quality data were integrated for both organic-rich and inorganic strata, with particular attention to volcanic layers (notably in the Ptolemais basin) and strata significantly influenced by detrital material from the ultramafic basement (especially in the Prosilio basin), due to their potential relevance for rare earth element (REE) concentrations.

The collected and supplemented datasets resulted in a consistent, comprehensive, and georeferenced inventory of coal mining waste across all three regions. This dataset provides a solid basis for targeted field investigations, sampling, and assessment of the distribution and recovery potential of critical raw materials, including rare earth elements, from both waste heaps and selected in situ strata.

6. Literature

Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in Exhausted Surface Lignite Mines. Challenges and Solutions. Mater. Proc. 2021, 5, 93.

Christanis, K., 2004. Coal facies studies in Greece. Int. J. Coal Geol., 58: 99-106.

Misiak J. (2017). Skład petrograficzny i formy litotypów węgla kamiennego w utworach karbonu górnego Górnośląskiego Zagłębia Węglowego. Gospodarka Surowcami Mineralnymi, T. 33, z. 3(3), 109–120. https://doi.org/10.1515/GOSPO-2017-0037

Misiak J. (2017). Petrological and facies characteristics of bituminous coal seam No. 111 from the Libiąż layers in the region of Dąb near Chrzanów (USCB). Gospodarka Surowcami Mineralnymi – Mineral Resources Management. 35/4. 85–96 doi:10.24425/gsm.2019.128544

Poniewiera M., Jelonek I., Gąsior B. (2015). Model złoża oparty na parametrach jakościowych węgli kamiennych - pierwszy komunikat. Czasopismo Inżynierii Lądowej, Środowiska i Architektury, z. 4, 379-393, https://doi.org/10.7862/rb.2015.203

Jureczka J. et al. (2009) Rozpoznanie formacji i struktur do bezpiecznego geologicznego składowania CO2 wraz z ich programem monitorowania. Raport Merytoryczny nr 3: Segment I, Rejon GZW. Państwowy Instytut Geologiczny. Warszawa

Budowa geologiczna regionu górnośląskiego. Available online: https://geopo rtal.pgi.gov.pl/ zrozumiec_ziemie/wycieczki/jura_krakowsko_czestochowska_1/teoria/E2670F3AB8737 0D4E0430A00037570D4 (accessed on 6 February 2026)

Buła Z., Kotas A. (1994) Atlas geologiczny Górnośląskiego Zagłębia Węglowego. Część III : mapy geologiczno-strukturalne. 1:100 000. Państwowy Instytut Geologiczny. WarszawaG

Jureczka J., Nowak G. J. (2016) Polskie zagłębia węgla kamiennego – przegląd informacji i badań geologicznych. Przegląd Geologiczny, vol. 64, nr 9. 617-630

Szlugaj J. (2020) Charakterystyka mineralogiczno-petrograficzna odpadów wydobywczych z wybranych kopalń węgla kamiennego w aspekcie ich wykorzystanie do produkcji kruszyw mineralnych. Studia, rozprawy, monografie 214. Wydawnictwo Instytutu Gospodarki Surowcami Mineralnymi I Energią PAN. Kraków

Pluta S. (2023) Rozprawa doktorska. Wpływ solanek na termiczny rozkład węgla utworów karbonu Górnośląskiego Zagłębia Węglowego. Gliwice

Kędzior, S.; Dreger, M. (2022) Geological and Mining Factors Controlling the Current Methane Conditions in the Rydułtowy Coal Mine (Upper Silesian Coal Basin, Poland). Energies 2022, 15, 6364

https://doi.org/10.3390/en15176364Olszar-Pieczko M. et al. (2004) Program Ochrony Środowiska Gminy Libiąż. Ośrodek Badań i Kontroli Środowiska P.P. w Katowicach. Katowice

Białecka B., Biały W. (2014) Tereny pogórnicze – szanse, zagrożenia. Analiza przypadku. PA NOWA S.A. Gliwice

J. Jureczka (2021) Profile Głębokich Otworów Wiertniczych – Wesoła PIG 1, PIG 2h. Zeszyt 160. Państwowy Instytut Geologiczny - Państwowy Instytut Badawczy. Warszawa

Wagner D. (2017) Zanikanie deformacji powierzchni śródmieścia Bytomia po zakończonej eksploatacji przez KWK Centrum. Przegląd Górniczy No 12, 31-37

Wagner D. (2019) Zanikanie obniżania powierzchni śródmieścia Bytomia w latach 2015-2018 po zakończonej eksploatacji przez KWK Centrum. Przegląd Górniczy No 01, 33-39

Jaros J. (1983) Kopalnia Brzeszcze (1903-1983). Śląski Instytut Naukowy. Katowice

Klabis L., Kowalski A. (2015) Eksploatacja górnicza w filarze ochronnym dla śródmieścia Bytomia, historia i teraźniejszość. Przegląd Górniczy No 5, 33-43

Goszcz R. (2004) Program Ochrony Środowiska dla Miasta Będzina na lata 2004-2015. Urząd Miejski w Będzinie. Będzin.

Albrecht J. (2019) Profilaktyka zagrożenia sejsmicznego w warunkach współwystępujących zagrożeń tąpaniami i metanowego na przykładzie eksploatacji III warstwy pokładu 510 w polu S ścianą 16b-S, w PGG S.A. Oddział KWK Murcki-Staszic. Przegląd Górniczy No 3, 32-39

Sojka A., Szuba G. (2016) Udostępnienie i rozcięcie pokładu 405/1 w partii L w obszarze górniczym Halemba II KWK „Halemba-Wirek". Systemy Wspomagania W Inżynierii Produkcji. Górnictwo – perspektywy i zagrożenia. 1(13) Gliwice

Setlak K., Gołda A., Moszko M. (2010) Zaszłości eksploatacyjne jako czynnik kształtowania aktywności sejscmicznej górotworu na przykładzie eksploatacji pokładu 207 w bloku E w OG „Lędziny I". Górnictwo i Geoinżynieria, Year 34, 2, 561-568

Nieć M. (2016) Możliwości i problemy zgazowania węgla na dużej głębokości metodą szybowo-otworową (hybrydową). Przegląd Górniczy No 5, 97-101

Adamczyk A. (2012) Dzieje kopalni Węgla Kamiennego Rydułtowy-Anna. Kopalnia Charlotte 1806-1945. Art. Druk s.c. Rybnik

Gabzdyl W., Probierz K., Marcisz M. (2004) Dokładność rozpoznania geologicznego złoża a możliwość selektywnej eksploatacji pokładów węgla. Zeszyty Naukowe Politechniki Śląskiej. Seria Górnictwo No 260, 69-79 Gliwice

https://zapadliska.gig.eu/pl/content/kopalnie

Jaros J. (1973) Historia górnictwa węglowego w Polsce Ludowej (1934-1970). Państwowe Wydawnictwo Naukowe. Kraków

Frankowski Z. et al. (2012) Zasady dokumentowania warunków geologiczno-inżynierskich dla potrzeb rekultywacji terenów zdegradowanych. Państwowy Instytut Geologiczny – Państwowy Instytut Badawczy. Warszawa

Firlit I. (2007) Eksploatacja pokładu 402 w KWK „Staszic" w aspekcie ochrony użytku ekologicznego źródła Kłodnicy. Górnictwo i Geoinżynieria, Year 31, No 3/1, 29-38

Pozzi M., Mzyk T. (2007) Ocena wpływu odpadów ulokowanych w wyrobiskach podziemnych kopalń na środowisko w świetle modelowania hydrogeochemicznego. Górnictwo i Geoinżynieria, Year 31, No 3/1, 148-161

Jaros J. (1962) Historia Kopalni Król w Chorzowie (1791-1945). WGH Katowice

Jaros J. (1984) Słownik historyczny kopalń węgla na ziemiach polskich. Śląski Instytut Naukowy. Katowice

Lisowski A. (2006) Górnictwo Węgla Kamiennego w Polsce. Ku następnej generacji kopalń i sektora (1996-2005). Główny Instytut Górnictwa. Katowice

Kilias, A., Mountrakis, D., 1989. The Pelagonian Nappe, tectonics, metamorphism and magmatism. Bull. Geol. Soc. Greece XXIII/ 1, 29– 46 (in Greek).

ATTACHMENT 1 - POLAND

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
No	Basic information	Location	Location	Location	Location	Location	Location	Location	Location	Location	Morphology	Morphology	Morphology	Hazards	Reclamation	Lithostratigraphic_ Series	Lithostratigraphic_ Series	Lithostratigraphic_ Series	Lithostratigraphic_ Series	Lithostratigraphic_ Series
	Owner	Country	Voivodeship	City	Colliery	X coordinate	Y coordinate	N coordinate	WE coordinate	Area, ha	Volume, m^3	Mass, mg	Material type	Fire	Status	Strat_Name	1_Crac_Sand	2_Mudstone	3_Upp_Siles_Sand	4_Paralic
1	KWSA, co-investor KWK Budryk	Poland	Silesia region	Knurów	Budryk KWK, Knurów KWK,	477002.09	259497.6	50 12 8,05	18 40 39,53	437.30	37000000		Hardcoal	Not hazardous	Not reclaimed	Mudstone Series,Upper		2	3	
2		Poland	Silesia region	Piekary Śląskie	Andaluzja KWK	498590.08	276880.85	50 21 32,64	18 58 48,62	10.60	1330000	2261000	Hardcoal		Partly reclaimed	Upper Silesian Sandstone Series			3	
3		Poland	Silesia region	Pszów	Anna KWK	457133.9	242323.86	50 2 47,88	18 24 3,99	8.20	1157000	1970000	Hardcoal		Reclaimed	Paralic Series				4
4		Poland	Silesia region	Wodzisław Śląski	Anna KWK	460115.43	238657.44	50 0 49,89	18 26 35,32	3.20	122000	208000	Hardcoal		Reclaimed	Paralic Series				4
5		Poland	Silesia region	Lubomia	Anna KWK	449543.04	236611.47	49 59 40,74	18 17 44,94	44.00	5034000	8558000	Hardcoal	Not hazardous	Partly reclaimed	Paralic Series				4
6		Poland	Silesia region	Chorzów	Barbara Chorzów KWK	495369.07	271665.47	50 18 43,68	18 56 5,78	2.80			Hardcoal		Reclaimed	Upper Silesian Sandstone			3	4
7		Poland	Silesia region	Chorzów	Barbara Chorzów KWK	497196.07	272490.63	50 19 10,44	18 57 38,16	9.60			Hardcoal			Upper Silesian Sandstone			3	4
8	Perpetual use by KWK Chwałowice	Poland	Silesia region	Ruda Śląska	Bielszowice KWK	487905.46	264101.35	50 14 38,32	18 49 49,18	25.50			Hardcoal	Not hazardous	Reclaimed	Mudstone Series,Upper		2	3	
9		Poland	Silesia region	Bytom	Bobrek KWK	491013.61	274324.39	50 20 9,61	18 52 25,28	4.40	412000	700000	Hardcoal			Upper Silesian Sandstone			3	4
10		Poland	Silesia region	Bytom	Bobrek KWK Ruch I	491823.38	275689.63	50 20 53,87	18 53 6,14	13.00		1300000	Hardcoal	Not hazardous	Partly reclaimed	Upper Silesian Sandstone			3	4
11		Poland	Silesia region	Bytom	Bobrek KWK Ruch I	490044.47	275647.44	50 20 52,40	18 51 36,11	16.00		2890000	Hardcoal	Not hazardous	Partly reclaimed	Upper Silesian Sandstone			3	4
12		Poland	Silesia region	Bytom	Bobrek-Centrum KWK	491645.64	276385.72	50 21 16,40	18 52 57,09	2.36	477200	811200	Hardcoal		Reclaimed	Upper Silesian Sandstone			3	4
13	KWSA, KWK Bobrek-Centrum Ruch Bobrek	Poland	Silesia region	Bytom	Bobrek-Centrum KWK Ruch Bobrek	487433.92	276236.5	50 21 11,30	18 49 23,91	32.00			Hardcoal	Not hazardous	Partly reclaimed	Upper Silesian Sandstone			3	4
14	KWK Bobrek Centrum Ruch Centrum	Poland	Silesia region	Bytom	Bobrek-Centrum KWK Ruch Centrum	492337.05	277439.63	50 21 50,57	18 53 32,01	14.60			Hardcoal	Not hazardous	Not reclaimed	Upper Silesian Sandstone			3	4
15	State Treasury of Poland, managing by Bytomskiej Spółki Węglowej S.A.	Poland	Silesia region	Bytom	Bobrek-Centrum KWK	496245.64	274326.35	50 20 9,88	18 56 50,02	8.00			Hardcoal	Not hazardous	Partly reclaimed	Upper Silesian Sandstone			3	4
16	State Treasury of Poland, KWK Bolesław Śmiały	Poland	Silesia region	Łaziska Górne	Bolesław Śmiały KWK	489695.05	252661.17	50 8 27,93	18 51 20,68	30.00		15500000	Hardcoal	Hazardous	Partly reclaimed	Mudstone Series		2		
17	State Treasury of Poland, KWK Bolesław Śmiały	Poland	Silesia region	Łaziska Górne	Bolesław Śmiały KWK	491408.33	252746.33	50 8 30,78	18 52 47,01	18.30			Hardcoal	Hazardous	Partly reclaimed	Mudstone Series		2		
18		Poland	Silesia region	Brzeszcze	Brzeszcze KWK	513142.63	235244.6	49 59 3,64	19 11 0,16	13.20	970000	1650000	Hardcoal		Partly reclaimed	Cracow Sandstone,Mudsto	1	2	3	4
19		Poland	Silesia region	Brzeszcze	Brzeszcze KWK	512775.05	236815.3	49 59 54,54	19 10 41,89	34.20	1000000	1700000	Hardcoal		Partly reclaimed	Cracow Sandstone,Mudsto	1	2	3	4
20		Poland	Silesia region	Brzeszcze	Brzeszcze KWK	511702.4	234025.46	49 58 24,26	19 9 47,69	30.00	3500000	5950000	Hardcoal		Reclaimed	Cracow Sandstone,Mudsto	1	2	3	4
21	KWK Brzeszcze, private	Poland	Silesia region	Brzeszcze	Brzeszcze KWK	508793.8	234966.86	49 58 54,93	19 7 21,69	30.25			Hardcoal	Not hazardous	Partly reclaimed	Cracow Sandstone,Mudsto	1	2	3	4
22	KWK Brzeszcze , private	Poland	Silesia region	Brzeszcze	Brzeszcze KWK	513597.71	234137.96	49 58 27,76	19 11 22,88	43.70			Hardcoal	Not hazardous	Partly reclaimed	Cracow Sandstone,Mudsto	1	2	3	4
23	KWK S.A.- ZZM in Bieruń, State Treasury of Poland, private	Poland	Silesia region	Bestwina	Brzeszcze KWK	502123.46	226239.38	49 54 12,48	19 1 46,48	14.10			Hardcoal			Cracow Sandstone,Mudsto	1	2	3	4
24	State Treasury of Poland	Poland	Silesia region	Bestwina	Brzeszcze KWK	502789.09	230555	49 56 32,25	19 2 19,97	14.60	3473000	5900000	Hardcoal		Reclaimed	Cracow Sandstone,Mudsto	1	2	3	4
25	State Treasury of Poland, perpetual use by Zakład Zagspodarowania Mienia in Bieruń	Poland	Silesia region	Pszczyna	Brzeszcze KWK	500744.5	231070.36	49 56 48,96	19 0 37,36	4.76			Hardcoal			Cracow Sandstone,Mudsto	1	2	3	4
26	PGG, State Treasury of Poland	Poland	Silesia region	Bestwina	Brzeszcze KWK	501447.68	230672.97	49 56 36,09	19 1 12,65	3.83			Hardcoal			Cracow Sandstone,Mudsto	1	2	3	4
27		Poland	Silesia region	Bytom	Centrum-Szombierki KWK	493142.91	273845.1	50 19 54,19	18 54 13,05	3.00			Hardcoal		Reclaimed	Upper Silesian Sandstone			3	4
28		Poland	Silesia region	Ruda Śląska	Centrum-Szombierki KWK	491681.58	273190.02	50 19 32,91	18 52 59,17	3.20			Hardcoal		Reclaimed	Upper Silesian Sandstone			3	4
29		Poland	Silesia region	Ruda Śląska	Centrum-Szombierki KWK	491922.2	273131.42	50 19 31,02	18 53 11,34	2.40			Hardcoal	Not hazardous	Reclaimed	Upper Silesian Sandstone			3	4
30		Poland	Silesia region	Bytom	Centrum-Szombierki KWK	492083.92	276246.27	50 21 11,91	18 53 19,29	10.00			Hardcoal		Not reclaimed	Upper Silesian Sandstone			3	4
31	State Treasury of Poland, perpetual use by KWK Chwałowice	Poland	Silesia region	Rybnik	Chwałowice KWK	467539.65	243652.34	50 3 33,28	18 32 46,94	14.10			Hardcoal	Not hazardous	Partly reclaimed	Upper Silesian Sandstone			3	4
32	State Treasury of Poland, perpetual use by KWK Chwałowice	Poland	Silesia region	Rybnik	Chwałowice KWK	468318.95	244926.17	50 4 14,69	18 33 25,76	6.88			Hardcoal		Partly reclaimed	Mudstone Series,Upper		2	3	
33		Poland	Silesia region	Rybnik	Chwałowice KWK	468445.12	243699.99	50 3 35,00	18 33 32,48	35.30			Hardcoal		Partly reclaimed	Mudstone Series,Upper		2	3	
34	Private, State Treasury of Poland, perpetual use by KWK Chwałowice	Poland	Silesia region	Rybnik	Chwałowice KWK	468471.29	244855.46	50 4 12,43	18 33 33,45	5.64	480000		Hardcoal	Not hazardous	Reclaimed	Mudstone Series,Upper		2	3	
35	Private, State Treasury of Poland, perpetual use by KWK Chwałowice	Poland	Silesia region	Rybnik	Chwałowice KWK	467580.67	243564.84	50 3 30,46	18 32 49,03	71.32			Hardcoal			Mudstone Series,Upper		2	3	
36	5,36 ha State Treasury of Poland, 1,08 ha private, 18,06 ha perpetual use of KWK Chwałowice	Poland	Silesia region	Rybnik	Chwałowice KWK	468036.92	243402.34	50 3 25,28	18 33 12,03	24.50		27000000	Hardcoal	Not hazardous	Reclaimed	Mudstone Series,Upper		2	3	
37		Poland	Silesia region	Rybnik	Chwałowice KWK	468718.17	243614.84	50 3 32,30	18 33 46,24	37.00	3415000	5805000	Hardcoal	Not hazardous	Partly reclaimed	Mudstone Series,Upper		2	3	
38		Poland	Silesia region	Rybnik	Chwałowice KWK	464423.24	243095.7	50 3 14,61	18 30 10,35	3.00	120000	204000	Hardcoal	Not hazardous	Reclaimed	Mudstone Series,Upper		2	3	
39		Poland	Silesia region	Rybnik	Chwałowice KWK	464841.6	244027.34	50 3 44,88	18 30 31,08	8.40	800000	1360000	Hardcoal	Not hazardous	Reclaimed	Mudstone Series,Upper		2	3	
40		Poland	Silesia region	Rybnik	Chwałowice KWK	466114.26	244264.06	50 3 52,81	18 31 35,03	3.80	60000	102000	Hardcoal	Not hazardous	Reclaimed	Mudstone Series,Upper		2	3	
41		Poland	Silesia region	Tychy	Czeczott KWK	509578.77	241042.98	50 2 11,68	19 8 1,67	12.30	500000	850000	Hardcoal		Reclaimed	Cracow Sandstone	1			
42		Poland	Silesia region	Miedźna	Czeczott KWK	509546.74	240921.89	50 2 7,76	19 8 0,05	9.00	188000	320000	Hardcoal		Reclaimed	Cracow Sandstone	1			
43		Poland	Silesia region	Czerwionka-Leszczyny	Dębieńsko KWK	478013	255087.06	50 9 45,35	18 41 31,46	97.00	22000000	35900000	Hardcoal	Hazardous	Partly reclaimed	Mudstone Series		2		
44		Poland	Silesia region	Gliwice	Gliwice KWK	469707.82	269379.61	50 17 26,91	18 34 28,63	10.34	2594000	5450000	Hardcoal		Partly reclaimed	Paralic Series				4
45		Poland	Silesia region	Psary	Grodziec KWK	507206.68	277886.51	50 22 5,06	19 6 4,91	8.30	953000	1620000	Hardcoal		Partly reclaimed	Upper Silesian Sandstone			3	4
46		Poland	Silesia region	Wojkowice	Grodziec KWK	504548.64	276831.19	50 21 30,98	19 3 50,27	20.80	2700000	4590000	Hardcoal		Reclaimed	Upper Silesian Sandstone			3	4
47		Poland	Silesia region	Wojkowice	Grodziec KWK	502505.63	277814.79	50 22 2,88	19 2 6,87	6.32	203000	345000	Hardcoal			Upper Silesian Sandstone			3	4
48		Poland	Silesia region	Ruda Śląska	Halemba KWK	489425.67	268183.67	50 16 50,64	18 51 5,54	9.50	360000	612000	Hardcoal	Hazardous	Partly reclaimed	Upper Silesian Sandstone Series			3	
49	Perpetual use by KWK Halemba	Poland	Silesia region	Mikołów	Halemba KWK	492472.59	261011.64	50 12 58,53	18 53 40,06	118.40		31700000	Hardcoal		Partly reclaimed	Upper Silesian Sandstone Series			3	
50	KW S.A.	Poland	Silesia region	Ruda Śląska	Halemba KWK	490329.62	264211.64	50 14 42,05	18 51 51,60	7.10	300000		Hardcoal		Not reclaimed	Upper Silesian Sandstone Series			3	
51		Poland	Silesia region	Jaworzno	Jan Kanty KWK	514883.16	263970.37	50 14 33,85	19 12 31,63	28.90	1065000	1810000	Hardcoal		Reclaimed	Cracow Sandstone,Mudsto	1	2		
52		Poland	Silesia region	Libiąż	Janina KWK	521864.18	245888.21	50 4 47,44	19 18 20,44	66.00	10846000	18438000	Hardcoal		Partly reclaimed	Cracow Sandstone	1			
53	State Treasury of Poland, perpetual use by KWK Jankowice	Poland	Silesia region	Świerklany	Jankowice KWK	467746.54	240939.56	50 2 5,46	18 32 58,17	32.62			Hardcoal	Not hazardous	Reclaimed	Upper Silesian Sandstone Series			3	
54	State Treasury of Poland, perpetual use by KWK Jankowice	Poland	Silesia region	Świerklany	Jankowice KWK	468799.66	242992.69	50 3 12,16	18 33 50,52	70.10	5600000	9520000	Hardcoal			Upper Silesian Sandstone Series			3	
55	City of Marklowice, Polish State Forests	Poland	Silesia region	Marklowice	Jankowice KWK	467706.7	240355.19	50 1 46,53	18 32 56,34	56.38			Hardcoal	Not hazardous	Partly reclaimed	Upper Silesian Sandstone Series			3	
56	State Treasury of Poland, perpetual use by KWK Jankowice	Poland	Silesia region	Świerklany	Jankowice KWK	469937.16	240581.75	50 1 54,29	18 34 48,42	8.50		30000	Hardcoal	Not hazardous	Reclaimed	Upper Silesian Sandstone Series			3	

57		Poland	Silesia region	Jaworzno	Jaworzno KWK	512987.42	260833.81	50 12 52,43	19 10 55,50	78.00	3350000	5695000	Hardcoal		Reclaimed	Cracow Sandstone	1			
58		Poland	Silesia region	Wojkowice	Jowisz KWK	503633.23	276159.27	50 21 9,24	19 3 3,90	7.60	1000000	1700000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone			3	4
59		Poland	Silesia region	Wojkowice	Jowisz KWK	503648.86	275968.65	50 21 3,07	19 3 4,69	6.80	800000	1360000	Hardcoal		Not reclaimed	Upper Sielesian Sandstone			3	4
60		Poland	Silesia region	Wojkowice	Jowisz KWK	501823.08	277928.02	50 22 6,55	19 1 32,31	10.68	1700000	2890000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone			3	4
61		Poland	Silesia region	Sosnowiec	Kazimierz-Juliusz KWK	517225.35	268907.87	50 17 13,53	19 14 30,72	11.30	292000	496000	Hardcoal		Reclaimed	Upper Sielesian Sandstone Series			3	
62		Poland	Silesia region	Sosnowiec	Kazimierz-Juliusz KWK	517040.97	268373.5	50 16 56,24	19 14 21,31	20.00	435000	739000	Hardcoal		Reclaimed	Upper Sielesian Sandstone Series			3	
63		Poland	Silesia region	Sosnowiec	Kazimierz-Juliusz KWK	515422.22	266711	50 16 2,56	19 12 59,25	7.60	600000		Hardcoal		Reclaimed	Upper Sielesian Sandstone Series			3	
64		Poland	Silesia region	Sosnowiec	Kazimierz-Juliusz KWK	516919.1	266926.62	50 16 9,39	19 14 14,92	6.30	530000		Hardcoal		Partly reclaimed	Upper Sielesian Sandstone Series			3	
65		Poland	Silesia region	Sosnowiec	Kazimierz-Juliusz KWK	518029.26	266604.75	50 15 58,85	19 15 10,96	2.85	121000	206000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone Series			3	
66		Poland	Silesia region	Zabrze	Makoszowy KWK	484190.59	266359.91	50 15 51,15	18 46 41,23	27.50			Hardcoal		Partly reclaimed	Mudstone Series,Upper		2	3	
67	KWK Makoszowy, State Treasury of Poland	Poland	Silesia region	Zabrze	Makoszowy KWK	484320.27	267850.54	50 16 39,44	18 46 47,56	3.50	300030		Hardcoal	Hazardous	Partly reclaimed	Mudstone Series,Upper		2	3	
68	Perpetual use of KWK Marcel	Poland	Silesia region	Radlin	Marcel KWK	462669.86	241799.05	50 2 32,23	18 28 42,60	56.13			Hardcoal	Hazardous	Partly reclaimed	Upper Sielesian Sandstone			3	4
69		Poland	Silesia region	Radlin	Marcel KWK Ruch II	463210.28	233575.1	49 58 6,00	18 29 12,62	20.70	2615000	4445000	Hardcoal	Not hazardous	Partly reclaimed	Upper Sielesian Sandstone			3	4
70	Polish State Forests	Poland	Silesia region	Godów	Marcel KWK Ruch II	463179.03	233043.85	49 57 48,79	18 29 11,23	16.50	2000000	3400000	Hardcoal	Not hazardous	Reclaimed	Upper Sielesian Sandstone			3	4
71		Poland	Silesia region	Skrzyszów	Marcel KWK Ruch II	464872.78	232046.97	49 57 16,87	18 30 36,60	71.30	10058000	17100000	Hardcoal	Not hazardous	Partly reclaimed	Upper Sielesian Sandstone			3	4
72		Poland	Silesia region	Wodzisław Śląski	Marcel KWK Ruch II	463353.94	234490.75	49 58 35,69	18 29 19,52	3.60	715000	1215000	Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
73		Poland	Silesia region	Wodzisław Śląski	Marcel KWK Ruch II	463246.13	234797	49 58 45,59	18 29 14,00	4.70	1243000	2113000	Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
74		Poland	Silesia region	Dąbrowa Górnicza	Paryż KWK	512163.66	273794.84	50 19 52,25	19 10 15,42				Hardcoal		Not reclaimed	Mudstone Series,Upper		2	3	4
75		Poland	Silesia region	Ruda Śląska	Pokój KWK	491257.72	271658.77	50 18 43,29	18 52 37,85	5.60	379000	644000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone Series			3	
76		Poland	Silesia region	Ruda Śląska	Pokój KWK	488856.15	270088.46	50 17 52,29	18 50 36,56	21.20	2249000	3823000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone Series			3	
77		Poland	Silesia region	Ruda Śląska	Pokój KWK	489633.11	270042.37	50 17 50,85	18 51 15,85	3.60	270000	459000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone Series			3	
78	State Treasury of Poland, perpetual use by KWK Pokój	Poland	Silesia region	Ruda Śląska	Pokój KWK	491120.22	267996.27	50 16 44,67	18 52 31,21	7.00			Hardcoal			Upper Sielesian Sandstone Series			3	
79		Poland	Silesia region	Ruda Śląska	Polska Wirek KWK	493906.15	267290.02	50 16 21,92	18 54 52,05	9.30		2210000	Hardcoal			Upper Sielesian Sandstone			3	4
80	KWK Polska Wirek	Poland	Silesia region	Świętochłowice	Polska Wirek KWK	493878.03	267538.46	50 16 29,97	18 54 50,61	5.26		164300	Hardcoal	Not hazardous	Reclaimed	Upper Sielesian Sandstone			3	4
81	KWK Polska Wirek	Poland	Silesia region	Ruda Śląska	Polska Wirek KWK	493751.47	266466.59	50 15 55,25	18 54 44,28	6.30	700000	1190000	Hardcoal		Not reclaimed	Upper Sielesian Sandstone			3	4
82		Poland	Silesia region	Ruda Śląska	Polska Wirek KWK	494051.47	267005.65	50 16 12,72	18 54 59,41	2.50	190000	323000	Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
83		Poland	Silesia region	Ruda Śląska	Polska Wirek KWK	494335.84	266788.46	50 16 5,69	18 55 13,79	13.90	1086000	1846000	Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
84		Poland	Silesia region	Bytom	Powstańców Śląskich KWK	492810.1	278838.85	50 22 35,90	18 53 55,87	11.60	1451000	2466700	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone			3	4
85		Poland	Silesia region	Bytom	Powstańców Śląskich KWK	491169.47	278598.22	50 22 28,03	18 52 32,80	24.30	2787500	4738700	Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
86		Poland	Silesia region	Zabrze	Pstrowski KWK	485883.56	273025.54	50 19 27,18	18 48 5,87	11.48	1475000	2507000	Hardcoal	Hazardous	Partly reclaimed	Upper Sielesian Sandstone			3	4
87		Poland	Silesia region	Zabrze	Pstrowski KWK	474720.89	258052.22	50 11 20,91	18 38 44,78	5.10	406000	690200	Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
88		Poland	Silesia region	Zabrze	Pstrowski KWK	485756.99	271889.6	50 18 50,38	18 47 59,62	8.60	1290000	2193000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone			3	4
89		Poland	Silesia region	Zabrze	Pstrowski KWK	487040.59	274677.1	50 20 20,77	18 49 4,19	21.90	780000	1326000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone			3	4
90		Poland	Silesia region	Zabrze	Pstrowski KWK	487687.46	274977.1	50 20 30,53	18 49 36,89	3.20	19000	32300	Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
91	BSRK	Poland	Silesia region	Zabrze	Pstrowski KWK	485269.49	275289.6	50 20 40,45	18 47 34,48	25.00	2668000	4535000	Hardcoal	Hazardous	Partly reclaimed	Upper Sielesian Sandstone			3	4
92		Poland	Silesia region	Bytom	Powstańców Śląskich KWK	493312.44	278193.53	50 22 15,03	18 54 21,35	8.00	1100000	1870000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone			3	4
93		Poland	Silesia region	Bytom	Rozbark KWK	494212.45	274693.04	50 20 21,69	18 55 7,12	3.50	15700	26700	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone			3	4
94		Poland	Silesia region	Bytom	Rozbark KWK	494966.35	274116.19	50 20 3,04	18 55 45,30	19.00			Hardcoal	Hazardous	Partly reclaimed	Upper Sielesian Sandstone			3	4
95		Poland	Silesia region	Bytom	Rozbark KWK	494605.41	274950.57	50 20 30,05	18 55 26,99	8.00	800000	1360000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone			3	4
96	Perpetual use of KWK Anna	Poland	Silesia region	Pszów	Rydułtowy KWK Anna	458575.31	242195.73	50 2 44,10	18 25 16,54	37.00			Hardcoal	Hazardous	Partly reclaimed	Paralic Series				4
97		Poland	Silesia region	Rybnik	Rydułtowy KWK	461989.56	244273.6	50 3 52,22	18 28 7,51	22.40	5000000	8500000	Hardcoal	Not hazardous	Partly reclaimed	Paralic Series				4
98	Perpetual use of KWK Rydułtowy	Poland	Silesia region	Rydułtowy	Rydułtowy KWK	460060.16	244164.29	50 3 48,22	18 26 30,47	37.00			Hardcoal	Hazardous	Partly reclaimed	Paralic Series				4
99		Poland	Silesia region	Czeladź	Saturn KWK	505336.82	268313.18	50 16 55,09	19 4 29,74	21.50			Hardcoal			Upper Sielesian Sandstone			3	4
100		Poland	Silesia region	Czeladź	Saturn KWK	506546.31	270223.07	50 17 56,90	19 5 30,99	14.30			Hardcoal			Upper Sielesian Sandstone			3	4
101		Poland	Silesia region	Czeladź	Saturn KWK	505042.4	270282.44	50 17 58,87	19 4 14,95	15.10			Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
102		Poland	Silesia region	Czeladź	Saturn KWK	504368.96	270763.69	50 18 14,48	19 3 40,92	7.00			Hardcoal			Upper Sielesian Sandstone			3	4
103		Poland	Silesia region	Czeladź	Saturn KWK	504072.87	270143.38	50 17 54,40	19 3 25,92	40.00			Hardcoal		Partly reclaimed	Upper Sielesian Sandstone			3	4
104		Poland	Silesia region	Siemianowice Śląskie	Siemianowice KWK	501367.22	270983.97	50 18 21,67	19 1 9,13	3.40	400000	680000	Hardcoal			Upper Sielesian Sandstone			3	4
105		Poland	Silesia region	Bestwina	Silesia Ruch Brzeszcze KWK	504078.73	231232.03	49 56 54,15	19 3 24,72	14.20	1100000	1870000	Hardcoal		Partly reclaimed	Cracow Sandstone,Mudsto	1	2	3	4
106		Poland	Silesia region	Sosnowiec	Sosnowiec KWK	511323.79	264823.5	50 15 1,76	19 9 31,96	20.00	1000000	1700000	Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
107	State Treasury of Poland, KWK Sośnica	Poland	Silesia region	Gliwice/Zabrze	Sośnica KWK	482073.08	267467.77	50 16 26,81	18 44 54,05	160.90		97214000	Hardcoal	Not hazardous	Partly reclaimed	Upper Sielesian Sandstone Series			3	
108	KWSA, KWK Makoszowy	Poland	Silesia region	Gierałtowice	Makoszowy KWK	482080.9	266177.15	50 15 45,01	18 44 54,67	45.00		6262200	Hardcoal	Not hazardous	Partly reclaimed	Mudstone Series,Upper		2	3	
109	KWK Szczygłowice (ZTS Krywald ERG, City of Knurów, partly private)	Poland	Silesia region	Knurów	Szczygłowice KWK	473959.32	259012.08	50 11 51,88	18 38 6,12	72.00		3965900	Hardcoal	Not hazardous	Partly reclaimed	Mudstone Series,Upper		2	3	
110	KWK Szczygłowice, private , State Treasury of Poland	Poland	Silesia region	Knurów	Szczygłowice KWK	473428.85	258424.58	50 11 32,76	18 37 39,51	8.00			Hardcoal			Mudstone Series,Upper		2	3	
111	KWK Szczygłowice, KP Kotlarnia, City of Gliwice	Poland	Silesia region	Gliwice	Szczygłowice KWK	466917.41	265430.45	50 15 18,47	18 32 8,82	65.15			Hardcoal	Not hazardous		Mudstone Series,Upper		2	3	
112	Ownership and perpetual use of KWK Szczygłowice, City of Knurów, private	Poland	Silesia region	Knurów	Szczygłowice KWK	474576.5	258268.33	50 11 27,88	18 38 37,44	40.70			Hardcoal			Mudstone Series,Upper		2	3	
113	KWK Szczygłowice -ownership and perpetual use, private	Poland	Silesia region	Sośnicowice	Szczygłowice KWK	466259.6	264292.95	50 14 41,50	18 31 35,96	61.45			Hardcoal		Partly reclaimed	Mudstone Series,Upper		2	3	
114	KWK Szczygłowice -ownership and perpetual use	Poland	Silesia region	Knurów	Szczygłowice KWK	474078.07	259224.58	50 11 58,78	18 38 12,06	29.00			Hardcoal		Not reclaimed	Mudstone Series,Upper		2	3	
115		Poland	Silesia region	Knurów	Szczygłowice KWK			50 11 34,80	18 38 39,12	8.70	377000	622000	Hardcoal		Not reclaimed	Mudstone Series,Upper		2	3	
116		Poland	Silesia region	Zabrze	Bielszowice KWK	487517.15	272034.91	50 18 55,23	18 49 28,63	35.00			Hardcoal	Hazardous	Partly reclaimed	Mudstone Series,Upper		2	3	

117		Poland	Silesia region	Lędziny	Piast KWK	508882.93	252700.03	50 8 29,27	19 7 27,65	24.82	1175000	1998000	Hardcoal		Reclaimed	Cracow Sandstone	1			
118	KWK Ziemowit	Poland	Silesia region	Lędziny	Ziemowit KWK	509772.77	250815.66	50 7 28,19	19 8 12,32	35.40	5500000	9350000	Hardcoal		Partly reclaimed	Cracow Sandstone,Mudsto	1	2	3	
119	State Treasury of Poland, perpetual use of KWSA	Poland	Silesia region	Gliwice	Gliwice KWK	478077.35	267834.3	50 16 38,20	18 41 32,05	15.33			Hardcoal	Not hazardous	Reclaimed	Paralic Series				4
120	State Treasury of Poland	Poland	Silesia region	Jaworzno	Sobieski ZGE Jaworzno III	520065.76	257810.43	50 11 13,80	19 16 52,18	39.00			Hardcoal		Not reclaimed	Cracow Sandstone,Mudsto	1	2		
121	State Treasury of Poland, perpetual use of KWSA	Poland	Silesia region	Brzeszcze	Brzeszcze KWK	511304.09	233681.04	49 58 13,14	19 9 27,65	9.12	24830		Hardcoal	Not hazardous	Not reclaimed	Cracow Sandstone,Mudsto	1	2	3	4
122	State Treasury of Poland, perpetual use of KWSA	Poland	Silesia region	Ruda Śląska	Pokój KWK	491337.4	271471.27	50 18 37,22	18 52 41,90	13.36			Hardcoal	Not hazardous	Not reclaimed	Upper Sielesian Sandstone Series			3	
123	State Treasury of Poland, perpetual use of KWSA	Poland	Silesia region	Rybnik	Rymer KWK	463869.42	243447.86	50 3 25,90	18 29 42,37	12.57	1550000		Hardcoal	Hazardous	Reclaimed	Paralic Series				4
124		Poland	Silesia region	Piekary Śląskie	Piekary ZG	499792.03	276513.66	50 21 20,76	18 59 49,47	4.80	425000		Hardcoal	Not hazardous	Partly reclaimed	Upper Sielesian Sandstone			3	4
125	ZG Piekary	Poland	Silesia region	Piekary Śląskie	Piekary ZG	496499.06	278229.29	50 22 16,28	18 57 2,71	21.40			Hardcoal	Not hazardous	Partly reclaimed	Upper Sielesian Sandstone			3	4
126	State Treasury of Poland	Poland	Silesia region	Piekary Śląskie	Piekary ZG	496906.87	276930.85	50 21 34,24	18 57 23,40	5.20			Hardcoal	Not hazardous	Partly reclaimed	Upper Sielesian Sandstone			3	4
127		Poland	Silesia region	Jastrzębie-Zdrój	Borynia KWK JSW	471276.88	237057.7	50 0 0,39	18 35 56,73	97.00	40000000	68000000	Hardcoal		Partly reclaimed	Mudstone Series,Upper		2	3	
128		Poland	Silesia region	Mszana	Jas- Mos KWK JSW	466455.01	231835.82	49 57 10,36	18 31 56,09	21.20	1400000	2380000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone Series			3	
129		Poland	Silesia region	Godów	Jas - Mos KWK JSW	463005.28	233272.81	49 57 56,17	18 29 2,43	29.50	3200000	5440000	Hardcoal		Reclaimed	Upper Sielesian Sandstone Series			3	
130		Poland	Silesia region	Godów	Jas - Mos KWK JSW	463345.13	229399.37	49 55 50,79	18 29 20,82	10.00	1100000	1870000	Hardcoal		Reclaimed	Upper Sielesian Sandstone Series			3	
131		Poland	Silesia region	Mszana	Jas - Mos KWK JSW	464472.98	232185.82	49 57 21,28	18 30 16,48	41.50	8000000	13600000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone Series			3	
132		Poland	Silesia region	Suszec	Krupiński KWK JSW	483960.77	242818.53	50 3 8,69	18 46 33,19	23.10	2913000	4952000	Hardcoal		Partly reclaimed	Mudstone Series		2		
133		Poland	Silesia region	Hażlach	Morcinek KWK JSW	470292.88	216323	49 48 48,66	18 35 13,03	44.90	2500000	4250000	Hardcoal		Not reclaimed	Upper Sielesian Sandstone Series			3	
134		Poland	Silesia region	Pawłowice	Pniówek KWK JSW	475600.08	234645.33	49 58 42,96	18 39 34,51	193.60	21400000	36380000	Hardcoal		Partly reclaimed	Mudstone Series,Upper		2	3	
135		Poland	Silesia region	Mszana	Zofiówka KWK JSW	470359.69	234538.95	49 58 38,65	18 35 11,34	137.10	43000000	73100000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone Series			3	
136		Poland	Silesia region	Katowice	Katowice-Kleofas KWK KHW	498587.61	266423.61	50 15 53,97	18 58 48,63	15.43	300000	510000	Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
137		Poland	Silesia region	Katowice	Katowice-Kleofas KWK KHW	499989.22	267122.84	50 16 16,62	18 59 59,45	2.45			Hardcoal		Reclaimed	Upper Sielesian Sandstone			3	4
138		Poland	Silesia region	Katowice	Katowice - Kleofas KWK KHW	500289.61	267436.12	50 16 26,77	19 0 14,63	4.10			Hardcoal	Not hazardous	Reclaimed	Upper Sielesian Sandstone			3	4
139		Poland	Silesia region	Katowice	Murcki KWK KHW	500598.54	257443.92	50 11 3,15	19 0 30,19	24.90	5752000	9778000	Hardcoal	Hazardous	Partly reclaimed	Mudstone Series,Upper		2	3	
140		Poland	Silesia region	Katowice	Murcki KWK KHW	502353.23	258040.8	50 11 22,46	19 1 58,71	12.60	1726500	2935000	Hardcoal	Not hazardous	Partly reclaimed	Mudstone Series,Upper		2	3	
141		Poland	Silesia region	Mysłowice	Mysłowice KWK KHW	508774.93	265425.72	50 15 21,42	19 7 23,27	11.15	37900	64400	Hardcoal	Not hazardous	Reclaimed	Mudstone Series,Upper		2	3	4
142		Poland	Silesia region	Katowice	Mysłowice KWK KHW	508593.68	265085.1	50 15 10,40	19 7 14,09	6.00			Hardcoal	Not hazardous	Reclaimed	Mudstone Series,Upper		2	3	4
143		Poland	Silesia region	Katowice	Staszic KWK KHW	503885.26	262007.99	50 13 30,92	19 3 16,14	10.10			Hardcoal		Partly reclaimed	Mudstone Series,Upper		2	3	4
144		Poland	Silesia region	Mysłowice	Wesoła KWK KHW	507292.9	256927.28	50 10 46,26	19 6 7,82	7.50	280000	476000	Hardcoal		Partly reclaimed	Mudstone Series		2		
145		Poland	Silesia region	Mysłowice	Wesoła KWK KHW	506854.61	256360.2	50 10 27,91	19 5 45,67	18.50	1412000	2400000	Hardcoal			Mudstone Series		2		
146		Poland	Silesia region	Katowice	Wujek KWK KHW	500931.02	264211.9	50 14 42,34	19 0 47,02	8.80	260000	442000	Hardcoal		Partly reclaimed	Upper Sielesian Sandstone Series			3	
147		Poland	Silesia region	Ruda Śląska	Śląsk KWK KHW	493957.72	264436.9	50 14 49,52	18 54 54,82	12.00			Hardcoal		Reclaimed	Upper Sielesian Sandstone Series			3	
148		Poland	Silesia region	Ruda Śląska	Śląsk KWK KHW	494592.09	264671.27	50 14 57,13	18 55 26,85	3.14			Hardcoal		Reclaimed	Upper Sielesian Sandstone Series			3	
149		Poland	Silesia region	Świętochłowice	Śląsk KWK KHW	493503.42	272142.58	50 18 59,07	18 54 31,40	28.00			Hardcoal		Reclaimed	Upper Sielesian Sandstone Series			3	
150		Poland	Silesia region	Brzeszcze	Brzeszcze KWK	512621.61	233678.24	49 58 12,95	19 10 33,81	34.66	4500000		Hardcoal	Not hazardous	Partly reclaimed	Cracow Sandstone,Mudsto	1	2	3	4
151	Ownership or managing by city of Zabrze	Poland	Silesia region	Zabrze	Bielszowice KWK	487929.65	269423.97	50 17 30,70	18 49 49,79	8.00			Hardcoal	Hazardous	Partly reclaimed	Mudstone Series,Upper		2	3	
152		Poland	Silesia region	Sosnowiec	Składowisko Zbiorcze	515862.46	266036.39	50 15 40,67	19 13 21,39				Hardcoal			no data				

ATTACHMENT 2 - SPAIN

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Basic information	Location	Location	Location	Location	Location	Location	Location	Location	Location	Morphology	Morphology	Morphology	Hazards	Reclamation
No	Owner	Country	Voivodeship	City	Colliery	X coordinate (WGS84)	Y coordinate (WGS84)	N coordinate	E coordinate	Area, ha	Volume, m^3	Mass, mg	Material type	Fire	Status
1	Encasur	Spain	Fuente Obejuna	Córdoba	Mina Cervantes	-5.326	38.312				1600000		Hard coal (Antracite)		Reclaimed
2	Encasur	Spain	Fuente Obejuna	Córdoba	Mina Cervantes	-5.331	38.304				1100000		Hard coal (Antracite)		Reclaimed
3	Encasur	Spain	Fuente Obejuna	Córdoba	Mina Cervantes	-5.322	38.318				900000		Hard coal (Antracite)		Reclaimed
4	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San Rafael	-5.31	38.312				850000		Hard coal		Reclaimed
5	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San Rafael	-5.312	38.311				450000		Hard coal (Antracite)		Reclaimed
6	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San Rafael	-5.316	38.31				40000		Hard coal (Antracite)		Reclaimed
7	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San Rafael	-5.314	38.306				85000		Hard coal (Antracite)		Reclaimed
8	Encasur	Spain	Fuente Obejuna	Córdoba	Mina San Rafael	-5.309	38.308				110000		Hard coal (Antracite)		Reclaimed
9	Encasur	Spain	Peña-Pueblonuevo	Córdoba	Minas de Santa Elisa	-5.267	38.292				11500		Hard coal		Reclaimed
10	Encasur	Spain	Peña-Pueblonuevo	Córdoba	Minas de Santa Elisa	-5.267	38.291				17000		Hard coal		Reclaimed
11	Encasur	Spain	Peña-Pueblonuevo	Córdoba	Mina Antolín	-5.25	38.287				100000		Hard coal		Reclaimed
12	Encasur	Spain	Peña-Pueblonuevo	Córdoba	Mina Ana	-5.253	38.295				500000		Hard coal		Reclaimed
13	Encasur	Spain	Bélmez	Córdoba	Mina Antolín	-5.237	38.294				100000		Hard coal		Partly reclaimed
14	Encasur	Spain	Bélmez	Córdoba	Mina Antolín	-5.233	38.291				3000		Hard coal		Reclaimed
15	Emergicar, SL	Spain	Henarejos	Cuenca	Minas Henarejos	-1.471	39.79				8000		Hard coal		Partly reclaimed
16	EMERGICAR, SL	Spain	Henarejos	Cuenca	Minas Henarejos	-1.471	39.789				6000		Hard coal		Partly reclaimed
17		Spain	Cestona	Guipuzcoa	Minas de Aizarna	-2.236	43.245				12000		Brown coal (Lignite)		Reclaimed
18		Spain	Sallent de Gallego	Huesca	Mina Millor	-0.402	42.766				150000		Hard coal (Antracite)		Reclaimed
19		Spain	Sallent de Gallego	Huesca	Mina Millor	-0.405	42.766				60000		Hard coal (Antracite)		Reclaimed
20		Spain	Sallent de Gallego	Huesca	Mina Millor	-0.405	42.765				20000		Hard coal (Antracite)		Reclaimed
21		Spain	Castigaleu	Huesca	Mina Eulalia	0.625	42.278				150000		Brown coal (Lignite)		Partly reclaimed
22		Spain	Castigaleu	Huesca	Mina Eulalia	0.624	42.277				8000		Brown coal (Lignite)		Partly reclaimed
23	Lignitos de Meirama, SA	Spain	Cerceda	La Coruña	Mina de Meirama	-8.442	43.204				21000000		Brown coal (Lignite)		Reclaimed
24	Lignitos de Meirama, SA	Spain	Cerceda	La Coruña	Mina de Meirama	-8.429	43.166				40000000		Brown coal (Lignite)		Reclaimed
25	Lignitos de Meirama, SA	Spain	Cerceda	La Coruña	Mina de Meirama	-8.427	43.194				1000000		Brown coal (Lignite)		Reclaimed
26	ENDESA GENERACIÓN, SA	Spain	Puentes de García Rodríguez	La Coruña	Mina As Pontes	-7.926	43.463				242000000		Brown coal (Lignite)		Reclaimed
27	Unión Minera del Norte, SA (UMINSA)	Spain	Toreno	León	Mina Alinos	-6.527	42.739				600		Hard coal (Antracite)		Partly reclaimed
28	Juan Bautista, García Losa	Spain	Igüeña	León	Mina Igüeña	-6.269	42.714				3500		Hard coal (Antracite)		Partly reclaimed
29	Asociación Minera, SA	Spain	Torre del Bierzo	León	Mina Dionisio	-6.383	42.595				7500		Hard coal (Antracite)		Reclaimed
30	Asociación Minera, SA	Spain	Torre del Bierzo	León	Mina El Hallazgo	-6.389	42.597				4800		Hard coal (Antracite)		Reclaimed
31	Asociación Minera, SA	Spain	Torre del Bierzo	León	Mina El Hallazgo	-6.387	42.595				6000		Hard coal (Antracite)		Reclaimed
32	Asociación Minera, SA	Spain	Torre del Bierzo	León	Mina El Hallazgo	-6.387	42.594				20000		Hard coal (Antracite)		Reclaimed
33	Alto Bierzo, SA	Spain	Torre del Bierzo	León	Mina Sospechosa	-6.328	42.594				9000		Hard coal (Antracite)		Partly reclaimed
34	Fundación Santa Bárbara	Spain	Torre del Bierzo	León	F. Santa Bárbara - Bierzo	-6.351	42.604						Hard coal (Antracite)	Not hazarous	Not reclaimed
35	Fundación Santa Bárbara	Spain	Torre del Bierzo	León	F. Santa Bárbara - Laciana	-6.421	42.966				22725		Hard coal (Antracite)	Not hazarous	Not reclaimed
36		Spain	Villagaton	León	Minas Leonesas	-6.193	42.634				30000		Hard coal (Antracite)		Partly reclaimed
37	Hullera Vasco Leonesa, SA	Spain	La Pola del Gordón	León	Mina Pastora	-5.6	42.862				200000		Hard coal		Partly reclaimed
38	Carbones Nocedo, SA	Spain	Soto y Amio	León	Mina de Gaset	-5.826	42.78				30000		Hard coal		Reclaimed
39		Spain	Pont de Suert	Lérida	Minas de Malpas	0.808	42.419				5600		Hard coal (Antracite)		Reclaimed

40		Spain	Pont de Suert	Lérida	Minas de Malpas	0.807	42.418				4000		Hard coal (Antracite)		Reclaimed
41		Spain	Pont de Suert	Lérida	Minas de Malpas	0.808	42.418				8000		Hard coal (Antracite)		Reclaimed
42		Spain	Pont de Suert	Lérida	Minas de Malpas	0.807	42.417				45000		Hard coal (Antracite)		Reclaimed
43	JM Meler Castarlenas	Spain	Isona y Conca D'Alla	Lérida	Minas de Malpas	1.073	42.106				7500		Brown coal (Lignite)		Reclaimed
44		Spain	Aguilar de Campoo	Palencia	Mina Lomilla Norte	-4.291	42.766				6000		Hard coal		Reclaimed
45	Arsenio Perales Guerricabeytia	Spain	Pancudo	Teruel	Mina Salomé	-0.967	40.809				100000		Brown coal (Lignite)		Reclaimed
46	Azural, SL	Spain	Utrillas	Teruel	Mina La Sabina	-0.865	40.81				25000000		Brown coal (Lignite)		Reclaimed
47	Azural, SL	Spain	Utrillas	Teruel	Mina La Yermegada	-0.879	40.809				20000000		Brown coal (Lignite)		Partly reclaimed
48	SAMCA	Spain	Rillo	Teruel	Minas Grupo San Rafael	-0.979	40.738				12000		Brown coal (Lignite)		Partly reclaimed
49	SAMCA	Spain	Rillo	Teruel	Minas Grupo San Rafael	-0.981	40.737				4000		Brown coal (Lignite)		Partly reclaimed
50	SAMCA	Spain	Rillo	Teruel	Minas Grupo San Rafael	-0.971	40.726				7000		Brown coal (Lignite)		Partly reclaimed
51	SAMCA	Spain	Rillo	Teruel	Minas Grupo San Rafael	-0.962	40.724				30000		Brown coal (Lignite)		Partly reclaimed
52	SAMCA	Spain	Rillo	Teruel	Minas Grupo San Rafael	-0.962	40.722				20000		Brown coal (Lignite)		Partly reclaimed
53	SAMCA	Spain	Rillo	Teruel	Minas Grupo San Rafael	-0.96	40.719				60000		Brown coal (Lignite)		Partly reclaimed
54	SAMCA	Spain	Oliete	Teruel	Mina Beatríz	-0.65	41.004				3000		Brown coal (Lignite)		Partly reclaimed
55	SAMCA	Spain	Andorra	Teruel	Mina Alloza	-0.524	41.01				38000000		Brown coal (Lignite)		Reclaimed
56	SAMCA	Spain	Ariño	Teruel	Mina Santa María	-0.567	41.034				15000		Brown coal (Lignite)		Partly reclaimed
57	SAMCA	Spain	Ariño	Teruel	Mina Demasia	-0.548	41.022				15000000		Brown coal (Lignite)		Partly reclaimed
58	SAMCA	Spain	Ariño	Teruel	Mina Demasia	-0.561	41.024				6000000		Brown coal (Lignite)		Partly reclaimed
59		Spain	Estercuel	Teruel	Mina Elvira	-0.644	40.855				6000		Brown coal (Lignite)		Partly reclaimed
60	Asistencia Técnica Minera, SL	Spain	Estercuel	Teruel	Mina Elvira	-0.651	40.859				60000		Brown coal (Lignite)		Partly reclaimed
61	Asistencia Técnica Minera, SL	Spain	Estercuel	Teruel	Mina Elvira	-0.654	40.858				300000		Brown coal (Lignite)		Partly reclaimed
62	Asistencia Técnica Minera, SL	Spain	Estercuel	Teruel	Mina Elvira	-0.656	40.855				2000000		Brown coal (Lignite)		Partly reclaimed
63	Asistencia Técnica Minera, SL	Spain	Estercuel	Teruel	Mina Elvira	-0.652	40.854				60000		Brown coal (Lignite)		Partly reclaimed
64	Asistencia Técnica Minera, SL	Spain	Estercuel	Teruel	Mina Elvira	-0.65	40.856				25000		Brown coal (Lignite)		Partly reclaimed
65	SAMCA	Spain	Gargallo	Teruel		-0.56	40.839				5000		Brown coal (Lignite)		Reclaimed
66	SAMCA	Spain	Gargallo	Teruel	Mina Gargallo	-0.598	40.844				25000		Brown coal (Lignite)		Reclaimed
67	ENDESA, SA, SAMCA	Spain	Gargallo	Teruel	Mina Gargallo	-0.602	40.843				4000		Brown coal (Lignite)		Reclaimed
68	SAMCA	Spain	Gargallo	Teruel	Mina Gargallo	-0.592	40.849				6000		Brown coal (Lignite)		Reclaimed
69	Minera Martín Aznar, SA	Spain	Escucha	Teruel	Mina de la Concepción	-0.813	40.784				60000		Brown coal (Lignite)		Reclaimed
70	Minera Martín Aznar, SA	Spain	Escucha	Teruel	Mina Se Verá	-0.815	40.788				25000		Brown coal (Lignite)		Reclaimed
71	Minas y Ferrocarril de Utrillas, SA	Spain	Escucha	Teruel	Mina Aún Hay Caso	-0.803	40.787				30000		Brown coal (Lignite)		Reclaimed
72	Minas Escucha, SA	Spain	Escucha	Teruel	Mina Aún Hay Caso	-0.804	40.784				6000		Brown coal (Lignite)		Reclaimed
73		Spain	Montalbán	Teruel		-0.823	40.834				4000		Brown coal (Lignite)		Partly reclaimed
74		Spain	Montalbán	Teruel	Mina Lavaderos de MFU	-0.85	40.832				20000		Brown coal (Lignite)		Partly reclaimed
75		Spain	Montalbán	Teruel	Mina Lavaderos de MFU	-0.839	40.831				250000		Brown coal (Lignite)		Partly reclaimed
76		Spain	Montalbán	Teruel	Mina Lavaderos de MFU	-0.848	40.829				8000		Brown coal (Lignite)		Partly reclaimed
77		Spain	Montalbán	Teruel	Mina Lavaderos de MFU	-0.845	40.828				60000		Brown coal (Lignite)		Partly reclaimed
78		Spain	Montalbán	Teruel	Mina Lavaderos de MFU	-0.844	40.826				12000		Brown coal (Lignite)		Partly reclaimed
79		Spain	Utrillas	Teruel	Mina La Serna	-0.838	40.798				20000000		Brown coal (Lignite)		Reclaimed
80	Minas y Ferrocarril de Utrillas, SA	Spain	Utrillas	Teruel	Minas Barriada Obrera del Sur	-0.844	40.788				1500000		Brown coal (Lignite)		Reclaimed
81	Minas y Ferrocarril de Utrillas, SA	Spain	Utrillas	Teruel	Minas Barriada Obrera del Sur	-0.854	40.817				25000000		Brown coal (Lignite)		Reclaimed
82	Asistencia Técnica Minera, SL	Spain	Utrillas	Teruel	Minas Barriada Obrera del Sur	-0.835	40.803				70000		Brown coal (Lignite)		Reclaimed

83	Asistencia Técnica Minera, SL	Spain	Utrillas	Teruel	Minas Barriada Obrera del Sur	-0.835	40.805				40000		Brown coal (Lignite)		Reclaimed
84		Spain	Escucha	Teruel	Mina Ebro	-0.823	40.778				3000		Brown coal (Lignite)		Reclaimed
85	Minas y Ferrocarril de Utrillas, SA	Spain	Utrillas	Teruel	Santa Bárbara	-0.848	40.808				6000		Brown coal (Lignite)		Reclaimed
86	Minera Martín Aznar, SA	Spain	Montalbán	Teruel	Mina Doña 3ª Lucrecia	-0.782	40.788				15000		Brown coal (Lignite)		Reclaimed
87	Minera Martín Aznar, SA	Spain	Montalbán	Teruel	Mina de Barranco Malo	-0.785	40.79				12000		Brown coal (Lignite)		Reclaimed
88	Minas y Ferrocarril de Utrillas, SA	Spain	Montalbán	Teruel	Mina de Barranco Malo	-0.787	40.792				8000		Brown coal (Lignite)		Reclaimed
89	Minera Martín Aznar, SA	Spain	Castel de Cabra	Teruel	Mina Elenita II	-0.712	40.81				500000		Brown coal (Lignite)		Reclaimed
90	Minera Martín Aznar, SA	Spain	Castel de Cabra	Teruel	Mina Elenita II	-0.708	40.809				25000		Brown coal (Lignite)		Reclaimed
91	Minas Palomar, SA	Spain	Palomar de Arroyos	Teruel	Mina La Serrana	-0.753	40.775				30000		Brown coal (Lignite)		Reclaimed
92	Minas Palomar, SA	Spain	Palomar de Arroyos	Teruel	Mina Ernesto Ferrer	-0.736	40.768				4000000		Brown coal (Lignite)		Reclaimed
93	Minas Palomar, SA	Spain	Palomar de Arroyos	Teruel	Mina Ernesto Ferrer	-0.739	40.77				600000		Brown coal (Lignite)		Reclaimed
94	Minas Palomar, SA	Spain	Palomar de Arroyos	Teruel	Mina Ernesto Ferrer	-0.735	40.765				8000000		Brown coal (Lignite)		Reclaimed
95	Minas Palomar, SA	Spain	Palomar de Arroyos	Teruel	Mina La Serrana	-0.746	40.783				20000		Brown coal (Lignite)		Reclaimed
96	Minas Palomar, SA	Spain	Palomar de Arroyos	Teruel	Mina La Serrana	-0.757	40.775				8000		Brown coal (Lignite)		Reclaimed
97	Herrero y Hubeda, SA	Spain	Castel de Cabra	Teruel	Santa Bárbara	-0.694	40.805				6000		Brown coal (Lignite)		Reclaimed
98	Herrero y Hubeda, SA	Spain	Castel de Cabra	Teruel	Santa Bárbara	-0.682	40.803				1500000		Brown coal (Lignite)		Reclaimed
99	SAMCA	Spain	Cañizar del Olivar	Teruel	Mina de Mº de los Ángeles	-0.655	40.818				6000		Brown coal (Lignite)		Reclaimed
100	Ricardo Galve Peguero	Spain	Cañizar del Olivar	Teruel	Mina San José	-0.661	40.816				4000		Brown coal (Lignite)		Reclaimed
101	Compañía General Minera de Teruel	Spain	Cañizar del Olivar	Teruel	Mina Manolita	-0.673	40.82				7000		Brown coal (Lignite)		Reclaimed
102	SAMCA	Spain	Hinojosa de Jarque	Teruel	Mina Doña A. Metilación	-0.726	40.675				55000		Brown coal (Lignite)		Partly reclaimed
103		Spain	Andorra	Teruel	Mina La Oportuna	-0.5	41.001				1500000		Brown coal (Lignite)		Reclaimed
104	ENDESA, SA	Spain	Andorra	Teruel	Minas de Andorra (Teruel)	-0.455	40.995				12000		Brown coal (Lignite)		Reclaimed
105		Spain	Andorra	Teruel	Mina La Oportuna	-0.505	40.999				4000000		Brown coal (Lignite)		Reclaimed
106	CEMEX España Operaciones, SLU	Spain	Berge	Teruel	El Corredor	-0.38	40.845				150000		Brown coal (Lignite)		Reclaimed
107	CEMEX España Operaciones, SLU	Spain	Berge	Teruel	El Corredor	-0.377	40.848				200000		Brown coal (Lignite)		Reclaimed
108	SAMCA	Spain	Foz-Calanda	Teruel	Mina Carmen y Pura	-0.287	40.904				2700000		Brown coal (Lignite)		Reclaimed
109	SAMCA	Spain	Foz-Calanda	Teruel	Mina Carmen y Pura	-0.235	40.897				7300000		Brown coal (Lignite)		Reclaimed
110		Spain	Castellote	Teruel	Mina Elvira y Palestina	-0.306	40.79				5000000		Brown coal (Lignite)		Partly reclaimed
111		Spain	Castellote	Teruel	Mina Elvira y Palestina	-0.304	40.785				8000000		Brown coal (Lignite)		Partly reclaimed
112	Minera Martín Aznar, SA	Spain	Castellote	Teruel	Mina Elvira y Palestina	-0.292	40.792				600000		Brown coal (Lignite)		Partly reclaimed
113	Minera Martín Aznar, SA	Spain	Castellote	Teruel	Mina Elvira y Palestina	-0.297	40.788				500000		Brown coal (Lignite)		Partly reclaimed
114		Spain	Mequinenza	Zaragoza	Mina Previsión	0.299	41.358				2500		Brown coal (Lignite)		Reclaimed
115	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Andresita	0.319	41.354				6000		Brown coal (Lignite)		Reclaimed
116	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Andresita	0.322	41.354				3000		Brown coal (Lignite)		Reclaimed
117	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Andresita	0.325	41.354				10000		Brown coal (Lignite)		Reclaimed
118	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Andresita	0.328	41.355				8000		Brown coal (Lignite)		Reclaimed
119	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Andresita	0.327	41.354				4000		Brown coal (Lignite)		Reclaimed
120	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Andresita	0.328	41.354				8000		Brown coal (Lignite)		Reclaimed
121	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Andresita	0.329	41.354				10000		Brown coal (Lignite)		Reclaimed
122	Fertinagro Nuetrientes, SL	Spain	Mequinenza	Zaragoza	Mina La Unión	0.344	41.356				2500		Brown coal (Lignite)		Reclaimed
123	Fertinagro Nuetrientes, SL	Spain	Mequinenza	Zaragoza	Mas de Fornós	0.325	41.386				12000		Brown coal (Lignite)		Reclaimed

124	ENDESA Distribución Eléctrica, SL	Spain	Mequinenza	Zaragoza	Mas de Fornós	0.336	41.381				10000		Brown coal (Lignite)		Reclaimed
125	ENDESA Distribución Eléctrica, SL	Spain	Mequinenza	Zaragoza	Mas de Fornós	0.338	41.381				8000		Brown coal (Lignite)		Reclaimed
126	Fertinagro Nuetrientes, SL	Spain	Mequinenza	Zaragoza	Mina La Fermina	0.346	41.363				9000		Brown coal (Lignite)		Reclaimed
127	Fertinagro Nuetrientes, SL	Spain	Mequinenza	Zaragoza	Mina La Fermina	0.35	41.366				15000		Brown coal (Lignite)		Reclaimed
128	Carbonífera del Ebro, SA	Spain	Mequinenza	Zaragoza	Mina Dos Hermanas	0.352	41.36				12000		Brown coal (Lignite)		Reclaimed
129	Carbonífera del Ebro, SA	Spain	Mequinenza	Zaragoza	Mina Amelia	0.355	41.356				25000		Brown coal (Lignite)		Reclaimed
130	Carbonífera del Ebro, SA	Spain	Mequinenza	Zaragoza	Mina Amelia	0.357	41.355				6000		Brown coal (Lignite)		Reclaimed
131	Carbonífera del Ebro, SA	Spain	Mequinenza	Zaragoza	Mina Amelia	0.359	41.355				6000		Brown coal (Lignite)		Reclaimed
132	Carbonífera del Ebro, SA	Spain	Mequinenza	Zaragoza	Mina Amelia	0.36	41.353				35000		Brown coal (Lignite)		Partly reclaimed
133	Carbonífera del Ebro, SA	Spain	Mequinenza	Zaragoza	Mina Amelia	0.361	41.352				20000		Brown coal (Lignite)		Reclaimed
134	Carbonífera del Ebro, SA	Spain	Mequinenza	Zaragoza	Mina Amelia	0.364	41.353				40000		Brown coal (Lignite)		Reclaimed
135	Carbonífera del Ebro, SA	Spain	Mequinenza	Zaragoza	Mina Amelia	0.367	41.354				10000		Brown coal (Lignite)		Reclaimed
136	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Boquereteś	0.341	41.325				7000		Brown coal (Lignite)		Reclaimed
137	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Boquereteś	0.341	41.327				12000		Brown coal (Lignite)		Reclaimed
138	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Boquereteś	0.343	41.326				4000		Brown coal (Lignite)		Reclaimed
139	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Boquereteś	0.343	41.329				6000		Brown coal (Lignite)		Reclaimed
140	Lignitrans, SL, Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Boquereteś	0.345	41.332				8000		Brown coal (Lignite)		Reclaimed
141	Minera del Bajo Segre, SA	Spain	Mequinenza	Zaragoza	Mina Previsión	0.313	41.355				4000		Brown coal (Lignite)		Reclaimed

ATTACHMENT 3 - GREECE

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U		V	W	Y	Z
No	Basic information	Location	Location	Location	Location	Location	Location	Location	Location	Location	Morphology	Morphology	Morphology	Hazards	Reclamation	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Lithostratigraphic_Series	Dumping Period	Dump Height (m)	Notes	References
	Owner	Country	Voivodeship	City	Colliery	X coordinate (WGS84)	Y coordinate (WGS84)	N coordinate	E coordinate	Area, ha	Volume, m^3	Mass, mg	Material type	Fire	Status	Strat_Name	1_Clastic and sandy clays	2_Marls	3_sands	4_gravels	5_Conglomerates	Dumping Period	Dump Height (m)	Notes	Company Information
1	Kozanis' Mining Co G.P.	Greece	W. Macedonia	Kozani	Prosilio	21.930743	40.136068			180	60000000		Xylite-rich Lignite	Yes (has happened a few times)	Not reclaimed	Komninon Fm.	1	2	3			2006-today	100	Internal	Company Information
2	Kozanis' Mining Co G.P.	Greece	W. Macedonia	Kozani	Prosilio	21.928259	40.133639			30	2500000		Xylite-rich Lignite	Yes (has happened a few times)	Partly reclaimed	Komninon Fm.						2006-today	25	External	Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in Exhausted Surface Lignite Mines. Challenges and Solutions. Mater.
3	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	North Field	21.748364	40.506714						Matrix Lignite	Yes (has happened a few times)	Reclaimed	Ptolemais Fm.	1	2				1987-2006	70-100	Internal	Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in
4	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Kardia	21.797898	40.463822						Matrix Lignite	Yes (has happened a few times)	Reclaimed	Ptolemais Fm.	1	2	3	4		1979-2019	80-130	Internal	Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in Exhausted Surface Lignite Mines. Challenges and Solutions. Mater.
5	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Kardia	21.862165	40.457089						Matrix Lignite	Yes (has happened a few times)	Reclaimed	Ptolemais Fm.	1	2 (calcareous)	3			1980-2019	30-120	External	Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in Exhausted Surface Lignite Mines. Challenges and Solutions. Mater.
6	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Kardia	21.79957	40.428029						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.	1	2				2006-2019	100-130	Internal	Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in Exhausted Surface Lignite Mines. Challenges and Solutions. Mater.
7	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	North Field	21.735927	40.502818						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.	1	2				2002-2017	90-120	Internal	Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in Exhausted Surface Lignite Mines. Challenges and Solutions. Mater.
8	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Mavropigi	21.707592	40.463996						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.		2		4	5	2011-2019	20-50	External	Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in Exhausted Surface Lignite Mines. Challenges and Solutions. Mater.
9	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Mavropigi	21.758726	40.456622						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.	1	2				2009-2018	40-60	Internal	Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in Exhausted Surface Lignite Mines. Challenges and Solutions. Mater.
10	Public Power Corporation (PPC)	Greece	W. Macedonia	Kozani	Mavropigi	21.764807	40.469117						Matrix Lignite	Yes (has happened a few times)	Partly reclaimed	Ptolemais Fm.	1	2	3			1989-2001	40-80	Internal	Antoniadis, A.; Roumpos, C.; Anagnostopoulos, P.; Paraskevis, N. Planning RES Projects in Exhausted Surface Lignite Mines. Challenges and Solutions. Mater.