



**DOLNY
ŚLĄSK**



REGIONAL ECOSYSTEM MAPPING

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BASIC FACTS OF LOWER SILESIA

Lower Silesia is a region located in the south-western part of Poland and borders with Germany and Czechia.

Capital of Lower Silesia: Wrocław (approx. 635 000 inhabitants)

Urbanisation rate: 69,4%

Area: 19 948 km² (6,4 % area of Poland)

Population:

- number of inhabitants in Poland: 38 m
- number of inhabitants in Lower Silesia: 2,9 m (7,6 % population of Poland)
- density in Poland: 123 inh./km²
- density in Lower Silesia: 146 inh./km²

GDP (growth rate in 2016: 2,8%):

- GDP in Poland: 1 720 000 000 PLN = 410 000 000 EUR
- GDP in Lower Silesia: 151 500 000 PLN = 36 000 000 EUR (8,5% of GDP of Poland)
- GDP per capita in Poland: 46 700 PLN = 11 200 EUR
- GDP p.c. in Lower Silesia: 52 100 PLN = 12 500 EUR (111 % of GDP per capita in Poland – 2nd place out of 16 Poland's regions)

Level of industrialization: 36,4% of GDP

Number of companies in Lower Silesia:

- 361 307 registered companies (2016)
- 463 - mining
- 6 917 - processing industry

Unemployment rate (in September 2018):

- Poland: 5,7%
- Lower Silesia: 5,1%

Export rates

- Poland (in 2017): 203 700 000 000 EUR
- Lower Silesia (in 2014): 16 650 000 000 EUR (10 % of Poland's export)

Export rates per 1 employee:

- Poland: 18 000 EUR
- Lower Silesia: 21 500 EUR (117 % Poland's rate)

Economic Added Value per 1 employee:

all goods & services:

- Poland: 26 200 EUR
- Lower Silesia: 29 800 EUR (114 % Poland's rate)

industry:

- Poland: 34 000 EUR
- Lower Silesian: 42 700 EUR

Investment in Research and Development (2015):

- 306 000 EUR (0,85% regional; GDP 1% in Poland)
- industry: 81 000 EUR

ENVIRONMENTAL & LEGAL CONDITIONS

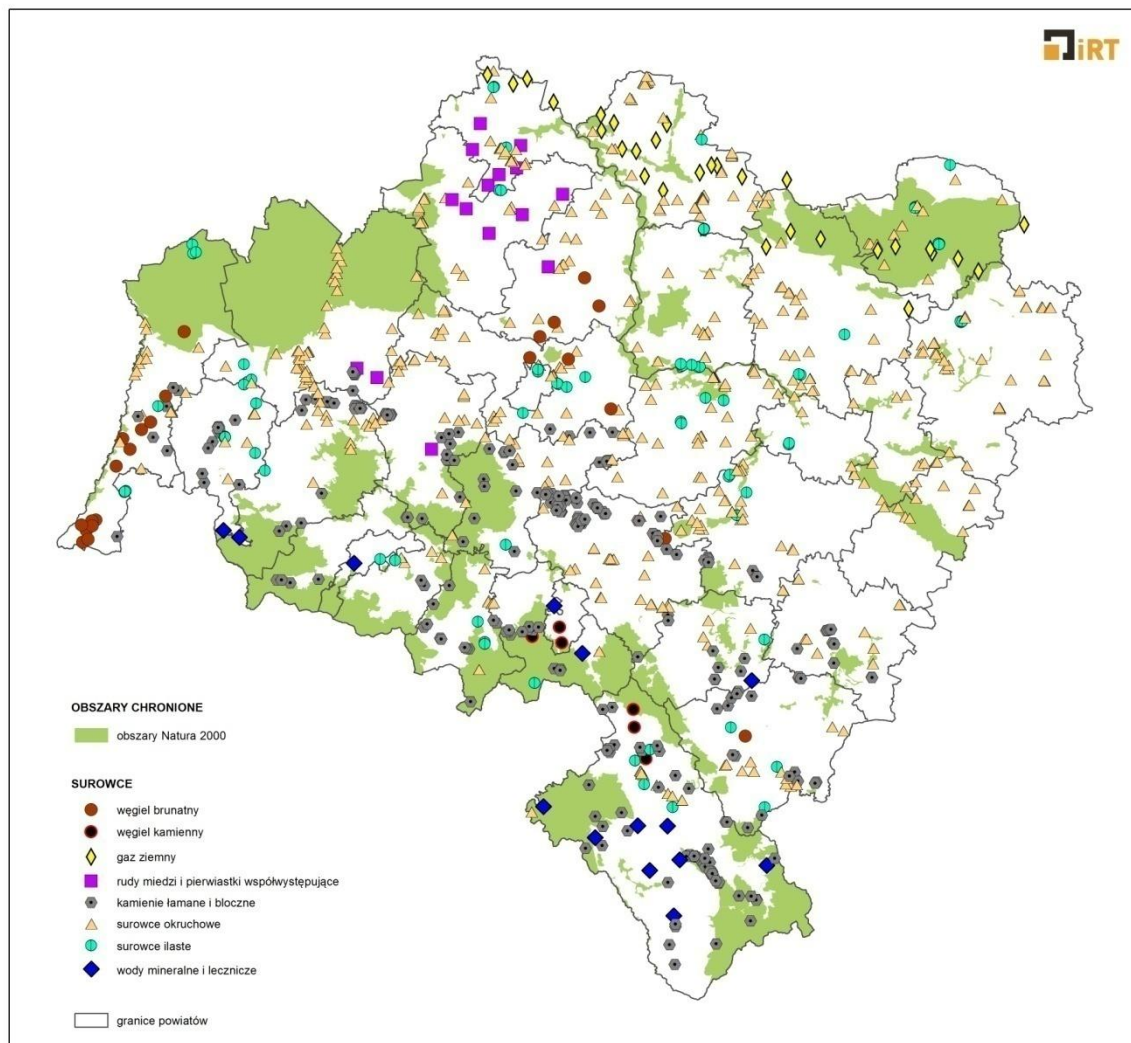
GEOLOGICAL DEPOSITS

The raw materials base of Lower Silesia has economic importance for the development of the region, both because of the nature of the minerals and the size of their resources. However, deposits of ores, such as copper and silver, energy mineral deposits, i.e. lignite, as well as various dimension and crushed rocks (magmatic and metamorphic) are strategic from the point of view of not only the regional economy but national, as well.



Occurrence of natural resources in Lower Silesia. Source: WBU study based on "Report on Spatial Development and Social and Economic Development of Lower Silesian Voivodeship 2011." (p.25)

PROTECTED AREAS



Occurrence of natural resources in Lower Silesia in context of protected area (NATURA 2000)

- NATURA 2000 comprises 21% of Lower Silesia area
- Environmentally damaging investments within NATURE 2000 areas are forbidden, except for overriding public interest (e.g. health, public security)
- The following deposits are within protected areas: 13 lignite coal deposits, 308 aggregates deposits, 154 road and constructing materials deposits, 72 building ceramic deposits, 5 sand deposits, 13 carbonate raw material deposits.

FORMAL AND LEGAL CONDITIONS

PERMISSIONS

Minister of the Environment grants a concession for exploitation of mineral deposits covering most of the mining property. It applies to:

- hydrocarbons,
- coal
- methane as an accompanying mineral,
- lignite
- metal ore (except for turf (bog) ore rich in iron)
- metals in the native state,
- ores of radioactive elements.
- native sulphur.
- salt: rock, potassium and potassium-magnesium
- gypsum and anhydrite,
- gemstones
- all minerals from deposits located within the Polish marine areas.

Marshal of the voivodeship (region) grants concession for extracting minerals from deposits of the right of ownership of land in the land areas, except for the cases when the license for the extraction of minerals provide governor (ie. the governor issues a license for the extraction of minerals are satisfied all the following requirements: mineral deposit is not covered by Own mining area documented deposit does not exceed 2 ha, extraction is less than 20 000 m³ per calendar year and is carried by surface mining without the use of explosives). The competence of the Marshals of the region is given concessions for the extraction of medicinal waters, thermal waters and brines from deposits. Deposits of curative thermal waters and brines are covered by the mining property. Application for a license shall be submitted to the competent local marshal.

Mineral deposits covered by the right of ownership of real estate is are not listed as mineral deposits in the art. 10 paragraph. 1 and 2 of the Geological and Mining Law. Mineral deposits covered by the right of ownership of real estate are inter alia:

- bentonite, bentonite clay, dolomite, clay, ceramics and refractories, chalk, quartzites, refractory, quartz core, magnesite, molding sands, backfilling sands, sands and gravels, clays and kaolin;
- stones and broken, modular: basalt, diabase, gabbro, boulders, granite, granodiorite, melaphyre, porphyry, syenite, porphyry tuff, amphibolite, gneiss, crystalline slate, marble, serpentine, sandstone;
- turf;
- limestone and marl lime and cement industry.

Medicinal water is groundwater, which in terms of chemical and microbiological is not contaminated, is characterized by natural variability of physical and chemical content:

- a) dissolved mineral solids - no less than 1000 mg / dm³ or
- b) a ferrous ion - not less than 10 mg / dm³ (ferruginous water), or
- c) a fluoride ion - not less than 2 mg / dm³ (water fluoride) or
- d) the iodide ion - not less than 1 mg / dm³ (water iodide) or

- e) a divalent sulphur - not less than 1 mg / dm³ (water sulfide), or
- f) of metasilicic - not less than 70 mg / dm³ (silicon water), or
- g) radon - not less than 74 Bq / dm³ (radon water), or
- h) unbound carbon - not less than 250 mg / dm³, with the proviso that from 250 to 1000 mg / dm³ of water is carbonic acid and more than 1000 mg / dm³ to Szczawa.

Thermal water is groundwater having a temperature at the outlet of the intake > 20 ° C.

Brine is underground water containing soluble mineral solids not less than 35 g / dm³.

The list of exploration licences in Poland's regions is publicly available. Choosing [województwo dolnośląskie](http://surowce-mineralne.blogspot.com/2017/08/koncesje-na-wydobywanie-kopalin-ze-zoz.html) (Lower Silesian voivodeship) from the list on the website: <http://surowce-mineralne.blogspot.com/2017/08/koncesje-na-wydobywanie-kopalin-ze-zoz.html>) one can find 297 registered deposits which were granted by exploration licences.

Governor (Starosta) or president of the city (if the city is the county status) gives a license if:

- your deposit is not under the strict control of the state (owned mining), but protects the right of ownership of real estate,
- your deposit is not greater than 2 hectares,
- bringing out during the year less than 20 000 m³ of raw materials,
- extracting opencast,
- not using blasting agents, which mine rocks (e.g. explosive, incendiary and initiators, blasting equipment).

For deposits protected by the ownership of real estate are inter alia.:

- bentonite, colloidal clay, dolomite, clay, ceramic and refractory, chalk, quartzite, quartz core, magnesite, molding sands, sands backfilling, sand and gravel, clays and kaolin;
- broken stones and, modular: basalt, diabase, gabbro, granite granodiorite, melaphyre, porphyry, syenite, porphyry tuff, amphibolite, gneiss, crystalline slate, marble, serpentine, sandstone;
- peat;
- limestone and marl lime for cement industry.

GENERAL DOCUMENTS RELATED TO NATURAL RESOURCES

1. Resolution of the Council of Ministers no. 202/2009, Poland's energy policy until 2030, was adopted for energy minerals on 10 November 2009. This is a formal document which refers to the deposits of Lower Silesia; on page 9, it refers specifically to the "Legnica" lignite deposits as strategic ones, with the need of introducing them into the Concept of State Spatial Development.
2. The Concept of Spatial State Development 2030 (Monitor Polski, item 252 of 13 December 2011, adopted by Resolution of the Council of Ministers no. 239), as the highest hierarchical planning document, defines the need to protect strategic resources, including map 19 defines the most important mineral deposits in Poland. It indicates the need to take activities to protect these deposits by the competent ministers. The core tasks of the CSSD 2030 relate to defining functional areas for deposits, defining a list of strategic areas for the country, and implementing and approving exploitation plans. Currently, the process initiated by the adopted CSSD 2030 is ongoing, and its closure is scheduled for 2019.
3. From a planning document of a national nature, the protection of deposits is continued in an optional manner in the documents such as a plan, regional raw materials policy, forecasts,

strategies and many other specialized, sectoral documents. These studies, until they are adopted as local acts, are not mandatory for the protection of deposits. Planning documents such as the spatial development plan of the voivodeship and the local spatial development plan, which are the source of universally applicable law, are of particular importance in protecting the deposits as they are acts of local law. The agreements of these deposit protection plans are binding and necessary for use. The first one is a planning document at the provincial level, and the second one at the commune level. On the other hand, the hierarchical structure of the planning acts makes both plans compatible with the CSSD. In Poland, each development plan is preceded by a planning document with a lower level of detail, i.e. a study of conditions and directions of the development accompanied by an environmental impact assessment which specifies general directions, but it is not a basis for administrative decisions.

4. In addition, some of the valorisation documents are ecophysiological studies, which should include information on the resource base (deposits). Eco-biographies are developed with the planning documents and included in the study.
5. In the area of the deposit protection for future and current operations, the MINIATURA 2020 programme, which deals with raw materials policy in terms of sustainable development, is currently being implemented. The purpose of the programme is to develop a methodology for the valorisation of the deposits - universal for 14 EU countries and 2 countries outside the Union, which would indicate the EU, national, regional and local significance.
6. For Lower Silesia, as well as for entire Poland, the valorisation of the deposits was carried out based on the criteria selected by Prof. Nieć and Prof. Radwanek-Bąk (from Cracow). Mrs. Urszula Kazimierczak (Wrocław University of Technology) was also among the contributors of valorisation from Lower Silesia.
7. Draft of State Raw Material Policy (2018) – social consultation conducted in 2018. The first attempt to create the raw material strategy on the national level.
8. Problems to be solved:
 - Ordering the legal space for the protection of the environment (e.g. in the Law of Environmental Protection - there is only a general disposition for the protection of the resources, in the regulations on minerals of national importance - there is no information on rock resources; in the regulations on properties management - only mineral resources owned by the mining industry are significant from the perspective of the state. Rock aggregates are not a mining property, and according to the Geological and Mining Law, they are the property of the land property), i.e. the development of formal and legal rules for the exploitation of domestic natural resources, indicating which deposits are protected and which are not;
 - Specification of the so-called functional space to be provided for future raw material investment, for their non-development;
 - Which raw materials are strategic for Poland's economy;
 - Fragmentation of the competences in various ministerial circles and at various levels.

LOWER SILESIAN STRATEGIC DOCUMENTS RELATED TO NATURAL RESOURCES

There is no special document dedicated to mining policy in Lower Silesia region. The basic and most shaping regional development policy are: the development strategy and the spatial development plan.

Principle of the policy of the Lower Silesian Voivodeship:

- determination of the protection area of documented mineral deposits of national and regional importance as well as defining management principles for this area
- taking into account the location of documented mineral deposits in planning and strategic documents

Development Strategy of the Lower Silesian Voivodeship 2030

The document states that the voivodeship policy needs to be directed at creating industrial processing plants, including copper and silver, and counteract export of non-processed non-renewable natural resources of Lower Silesia. Among the 5 strategic objectives there is:

Strategic objective 4: Responsible use of resources and protection of natural environment and cultural heritage

Priority 4.1: Sustainable use of environmental assets and resources

Priority 4.2: Circular economy development

The Spatial Development Plan

The document is a territorial extension of the strategy and have a 2020 perspective. Work on a new document is underway and it is expected that the Spatial Development Plan 2030 will be adopted soon. However, in contradiction to local spatial development plans, which are act of local law, the document does not bear legal obligations.

The areas of occurrence of documented mineral deposits and the concept of the spatial development of the country in this respect are taken into account in the voivodeship spatial development plan:

Objective 2 A rational and sustainable way of using resources of the natural and cultural environment

Direction 2.3. Protection and rational use of environmental resources

Regional Innovation Strategy of Lower Silesian Voivodeship for 2011-2020 with Strategic Framework for Smart Specialisations – addressed policy instrument

Regional Innovation Strategy of Lower Silesian Voivodeship and Development Strategy of the Lower Silesian Voivodeship directly affects the **Regional Operational Programme**, especially in priority area:

Enterprises and Innovations.

Smart Specialization “Natural and secondary raw materials” includes the following subareas:

- 1) Technologies of the acquisition, processing and utilization of useful minerals,
 - a) technologies of the acquisition of new products from the main mineral,
 - b) integrated systems for monitoring the threats in the environment of the mining plants,
 - c) technologies of the acquisition, treatment and use of ordinary, thermal and mineral waters,
 - d) technologies of the acquisition and processing, and the use of wood, vegetable raw materials in the innovative products,
 - e) new treatment and spa services on the basis of the use of the natural resources.
- 2) Technologies for the recovery of useful materials, recycling and disposal of waste.
- 3) Advanced materials:
 - a) new characters of raw materials (powders, microstructures, nanostructures, amorphs, others),

- b) composites,
- c) smart materials,
- d) materials for industrial applications,
- e) design and development of the production technology of the functional materials.

CURRENT STATUS ON IMPLEMENTATION OF POLICY INSTRUMENT – RIS3

The Lower Silesian Voivodeship has commissioned to carry out the research on the diagnosis and development trends of the Lower Silesian smart specialization natural resources and secondary raw materials in 2017

The content of the diagnosis:

- 1) Characteristics of the industry
- 2) Institutions supporting the industry
- 3) Analysis of the effectiveness of public intervention
- 4) Innovative potential in the industry
- 5) Identification of factors of the smart specialisation sector “Natural resources and secondary raw materials”
- 6) SWOT Analysis

In the conclusion of the SWOT Analysis the following factors were described:

Strengths:

- Access to rich natural resources;
- Strong traditions in acquiring and exploiting mineral resources;
- Development potential of the industry;
- Effect of a strong player - KGHM Polska Miedź S.A;
- Attractiveness of the region as a place to work and live;
- Proximity of western and southern Polish border;
- European funds from the current budget perspective;
- -Range of universities and scientific research centerscentres.

Weaknesses:

- Large thematic diversity of the branches within the IS ;
- No scientific facilities for certain IS branched;
- Inadequate promotion;
- Competition from other regions;
- Location of a part of deposits on the protected areas or the constructed areas;
- Insufficient transport infrastructure;
- Low innovation level;
- Depletion of raw materials.

Opportunities:

- Increasing demand for innovative products/services;
- Increase in wealth of the society;
- Development of new environmentally friendly technologies.

Threats:

- High costs of marketing;
- Variable and incomprehensible legal conditions;
- Moving the business to other countries or regions and highly skilled professionals to other labour markets;
- Production of used machines and tools in the industry outside Poland;
- Trends volatility;
- Increasing labour costs;
- High costs of running business;
- Competition from the companies using imported mineral raw materials

CHARACTERISTIC OF BUSINESS ENVIRONMENT

MINING AND PROCESSING OF MINERAL RESOURCES INDUSTRIES

The raw material companies rarely supply consumer goods, and their final product is usually the raw material for the entire chain of companies producing final products. This frequent self-limitation causes a significant proportion of added value to be produced in the companies using final products of the raw materials industry for trade and production of consumer goods.

Copper deposits (operated by the KGHM Polska Miedź S.A.) are of the highest economic importance. They are located in the area of Lubin, Polkowice, Głogów, where the volume of resources is estimated as 4.5% of the world's resources. At the end of 2015, the balance resources in 15 identified deposit areas were 1976 million tonnes of deposits, including 35.57 million t Cu and 107.47 thousand tonnes of silver (BZZK¹ 2015). The average Cu content is 1.84% and Ag52.5 g/Mg (<http://kghm.com/pl/biznes/wydobycie-i-wzbogacanie>).

According to BGSMPiS² 2013: copper deposit is accompanied by a whole range of precious metals: Ag, Au, As, Pb, Zn, Ni, V, Mo, Se, Re, platinum group, among which, the following are recovered: Ag, Au, Pb, Se, Ni in the form of sulphate, palladium and platinum sludge, metallic rhenium and ammonium perrhenate. At the end of 2013, the resources of these elements amounted to: Ag - 103182 t, Pb - 1548600 t, Co - 121500 t, Ni - 56380 t, V - 139110 t, Mo - 68710 t, Zn - 320290 t. The resources of rhenium, selenium and platinum were not estimated.

In 2015, KGHM Polska Miedź S.A. extracted 31.57 million tonnes of deposits with a content of 1.52% Cu and 44.6 g/t Ag (BZZK2015), totalling 479 thousand tonnes of metallic copper (BZZK2015), from which 574.3 thousand tonnes of electrolytic copper were produced, including 420.5 thousand tonnes from own concentrates and 153.8 thousand tonnes from foreign concentrates. In addition, one produced 1 200 t Ag (<http://kghm.com/pl/biznes/produkty/metale-szlachetne#srebro>) 2 703 kg of gold and 9.17 t of rhenium, both from own deposits, as well as from foreign concentrates (BZZK2015).

¹ Balance of mineral resources in Poland

² Balance of mineral resources management in Poland and the world

Bolesławiec region is also of the perspective importance for copper ore mining; the old copper basin, which currently is the subject of the analysis.

Lignite is the second most important economic extractive resource. In the area of Lower Silesia, there is a Turów deposit which belongs to the PGE GiEK S.A. The Turów Brown Coal Mine – a large opencast mine in Bogatynia – connected (in terms of organisation and infrastructure) with Turów power plant (situated nearby) is a modern and perspective company using the latest technology. There are the prospective deposits: Radomierzyce deposit and Legnica-Ścinawa complex with documented 8 deposits.

Table 1 Total resources and extraction of 14 brown coal deposits in Lower Silesia (based on BZZK 2015)

Balance resources (thousand tonnes)	Industrial resources (thousand tonnes)	Extraction (thousand tonnes)
6 271 277	317 689	7 328

Six deposits of **hard coal** are located in the south part of Lower Silesia (near Wałbrzych and Nowa Ruda), the balance resources of which are in categories A+B+C1 equal to 188 161 thousand tonnes. In spite of closing all mines in the 90-ties of XX century the region has got a vivid and still alive history. There are plans for reactivation of mining activities – in April 2017, the searching concessions were held by: Coal Holding (currently Balamara resources limited) in the area of Nowa Ruda, and Nexano Minerals in the area of Ścinawki.

Natural gas deposits situated in the northern part of the region and there is **an underground gas storage** - Wierchowice, belonging to PGNiG S.A.

Table 2 Total resources and extraction of 25 natural gas deposits in Lower Silesia (based on BZZK 2015)

Extractable resources (million m ³)	Industry resources (million m ³)	Extraction (million m ³)
5779.59	2006.23	600.59

Table 3 Total resources and extraction of 5 helium deposits in Lower Silesia (based on BZZK 2015)

Extractable resources (million m ³)	Industry resources (million m ³)	Extraction (million m ³)
4.19	4.19	0.193

The raw material base of the Lower Silesia is also heavily represented by various and different rock resources, rich deposits of high quality sands and gravels. On the basis of these regional raw materials, a large number of stone processing projects (1.5 thousand stone companies) and the largest aggregate base for road and rail construction projects were developed.

Lower Silesia in Poland is a major producer of **construction stones** and a monopolist in the production of granite. Granites useful for the production of blocks exist in rocks: Strzegom-Sobótka, Strzelin-Zulowa and the Karkonosze Massif (Kudowa Massif and Kłodzko-Złotostocki Massif are not exploited due to the nature protection). The total resources of the identified deposits of granites are approx. 1623 million t. (BGSPIS 2013).

The extraction of **granites** for blocks concentrates in Strzegom-Sobótka Massif and partly in Strzelin-Zulowa Massif. Low extraction is also observed in the Karkonosze Mountains Massif. The total extraction of block granites amounted to 26 deposits, in 2013 it was approx. 0.9 million tonnes (BGSMPiS 2013). According to BGSMPiS, the leaders in this regard are: Borowskie Kopalnie Granitu, Grabinex, Skalimex-Borów, Morstone, Granit Strzegom, Piramida, GT&F Corporation Polska, Wekom, PWPiSKB Kwarc Skalimex-Grantin Granimex. There is also a number of smaller private companies.

Syenite of parameters similar to granite of Przedborowej and Kośmina type are extracted in the area of Ząbkowice Śląskie. According to BGSMPiS, the total resources of the deposits documented in this area are 56 million tonnes.

Lower Silesia is practically the only area of **marbles** extraction in Poland. 11 rock deposits were recorded in the Kaczawskie Mountains, Krowiarki and in Sławniowice area (Opolskie Region). The total resources are approx. 48 million tonnes (BGSMPiS).

Significant block extraction, mostly **yellow chalky sandstone** is in the area of the Stołowe Mountains, in the area of Lwówek Śląski - Bolesławiec. According to BGSMPiS, in the first area, there are 8 deposits, with the total resources of approx. 38 million tonnes, and in the other 26 resource deposits of approx. 55 million tonnes.

Red permian sandstones are also extracted in the area of Nowa Ruda, where approx. 5 mln tonnes of the material was reposed in 3 deposits.

In 2013, the extraction of Lower Silesia **gypsum** was the only a slight percentage of the extraction and production in Poland (4%), Europe (0.4%) and the world (0.05%).

According to the information in BGSMPiS 2013, the best white gypsum from Gypsum and Anhydrite Mine Nowy Łąd in Niwnice is completely processed on site for various grades of white gypsum adhesives and special gypsum (e.g. dental, surgical, etc.).

White burnt clay are in Poland only in Lower Silesia, in the sandy-clay upper chalk in Bolesławiec region, where it became the raw material for the development of the so-called Bolesławiec ceramics. There are 6 documented deposits of 58 527 000 thousand tonnes (BZZK 2015). One of the them, Janina I has been operated by Ekoceramika since 2004, and the extraction in 2015 amounted to 112 thousand tonnes. White burnt, stoneware and refractory clays are operated as accompanying fossil in Turów Bełchatów coal mine. However, their resources are not documented (BGSMPiS 2013). Since 2006, Bolesławieckie Zakłady Materiałów Ogniotrwałych extract sandy-clay deposits from Red Water deposits, formally documented as moulding fossil.

Table 4 Total resources and extraction of 5 white burnt clay deposits in Lower Silesia (based on BZZK 2015)

Balance resources (thousand tonnes)	Industrial resources (thousand tonnes)	Extraction (thousand tonnes)
58 527	559	112

Stoneware clay in Lower Silesia is so-called Bolesławiec clay of the cretaceous and tertiary age where they are extracted in Zebrzydowa Zachód deposit by Ekoceramika. The properties of stoneware clay apply also to Miopolicene Poznań clay documented in Kraniec near Brzeg Dolny and a part of clays from the deposits: Odrzychów near Bolesławiec.

Table 5 Total resources and extraction of 11 stoneware clays in Lower Silesia (based on BZZK 2015)

Balance resources (thousand tonnes)	Industrial resources (thousand tonnes)	Extraction (thousand tonnes)
16 907	3 416	182

Refractory clay exists in Poland only in Lower Silesia (80% of the resources). There are 4 so-called Jarosłów deposits in the area of Strzegom, from which one is exploited - Rusko-Jarosłów.

Table 6 Total resources and extraction of 4 refractory clays deposits in Lower Silesia (based on BZZK 2015)

Balance resources (thousand tonnes)	Industrial resources (thousand tonnes)	Extraction (thousand tonnes)
43 441	1 273	87

Bentonites, extracted only in Lower Silesia are insignificant in the world and European extraction. The national balance resources amount to 2 884 thousand tonnes. However, the operation of bentonite is carried out only in Lower Silesia from Krzeniów deposit. It was shaped in the years 2008-2013 at the level of 0.8-3.0 thousand t/y.

Table 7 Total resources and extraction of 3 betonite deposits in Lower Silesia (based on BZZK 2015)

Balance resources (thousand tonnes)	Industrial resources (thousand tonnes)	Extraction (thousand tonnes)
1 578	345	0.5

Magnesites in Poland are found only in Lower Silesia in the serpentinite massif of Braszowice. According to the information provided in BGSMPiS2013, in recent years, magnesite has been extracted by only one company: Magnezyty Grochów.

Table 8 Total resources and extraction of 14 magnesite deposits in Lower Silesia (based on BZZK 2015)

Balance resources (thousand tonnes)	Industrial resources (thousand tonnes)	Extraction (thousand tonnes)
14,001	3971	96

Kaolin is only extracted in Lower Silesia, in Poland. Initially, kaolin was extracted from small deposits in the area of Strzelin, Żarów, Mirska. In 1947, at the northern end of Nowogrodziec, a clay raw material mine was established, which specialised in producing high quality kaolin. In 1995, it was privatized, and it is now a part of Quartzwerke group. Despite the existence of 14 documented reserves, currently only: Maria III deposit with the balance resources of 78 939.54 thousand tonnes, where the extraction in 2015 amounted to 285.30 thousand tonnes, and Dunino deposit, originally documented as a deposit of halloysite, which was reclassified to kaolin raw materials. The current balance resources of this deposit amount to PLN 474.87 thousand tonnes, and the extraction is 1.35 thousand tonnes.

Table 9 Total resources and extraction of 14 kaolin deposits in Lower Silesia (based on BZZK 2015)

Balance resources (thousand tonnes)	Industrial resources (thousand tonnes)	Extraction (thousand tonnes)
212 077.41	71 355.44	286.65

The extraction of **clay raw materials of construction ceramics** in Lower Silesia is 10.9% of the national production, and their resources are 473 times of the national extraction. The largest resources of 727 650 m³ are the fossil accompanying the brown coal deposit Legnica - Pole Wschodnie (BZZK 2015).

The most modern plant was during in the Polish People's Republic times, located in Środa Śląska, and taken over in 1994 by the Röben family, which is one of the most modern in the world.

Table 10 Total resources and extraction of 68 clay raw materials of construction ceramic deposits in Lower Silesia (based on BZZK 2015)

Balance resources (thousand m ³)	Industrial resources (thousand m ³)	Extraction (thousand m ³)
789 763	22 510	181

Feldspar is extracted in Poland only in Lower Silesia, from two deposits located in Wrocław area.

The exploitation of Lower Silesia feldspar is carried out by Strzeblowskie Mineral Resources Mines, which produce feldspar and quartz flours and abrasives used in the industries: noble ceramics, ceramic tiles, sanitary goods, glass metallurgy, industrial chemicals, enamels, abrasives etc.

Table 11 Total resources and extraction of 9 feldspar deposits in Lower Silesia (based on BZZK 2015)

Balance resources (thousand tonnes)	Industrial resources (thousand tonnes)	Extraction (thousand tonnes)
136944.43	5486.19	76.54

The extraction of **glass sands** in Lower Silesia is 25% of the national production, and its resources represent 130 times of the extraction of Lower Silesia and 32 times of the national extraction.

At present, one of the deposits, Osiecznica II, is exploited by KiZPPS "OSIECZNICA", a member of Quarzwerke Group, which has a modern processing plant. Quartz sand produced in Osiecznica is characterized by very high chemical purity and extremely bright colour. Sands with a particularly low iron oxide content (up to 0.008% - 80 ppm) are used to produce high quality, crystal usable glass, flat glass for solar modules and packaging glass.

Table 12 Total resources and extraction of 8 glass sand deposits in Lower Silesia (based on BZZK 2015)

Balance resources (thousand tonnes)	Industrial resources (thousand tonnes)	Extraction (thousand tonnes)
85,832.11	12,595.31	655.48

The medicinal and thermal waters of Lower Silesia constitute 95% of the documented balance of available resources in the country.

These valuable medicinal waters are used by both the spa and bottling industry. They occur in the following places: Czarniawa-Zdrój, Długopole-Zdrój, Duszniki-Zdrój, Gorzanów, Grabin, Jedlina-Zdrój, Jeleniów, Kudowa-Zdrój, Polanica-Zdrój, Stare Bogaczowice, Stare Rochowice, Stary Wielisław, Szczawina, Szczawno-Zdrój, Świeradów-Zdrój.

These valuable medicinal waters are used by both the spa and bottling industry. They occur in the following places: Czarniawa-Zdrój, Długopole-Zdrój, Duszniki-Zdrój, Gorzanów, Grabin, Jedlina-Zdrój,

Jeleniów, Kudowa-Zdrój, Polanica-Zdrój, Stare Bogaczowice, Stare Rochowice, Stary Wielisław, Szczawina, Szczawno-Zdrój, Świeradów-Zdrój.

Table 13 Total resources and extraction of brine, healing and thermal waters from 19 deposits in Lower Silesia (converted based on BZZK 2015)

Available (m ³ /h)	Exploited (m ³ /h)	Consumption (m ³ /h)
38 250.55	506.72	126

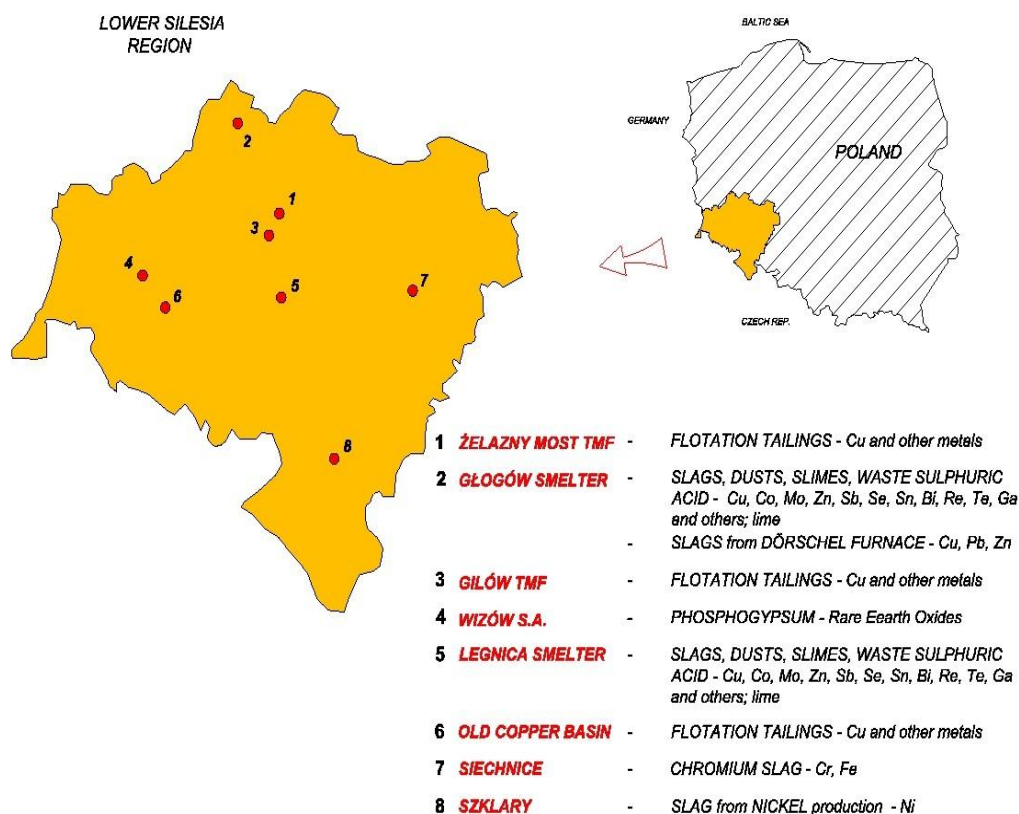
RECOVERY AND RECULTIVATION INDUSTRY

The largest volumes of waste related to the exploitation of mineral resources are related to the mining of copper and brown coal ores.

The exploitation of lignite – after 40 years of activities of KWB Turów in 2006, 1.5 billion cubic meters of overburden were found on the landfill, with significant content of clays (Zajączkowski 2012).

The exploitation of rock raw materials involves the accumulation of significant amounts of fine-grained fractions generated during crushing and cutting of solid rocks (basalt, melafir, granite). In the case of waste generated in the production of basalt and melaphy, they can be used as fertilizer, raw material for the production of mineral wool. All fine fractions can potentially be used as fillers for construction chemicals, and from some of which one can try to recover rare earth elements (A. Solecki own research).

The exploitation of copper ores and other metals have been used in KGHM for over 600 million Mg of post-flotation waste at the presently abandoned Lena, Iwina, Wartowice and Gilow landfills and at the currently active site of Żelazny Most. The mass of post-flotation waste may amount to approx. 2000 million tons of Mg by the end of the exploitation of Lubin-Głogów deposit. Quartz and carbonate minerals (dolomite and calcite) and clay minerals dominate in the composition (Łuszkiewicz, 2000).



In 2013, in the Lower Silesian Voivodship, 29.7 million Mg of waste from Group 01 was generated, most of which was assigned Code 01 03 81, i.e. waste from flotation of non-ferrous metal ores, which is mainly connected with the activity of KGHM Polska Miedź S.A. in the area.

Processing waste

Copper ores delivered from the mines of KGHM Polska Miedź S.A. are enriched in the process of flotation in the plants of the Department of Ores Enrichment located in Lubin, Polkowice and Rudna. The level of crushing of the Polish copper ores, not exceeding 2%, results in the separation of approx. 94% of the extracted mass in the process of their enrichment as waste. This means that up to 28 million Mg of flotation waste is generated at the current level of 30 million Mg/year.

- Copper flotation waste - the largest source of copper and accompanying elements
- Nickel slag - a potential source of nickel
- Ash and slag from the smelters - source of cobalt (Co), rhodium (Rh), zinc (Zn), molybdenum (Mo)
- Waste from the production of phosphoric acid - rare earth oxides

Cobalt - cobalt ore deposits do not appear separately. Its presence was found in copper ore deposits on Monoklina Przedsudecka (estimated resources of 120.6 thous. Mg of cobalt, including 96.1 thous. Mg of exploited deposits).

Graphite - creates deposits in a form of graphite shales near Stronie Śląskie. On the other hand, the inserts of graphite rocks are found near Strzelin, Dzierżoniów, Wałbrzych and Bystrzyca Kłodzka.

Platinum - copper ore deposit on Monoklina Przedsudecka is the primary source.

Rare earth elements - processing of significant quantities of apatite ore originating from Kolo led to the formation of phosphorus pile in Wizowo. According to Jarosiński (2016), it is a potential source of rare earth elements and contains an average of 0.69% of Ln_2O_3 , with resources of 828 thousand tonnes of rare earths, including 200 tonnes of yttrium and at least 33 tonnes of europium. Despite the importance of rare earths as critical raw materials, there are serious problems with the development of cost-effective recovery technologies from this pile.

Critical raw materials of Lower Silesia

In Lower Silesia, there are at least 16 hectares of volume of 1 million m^3 , which allow us to think about the cost-effective exploitation of mineral waste located there, such as sandstone, conglomerate and post-flotation waste.

MINING CULTURAL HERITAGE

Purposes of the development of mining excavations:

- Substantial improvement of the environment and human safety resulting from the reclamation and protection of post-mining areas and facilities;
- The protection of historically valuable sites of former mining works;
- Increased tourist value.

Mining heritage treated in two ways:

- Shaping a local identity based on specific traditions and knowledge, aiming to revive monuments and places of former mining works,
- Economic resource stimulating local development planning, inter alia based on tourism, inclusive, creative industries, expanding access to cultural goods.

Examples of the development of post-mining areas

Kletno [Underground Tourist Route in the old uranium mine](#) – an underground tourist and educational route in the Old Uranus Mine - exhibits a number of attractive lightings of local minerals (fluorite, amethyst, quartz and others).

Krobica - [St. John's Mine](#) – tourist and educational „Route of the ancient ways of precious metals mining” is an underground 350-metre-long passage through two adits and 13 posts alongside the 8-kilometre -long ground route. The drifts of a mine extracting zinc and cobalt ore were worked here from the 16th century to the 19th.

Kowary [Underground Tourist Route "Kowary"](#) – an underground Tourist Route “Kowary Sloughs” - exposures related to the geology of the Sudetes and mining techniques in the Uranus Exploratory Drift.

Nowa Ruda [Underground Tourist Route "Coal Mine"](#) – an underground Tourist Route “Coal Mine in Nowa Ruda” with an underground railway.

Municipality of Mirsk - [Geopark](#) – a tourist and educational route “In the footsteps of the old mining ore”, the underground tourist route “St. John's Mine” - an example of comprehensive protection, protection and utilization for historical recreation of mining areas and tin mining ores.

Szklary [Mine of nickel chrysoprase and opal in Szklary](#) – an underground Route is available from 1st of May until 31st of September.

Walim [Silver Mine “Silberloch”](#) - Underground Tourist Route is not available for tourists currently.

Wałbrzych [Former Mine, Science and Art Centre](#) – a complex of underground mining structures and an underground route, formerly the “Julia” Coal Mine, it was created with respect for mining traditions, unique scenery and local industrial landscapes.

Złotoryja [Gold Mine “Aurelia”](#) – an underground route (a 100 m long) is available from 1st of October until 20th of December.

Złoty Stok [Gold Mine](#) – an underground Tourist Route “Gold Mine” and Medieval Technological Park were built on the basis of the oldest mining and metallurgical centre in Poland, finally closed in 1961. It is constantly expanding its tourism offer related to the promotion of mining tradition and technology.

R&D

The raw materials industry is characterized by a high proportion of industrial production, employment and investment expenses, including for innovation activities. A significant part of the mineral sector is in the hands of foreign investors who implement new technologies based on their own proven methods.

KGHM CUPRUM Ltd. – Research & Development Centre as a unit created for the needs of KGHM conducts mainly research, which final phase is implementation in the KGHM’s mines. These implementations are not registered in the POLon database, as they are covered by the security classification. KGHM CUPRUM has 30 active patents, including 21 inventions, 8 for utility models and 1 registered trademark.

EIT Raw Materials found itself in the group of 116 partners from Europe within the framework of KIC, which is the most important undertaking of the European Innovation Partnership for non-energy raw materials (EIP RM), whose action plan is to preserve the security of raw materials in Europe. The EIT Raw Materials is one of the six locations of research centres within the EIT Knowledge and Innovation Community in the Raw Materials area, the so-called Colocation Eastern CLC for Central and Eastern Europe dedicated to the raw material sector in Wrocław, which coordinates research, education and SME development.

Polish Technology Development Centre (*former Wrocław Research Centre EIT+*) has a comprehensive research infrastructure allowing the implementation of tasks for industry in the form of research projects and basic research that take into account global development trends. The institution employs approx. 73 people in scientific positions, employed in the implementation of research / scientific work, including 39 people with a degree / scientific degree.

POLTEGOR – Opencast Mining Institute deals with the development and implementation of industrial innovative technologies, processes, methods and technical solutions for the needs of opencast mining as well as broadly understood environmental protection. The Institute employs approximately 43 people in scientific positions, employed in the implementation of research / scientific work, including 16 people with a degree / scientific degree. Poltegor Institute has implemented over 200 results of its research since 2013, most of which concerned the

implementation of products (93) and technology (83), the rest related to inventions. In addition, Poltegor Instytut was granted 33 patents, 16 of which are still valid. It also has a protective right for two trademarks and one utility model.

Wroclaw University of Science and Technology, Faculty of Geoengineering, Mining and Geology is a unit with nearly 50 years of experience in conducting scientific and technical research. Currently, the Faculty educates and conducts research in the field of underground and open-cast mining, exploratory and mining geology, geoinformatics and geoengineering. The Faculty cooperates with universities and scientific, research and industrial units in Poland and in the world. There are about 62 people in the faculty at scientific positions, employed in the implementation of research / scientific work, including 49 people with a degree / degree. The Polytechnic has around 260 patents, 13 of which are the result of work in the department of geoengineering, mining and geology.

University of Wroclaw, Institute of Geological Sciences is one of the largest research and teaching institutions in Poland dealing with earth sciences. It employs over 50 teaching staff (including 5 with the title of professor). The Institute's research and teaching activities cover practically all areas of geology. At present, the Institute does not have active patents for inventions. It has only protection rights for two trademarks.

Institute of Low Temperatures and Structural Research Włodzimierz Trzebiatowski of the Polish Academy of Sciences is a scientific institution of the Faculty of Sciences and Earth Sciences of the Polish Academy of Sciences. The Institute employs 116 scientific workers; of which - 33 professors, 26 habilitated doctors, 35 doctors. The Institute of Low Temperature has 17 active patents and has protective rights for one trademark, 3 transferable rights to know-how and one license.

College of Artistic and Management Crafts in Wroclaw is the only university in Poland that educates craftsmen in the jewellery industry, the expertise of precious stones and the preservation of works of art. As one of the few in Europe, he conducts studies in the field of gemology, or science about precious stones. Specialist education takes place at the undergraduate level in the full-time and extramural studies. The university is focused on preparing highly qualified professionals who are able to independently run a business.

Most universities have business offers addressed to entrepreneurs, which can be easily found on their websites. According to the conducted research, entrepreneurs are more willing to cooperate with research institutes than with universities. This is due to complicated procedures, mismatch to the market, lack of a special cell for cooperation with entrepreneurs at Lower Silesian universities.

The raw materials industry sector has much potential for cooperation with R&D, in particular in areas such as new mining technologies (processes, equipment, materials) and technology of obtaining rare earths (recovery of raw materials). Due to the increasing demand for critical materials, the interest in substitution is also increasing.

CLUSTERS

During the mining and processing activities, the following problems occur: environmental impact, materials processing technology, finding skilled workers, obtaining concessions and approvals. Both

the need to protect undeveloped deposits and the extraction of minerals from exploited deposits generates spatial conflicts. The cyclical increase in demand for raw materials contributes to the periodic intensification of these conflicts. In order to address the above problems in the stone industry, the "Wałbrzych Raw Materials" (Wałbrzyskie surowce) cluster was established, aimed at the integration of regional raw material companies around the area of advanced material technologies and cooperation in the axis: business - science - local government units - business environment units. Similarly, the integrating role is performed by the "Stone-masonry cluster" (Klaster kamieniarski) coordinated by the Bazalt Foundation in Strzegom.

Cluster "Wałbrzyskie Surowce" - raw materials for advanced material technologies was founded in 2013, and its coordinator is Agencja Rozwoju Regionalnego "AGROREG" SA. Currently, it has 15 members, including two research units cooperating with the University of Environmental and Life Sciences in Wrocław and the "Poltegor - Institute" Institute of Opencast Mining. The cluster conducts activities integrating the environment. It helps you find new sales markets and develop new products. From the beginning of its operation, the cluster has been operating to promote natural stone and its correct use.

Stone-masonry cluster operates in the raw materials industry. It started its activity in 2013, and the "Bazalt" Foundation is currently the coordinator of the cluster. Cluster members include Wrocław University of Environmental and Life Sciences, Poltegor-Institute, D & J GROMIEC, Strzegom Municipality. The cluster works to strengthen the economic potential of the stone industry enterprises from Lower Silesia, primarily through seeking new sales markets, developing new concepts of products made of stone, promoting the use of natural stone.

STAKEHOLDERS GROUP

Institute for Territorial Development – Jan Blachowski, Ilona Szarapo

KGHM CUPRUM Ltd. – Research & Development Centre – Izabella Nowak

KGHM Polska Miedź S.A (KGHM Polish Copper) – Wiktor Kowalczyk

Stone-masonry cluster – Krzysztof Skolak, Jacek Major

Wałbrzych raw materials cluster – Jerzy Dudzik, Mirosław Miller

District Mining Authority in Wrocław – Miranda Ptak, Robert Podolski

Polish Geological Institute – National Research Institute; Lower Silesian Branch – Maciej Kłonowski, Katarzyna Zboińska

Department of Geoengineering, Mining and Geology of Wrocław University of Technology – Jan Kudełko, Urszula Kaźmierczak

POLTEGOR INSTITUTE - Opencast Mining Institute – Jacek Szczepiński, Barbara Rogosz

Polish Technology Development Centre (former Wrocław Research Centre EIT+) – Artur Bednarkiewicz, Sebastian Arabasz

Employers' Organization of Polish Copper – Beata Staszaków, Rafał Szkop

EIT RAW MATERIALS Eastern Co-Location Centre – Krzysztof Kubacki

Institute for Territorial Development (Instytut Rozwoju Terytorialnego)

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I. Description of Company's activity

The Institute for Territorial Development is a research and development entity whose activity is focused on the implementation of tasks related to spatial planning and territorial development, with particular emphasis on regional and cross-border issues. The Institute is a self-governing organizational unit of the Marshal Office of Lower Silesian Voivodeship, established in 1999 in result of conjoining of four smaller regional planning offices from Lower Silesia.

The Institute employs over 50 people, including more than 40 highly specialist staff from the fields of spatial planning, transportation planning, environmental protection and planning, socio-economic analysis, spatial information systems and other. IRT carries out its tasks basing on multi-level cooperation with self-government and government administration units, academic institutions and social partners from Poland and abroad.

The tasks of the Institute for Territorial Development include:

- carrying out tasks in the field of planning and spatial development, defined mainly in the Act on spatial planning and development
- carrying out tasks in the area of development policy, defined mainly in the Act on the principles of conducting development policy
- performing tasks in the field of providing information about the environment and its protection, environmental impact assessments, including cross-border ones, specified in the Act on sharing information about the environment and its protection, public participation in environmental protection and environmental impact assessments
- implementation of tasks in the scope of creating and using spatial information infrastructures, specified in the act on spatial information infrastructure

Strategic Activities

- Ensuring reliable and comprehensive knowledge about territorial development:
- Maintaining and developing lasting cooperation in territorial development
- Stimulating development initiatives based on principles developed and promoted by the Institute

II. Examples of currently conducted projects

- Spatial Development Plan of the Voivodeship
- Lower Silesia Geoportal
- Lower Silesia Cycle Policy
- Anti-SMOG resolution for the Lower Silesia
- Study on lignite deposits in the Legnica area, social, economic and spatial conditions for their protection

KGHM Cuprum Ltd. – Research & Development Centre (KGHM CUPRUM sp. z o.o. Centrum Badawczo-Rozwojowe)

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I. Description of Company's activity

KGHM CUPRUM Ltd. Research & Development Centre supports a copper giant KGHM Polska Miedz S.A in the implementation of the strategy, diversification of the activity and in creating development and innovative technological solutions. The activity of the Company is not limited only to the cooperation with the entities from the capital group of KGHM Polska Miedz S.A. and the copper mining region on the Fore-Sudetic Monocline.

KGHM CUPRUM offers clients and partners solutions in the scope of:

- mining and geo-engineering eg.: mining methods, rock excavation technologies, mechanization of mining works, mining aerology, analysis on the hazards in underground mining (in ores and non-ferrous metal, salt and hard coal mines); shaft designs and underground construction; mine surveying; data analyses related to mining industry; optimization of psychological and organizational conditions in the workplace;
- hydrogeology and geology, exploration and evaluation of geological projects;
- environmental protection, including the development and use of industrial waste; revitalization of postindustrial areas and protection of the mining heritage;
- modern methods of copper ore processing;
- energy technologies.

The services and works offered include all stages of research and development activity: starting from scientific research, through project, evaluation of its impact on the environment, feasibility study, and ending with the supervision over its execution.

During 50 years of the company activity it have conducted projects in many countries in the world: USA, Canada, Cuba, Peru, Brasil, Chile, Germany, Poland, Ukraine, Hungary, Romania, Serbia, Marocco, Algeria, Mauritania, Senegal, Congo, Democratic Republic of Congo, Angola, Zambia, Botswana, Republic of South Africa, Kazahstan, Iran, India, China, North Korea, Laos, Australia, UK.

II. Examples of currently conducted projects

In Horizon 2020 programme:

- SIMS - Sustainable Intelligent Mining Systems
- DISIRE - Integrated Process Control based on Distributed In-Situ Sensors into Raw Material and Energy Feedstock
- BIOMORE - New Mining Concept for Extracting Metals from Deep Ore Deposits using Biotechnology
- THING – Stimulate scaleups to develop novel and challenging technology and systems applicable to new markets for robotic solutions

In KIC Raw Materials platform:

- Re-Activate - Reactivating former mine sites
- Rock Vader - Smart Hard Rock Mining System

- Virtual Mine - A modeling tool for Wider Society Learning
- VISUAL 3D - Visualisation of 3-4D – models in geosciences
- Safe Deep Mining - Continued education program in rock engineering for deep mines
- MaMMa - Maintained Mine & Machine
- MiReBooks – Mixed Reality Handbooks form Mining Education
- OpenYourMine – Master education project dedicated to mineral resources and sustainability

In INTERREG Programme – Baltic Sea Region

- BSUIN - Baltic Sea Underground Innovation Network

In SMART GROWTH OPERATIONAL PROGRAMME 2014-2020:

- Integrated monitoring system for high-energy paraseismic events based on GNSS and PSInSAR satellite data and seismic sensors

Project funded by NCBiR (The National Centre for Research and Development):

- Development of computer tool to design blasting patterns in the mining and geological conditions of Legnica-Głogów Copper Basin mines (CuBR III; Acronym: PROMETEST)

III. Partners in projects:

Foreign partners:

- ABB AB, Szwecja
- Agencia Estatal Consejo Superior de Investigaciones Cientificas, Spain
- Agnico-Eagle Finland OY, Finland
- ANYbotics, Switzerland
- Atlas Copco Rock Drills AB, Sweden
- Baltic Scientific Instruments, Latvia
- Boliden Mineral AB (BOL), Sweden
- Spanish National Research Council, Spain
- DMT GmbH& Co., Germany
- E F T A S Fernerkundung Technologietransfer GmbH, Germany
- Ericsson AB, Sweden
- Geological Survey of Slovenia, GeoZS, Slovenia
- German Research Centre for Geosciences, Germany
- Helmholtz-Zentrum Dresden-Rossendorf e.V., Germany
- IGW Europe AB, Sweden
- K+S Kali GmbH, Germany
- Karelian Research Center of the Russian Academy of Sciences, Russia
- Luossavaara-Kiirunavaara AB, Sweden
- Mobilaris AB, Sweden
- Sandvik Mining and Construction, Austria
- Sotkamo Silver AB, Sweden
- Swedish Nuclear Fuel and Waste Management Co., Sweden
- Veitsch-Radex GmbH&Co KG, Austria
- VTT Technical Research Centre of Finland Ltd., Finland
- Wolfram Bergbau und Hütten AG, Austria
- Zentralanstalt für Meteorologie und Geodynamik Wien, Austria
- Clausthal Institute of Environmental Technology GmbH, Germany
- Katholieke Universiteit te Leuven, Belgium
- Lulea Tekniska Universitet, Sweden

- Montanuniversität Leoben, Austria
- Ovidius University of Constanta, Rumania
- Rheinisch-Westfaelische Technische Hochschule Aachen, Germany
- Oulu Univesity of Applied Sciences, Finland
- Tallinn University of Technology, Estonia
- Technische Universität Bergakademie Freiberg, Germany
- University of Edinburgh, UK
- University of Limerick, Ireland
- University of Oxford, UK
- University of PISA, Italy
- University of Zurich, Switzerland
- Vilnius University, Lithuania.

Domestic partners:

- AGH University of Science and Technology, Cracow
- Gdańsk University of Technology
- Łódź University of Technology
- Warsaw University of Technology
- Wrocław University of Technology
- Silesian University of Technology
- Military Technical Academy in Warsaw
- Central Mining Institute, Katowice
- Institute of Non-Ferrous Metals, Gliwice
- Institute of Fundamental Technological Research, Polish Academy of Sciences
- Institute of Innovative Technologies EMAG, Katowice
- Polish Centre for Technology Development, Wrocław
- KGHM Polska Miedź S.A., Lubin
- Przedsiębiorstwo Budowy Kopalń PeBeKa S.A., Lubin
- Nitroerg S.A., Bieruń
- KGHM ZANAM S.A., Lubin
- SEVITEL Sp. z o.o., Katowice

KGHM Polska Miedź S.A (KGHM Polish Copper)

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I. Description of Company's activity

Knowledge and teamwork – are the corporate pillars on which KGHM has been building the position of a leader in copper and silver production for 55 years. As a modern and global organisation it influences sustainable development worldwide.

Company operates on 3 continents. Mining Project are conducted in: Europe / North America / South America.

KGHM is a Leader in the mining industry.

World resources of copper ore, controlled by KGHM - 22,7 million tones.

Other production: Copper / Precious metals / Rhenium / Molybdenum / Nickel / Palladium

Number of employees – 34 000

KGHM engages in the extracting and processing of valuable natural resources with the largest European deposits of copper ore located in the south-western part of Poland right in the heart of its catchment area. Owing to its vast experience, openness and constant improvement of competencies, the company has built a unique culture of teamwork ranking high on the international arena.

Today, KGHM is able to face any challenge, win markets and implement broad and ambitious investment projects.

Knowledge-based experience in technologies and processes combined with employee competencies constitute the most precious resource of KGHM and provide the foundation of the company value. All this contributes to the growth of the company as an environmentally friendly, socially sensitive and inclusive corporation.

Knowledge-based experience is also instrumental in discovering new sustainable methods of extracting and processing natural resources.

All KGHM logo labelled copper, silver, and other metals have for years been associated with excellent quality as recognised and much-in-demand products worldwide.

The implementation of the development strategy, systematically strengthens KGHM's international position. Currently, the company boasts a geographically diversified portfolio of mining projects. KGHM has located its facilities on three continents – Europe, the North and South America. With its control over 22,7 million tonnes of copper ore resources worldwide KGHM has risen to the well-deserved position of a global mining industry leader. The company's portfolio also includes new metals like molybdenum, palladium or nickel which help KGHM join the international community of multi-resource companies.

KGHM cultivates its reputation of a reliable producer, a trusted business partner and a company with a sustainable development policy.

KGHM is also a responsible employer acknowledging and recognising the commitment and cultural identity of its employees around the world.

The company employs a total of 34 thousand people who believe that their work is important to the world. Without their expertise, integrity and courage precious metals would hardly reach the global market and make sustainable development possible.

Stone-masonry cluster (Klaster Kamieniarski)

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I. Description of Organization's activity

The idea of the Stone-masonry Cluster is to promote natural stone, increase its participation in construction projects and implementations, the rational use and continuous improvement of the industrial potential of the region. The area of interest includes small and medium enterprises, companies related to mining, processing and managing stone, research units, design offices, architects and artists working in natural stone.

Objectives of the operation of the cluster:

- integration of SMEs, research centers and business environment communities,
- linking an innovative knowledge-based economy with the development of technology in the stone industry,
- training specialists employed in this sector of the economy,
- introducing innovative solutions and popularizing technological achievements,
- promoting the use of natural resources of the region,
- strengthening the economic potential of the stone industry enterprises from Lower Silesia, primarily through seeking new sales markets, developing new concepts for products made of stone, promoting the use of natural stone;
- increasing cooperation between individual entrepreneurs;
- preparing joint ventures (including the preparation of joint bids for tenders).

II. Partners:

Members of the the Stone-masonry cluster:

D&J GROMIEC – granite products producer

Fundacja Bazalt – the Basalt Foundation is due to initiate, assist and coordinate activities for reclamation of a post-industrial area

Granex – investment service in field of natural stone supply: pre-investment, supply and service consulting

Graniro – supplier of diamond technology solutions for natural stone processing

Kurier Kamieniarski – a news paper devoted to the stone-masonry topic

P.K.B Wiesław Wilk – a company specialized in production and selling of natural stone products and cutting granite blocks

P.O.G. Jan Łobodziec – Granite processing plant

Stone Consulting – technical consulting in the field of marketing and putting on the market of natural stones construction products

Uniwersytet Przyrodniczy we Wrocławiu – Wrocław University of Environmental and Life Science

WRKB Granit – Production and marketing of natural stone products

Zespół Szkół w Strzegomiu – the Complex of Vocational Schools has educated vocational students since 1947

Wałbrzych raw materials cluster (Klaster „Wałbrzyskie Surowce”)

<http://www.walbrzyskiesurowce.pl/>

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I. Description of Organization’s activity

The cluster's offer is in the fields of science, raw materials, scientific institutions, R&D institutions, universities (in particular, faculties in the fields of chemistry, energy, geology, chemical metallurgy, solid state physics, materials engineering) and business environment institutions.

The operation base for the task of the "Wałbrzyskie surowce" Cluster - raw materials for advanced material technologies - is the raw material, metallurgy and energy potential of the Wałbrzych Agglomeration and the Nowa Ruda Town which has the infrastructure necessary for the needs of the implementation.

The primary goal of the "Wałbrzyskie Surowce" Cluster is to develop and implement a new development strategy for the energy and raw materials industry aiming at manufacturing highly processed products competing on the markets of Europe and the world and based on local natural resources and the competences of technical and engineering staff.

The strategy will be developed and implemented using the latest scientific knowledge, the available patents and technologies and based on the international benchmark of companies with a similar profile to those operating in the Wałbrzych Agglomeration. The results of the study will be implemented as part of the regional strategy of smart specializations (RIS3), and the effectiveness of the implementation will be assessed using monitoring and evaluation methods adopted in Lower Silesia and at the level of the country.

II. Partners:

Members of the the Wałbrzych raw materials cluster:

Companies: Kopalnie Surowców Skalnych w Bartnicy Sp. z o.o., Mineral Polska Sp. z o.o., Coal Holding Sp. z o.o., Brante Partners Sp. z o.o., GONDEK Sp. z o.o., Miedzi Copper Corp., Piaskowiec Bruki Kamienne Piotr Adamski

Science Entities: Polska Akademia Nauk, „Poltegor – Instytut” Instytut Górnictwa Odkrywkowego, Politechnika Wrocławska, Międzynarodowa Wyższa Szkoła Logistyki i Transportu

Business environment institutions: Agencja Rozwoju Regionalnego „AGROREG” S.A., Dolnośląska Agencja Rozwoju Regionalnego S.A., Karkonoska Agencja Rozwoju Regionalnego S.A., Wałbrzyska Specjalna Strefa Ekonomiczna „INVEST-PARK” Sp. z o.o.

Local administration: Starostwo Powiatowe w Świdnicy, Urząd Miasta Wałbrzych

Financial institutions: Gospodarczy Bank Spółdzielczy Radków

Associations: Stowarzyszenie Podziemne Trasy Turystyczne Polski.

District Mining Authority in Wrocław (Okręgowy Urząd Górniczy we Wrocławiu)

http://www.wug.gov.pl/kontakt/oug_we_wroclawiu

ul. Kotlarska 41, 50-151 Wrocław

Phone: +48 71 790 20 80

e-mail: ougwroclaw@wug.gov.pl

I. Description of Organization's activity

Mission

We provide public service with the aim to improve miners' health and safety, ensure sustainable management of deposits and reduce the negative impact of the extractive industry on people and the environment.

Vision

Mining authorities are perceived as a specialist and citizen-friendly institution. We plan and work using modern tools. Our experts control and advise. We solve problems of Polish mining.

Scope of responsibilities

The President of State Mining Authority, district mining offices and Specialized Mining Office supervise mining plant operations, especially in respect of:

- health and safety at work, and fire protection,
- mine rescue,
- management of mineral deposits during the process of extraction,
- environment protection and deposit management,
- mining damage prevention,
- mining plant construction and closure, including land reclamation and development of post mining areas.

Polish Geological Institute – National Research Institute; Lower Silesian Branch (Państwowy Instytut Geologiczny – Państwowy Instytut Badawczy; Oddział Dolnośląski im. H. Teisseyre’a)

<https://www.pgi.gov.pl/wroclaw/kontakt-i-lokalizacja.html>

al. Jaworowa 19

53-122 Wrocław

Phone: +48 71 337 20 91 to 93

email: sekretariat.od@pgi.gov.pl

I. Description of Organization’s activity

The Polish Geological Institute (PGI) was founded on the 7th of May 1919 on the strength of the Resolution of the Parliament of the Republic of Poland. It is the oldest Polish nation-wide scientific institution. It is involved in comprehensive studies of geological structure of the country for practical use in national economy and environmental protection. In addition to scientific activities in all fields of modern geology the Institute was entrusted with the tasks of the Polish Geological Survey and the Polish Hydrogeological Survey. Moreover, it is responsible for the country’s security in supply of mineral resources, the groundwater management, for monitoring of the geological environment and warning against natural hazards and risks.

In February 2009, the Council of Ministers bestowed the Polish Geological Institute the status of National Research Institute in recognition of the achievements and contribution to the developments in science and national economy during last 90 years.

Legal Status: Research and Development Unit, National Research Institute

Supervising Institution: Ministry of Environment

The Polish Geological Institute belongs to the association of European geological surveys – EuroGeoSurvey (EGS) with its seat in Brussels.

Scope of activities of the institute:

- Comprehensive studies of the geological structure of Poland

- Geological, geoenvironmental and hydrogeological mapping
- Evaluation of national minerals resources potential
- Evaluation of quality and resources of groundwaters including mineral and thermal waters
- Monitoring and analysis of wide spectrum of geological issues of the natural environment, including groundwaters
- Acquisition, storage, processing and dissemination of geological and geoenvironmental information on the entire territory of Poland, including the marine sea
- Expertise on a wide array of geological issues for the state administration and self governments
- Cooperation with geological surveys and organizations involved in geological research in other countries
- Editing and publishing maps, atlases, periodicals and series of publications in geology

II. Examples of currently conducted projects

- **ACE** Antarctic Climate Evolution
- **CO2GeoNet** (od 2008) Geological storage of CO₂. European Network of Excellence
- **Cost Action TU1206 SubUrban** (od 2014) A European network to improve understanding and use of the ground beneath our cities
- **COST Action TU1405 GABI** (od 2015) European network for shallow geothermal energy applications in buildings and infrastructures
- **ECCSEL** (od 2011) European Carbon Dioxide Capture and Storage Laboratory Infrastructure
- **ECORD** (od 2011) European Consortium for Ocean Research Drilling
- **EMODNET** (od 2009) European Marine Observation and Data Network
- **ENeRG** (od 2009) European Network for Research in Geo-Energy
- **GECON (od 2018)** <https://www.geogecon.com/pl>
- **GeoPLASMA-CE** Shallow Geothermal Energy Planning, Assessment and Mapping Strategies in Central Europe
- **Geo3EU** (od 2008) GeoEurope3D
- **GeoThermal4PL** <https://www.pgi.gov.pl/geothermal4pl.html>
- **ICDP** (od 2010) International continental scientific drilling program
- **IGCP** International Geoscience Programme
- **InSARap** (od 2014) Sentinel-1 Performance Study with TOPS Data'
- **IODP** (od 2011) Integrated Ocean Drilling Program
- **Minerals4EU** (od 2013) European Intelligence Network on Supply of Raw Materials – Minerals4EU
- **MUSE (od 2018) Managing Urban Shallow geothermal Energy**
<http://geoera.eu/projects/muse/>
- **OneGeology** (od 2007)
Making Geological Map Data for the Earth Accessible
- **PanAfGeo** (od 2013)
Geoscientific knowledge and skills in African Geological Surveys
- **ShaleMech** <https://shalemech.pgi.gov.pl/pl/>
- **Shaleseq** (od 2014)
Physico-chemical effects of CO₂ sequestration in the Pomeranian gas-bearing shales
- **TERRAFIRMA** (od 2003)
Pan-European Ground Motion Hazard Information Service
- **TransGeoTherm (2012-2014)** <http://www.transgeotherm.eu/>

The scope of projects conducted by the institute can be found on the website:

<https://www.pgi.gov.pl/en/projects.html?cont=lists&ccname=projekty>

Wrocław University of Science and Technology: Department Geoengineering, Mining and Geology (Politechnika Wrocławska; Wydział Geoinżynierii, Górnictwa i Geologii)

<http://wggg.pwr.edu.pl/>

ul. Na Grobli 15

50-421 Wrocław

GEOCENTRUM, budynek L-1

Phone: +48 71 320 68 35

email: wggg@pwr.edu.pl

I. Description of Organization's activity

The Faculty of Geoengineering, Mining and Geology of Wrocław University of Science and Technology is a unit with nearly fifty years' history of providing education to students, as well as conducting scientific and technical research. The Faculty was founded in 1968 and since its very beginning has been responding to the needs of the developing domestic economy and the regional raw material based industry of Lower Silesia.

Currently, the Faculty offers education and conducts research in the field of underground and open pit based mining of deposits, exploratory and mining geology, geoinformatics, and geoengineering. The Faculty cooperates with universities as well as scientific and research institutions and industrial units in Poland and other parts of the world. The quality of teaching at the Faculty is guaranteed by the accreditation granted by the State Accreditation Committee, an IPMA certificate, and the Faculty Committee for the Evaluation and Ensuring Teaching Standards. Students also have an opportunity to deepen their knowledge by participating in Scientific Circles, taking Technology Trips, doing internships, and attending scientific conferences.

The Faculty of Geoengineering, Mining, and Geology is tuning its educational offering to social and economic changes. Our graduates do exceptionally well in the labour market, pursuing employment in mining companies, public state-level and self-government administration, project units, or enterprises operating in the business of collecting and processing spatial information.

The Faculty delivers two degree programmes - mining and geology and geodesy and cartography, in two cycles of education, as well as third cycle programmes. Graduates of the University's degree programmes have an opportunity to complete paid post-graduate programmes in the fields of open-pit mining, environmental protection and health and safety in the workplace, management and marketing, geoinformatics, and mineral and waste processing.

II. Examples of conducted projects

- A bilateral project conducted under the Financial Mechanics EEA and the Norwegian Mechanism entitled "Geothermal Energy: the Basis of Low-Emission Heat Engineering and Improvement of Living Conditions and Sustainable Development - Preliminary Studies for Selected Areas in Poland". Time-frame: from July 7, 2017, to October 31, 2017.
- European Union framework programme - Horizon 2020 - project entitled "Integrated Process Control Based on a Network of Integrated Sensors for Satisfying the Demand for Raw Materials and Energy". Acronym: DISIRE Time-frame: from January 1, 2015, to December 31, 2017.

- NCBiR - CuBR - 1st competition – Project entitled “Innovative Methods for Making Deep Deposits of Copper Ores Available” (ACRONYM: I-MORE) Time-frame: from January 1, 2015, to December 31, 2017.
- NCBiR - CuBR - 2nd competition – Project entitled “Development of a High-Performance Technology for Enriching Polish Copper Ores” (Acronym: HighCopper) Time-frame: from May 1, 2015, to April 30, 2018.
- NCBiR - National programme - Applied Research Programme 1st competition - Time-frame: from October 1, 2012, to September 30, 2015, Project entitled Smart System for Automatic Testing and Constant Diagnosis of Conveyor Belts’ Condition (PBS path A) (ABCD).
- NCBiR - National programme - Applied Research Programme 3rd competition - Project entitled “Connectors of Multi-Ply High Endurance Conveyor Belts” (NZTP) Time-frame: from April 1, 2015, to March 31, 2018.
- NCBiR – National programme - IniTech programme – Project entitled Linear Indirect Drive Improving Conveyors’ Functionality Time-frame: from May 1, 2010, to April 30, 2013.
- NCBiR – National programme - 10th competition – Project entitled “Conveyor Belt Featuring Increased Resistance to Wear and Tear Damage Applicable Particularly in the Coal, Copper Ore, and Rock Mining Industries” Time-frame: from September 1, 2010, to February 28, 2013.
- NCN – OPUS 4 competition – Project entitled “Development of a Numeric Modelling Method for Mining Terrain Deformations in Complex Geological and Mining Conditions of Use. Time-frame: from July 19, 2013, to January 18, 2016.
- NCN – SONATA 4 competition – Project entitled “The Mechanism of Development and Disruption of a Three-Phase Contact at the Junction of the Solid-Liquid-Gas Phases in Various Flotation Devices.” Time-frame: from July 11, 2013, to July 10, 2016.
- NCN – PRELUDIUM 2 competition – Project entitled “Resources of Metallic Raw Materials and Their Deposits on Regular Chondrites’ Parent Bodies” Time-frame: from September 5, 2012, to March 4, 2016.
- Project co-financed with the resources of the European Regional Development Fund under the Operational Programme Innovative Economy - Priority 1 - research and development of modern technologies, Sub-action 1.3.1 - Development projects. Project entitled “Technological Strategies and Scenarios for the Management and Use of Rock Material Deposits” Time-frame: from November 26, 2009, to April 30, 2013.

“Poltegor-Institute” Institute of Opencast Mining (“Poltegor-Instytut” Instytut Górnictwa Odkrywkowego)

<https://www.igo.wroc.pl/kontakt/>

ul. Parkowa 25, 51-616 Wrocław

Phone: +48 71 348 82 00

email: poltegor@igo.wroc.pl

I. Description of Organization’s activity

"Poltegor Institute" - the Institute of Open Cast Mining has been operating for over 60 years. It is the only Polish research institution which competence covers a whole range of problems related to management, exploration, exploitation and reclamation of raw materials extracted with an opencast method, especially lignite and natural stone. Its expertise includes design and research covering geology, mining, engineering, and environmental protection during the construction and modernization of open pit mines.

The Institute focuses on all activities related to designing opencast mining operations and research in this field, including:

- Calculation of deposit reserves and its variability of quality parameters;
- Strategy of mining and mine operations planning;
- Geomechanical analyses and stability evaluations for open pits and dumps;
- Dewatering and hydrotechnics;
- Machinery and auxiliary equipment;
- Land reclamation plans and environmental protection;
- Economic analyses of mine operations;
- Mining plans, prefeasibility and feasibility reports, environmental impact assessment reports.

All the above R&D activities are provided by a team of scientists and engineers with many years of experience proven in designing of operating lignite and natural stone opencast mines in Poland, EU, India and Australia. Their work is supported by the most advanced software for modeling deposit conditions, groundwater flow modeling and spatial modeling in GIS system.

The achievements of "Poltegor – Instytut" have been widely appreciated as the Institute has received a number of prestigious awards, prizes, and distinctions in the recent years, among others, an award at the International Exhibition on Inventions, Research and New Technologies EUREKA in Brussels, Concours Lepine in Paris, and at INPEX in Pittsburgh. The Institute's work includes several dozen of patents, monographs, hundreds of press articles, and many conferences organized for domestic and international participants.

II. Examples of the conducted projects

Projects funded under the Operational Programme Innovative Economy:

- **Strategies and scenarios of technological development and utilization of natural stone deposits** UDA-POIG.01.03.01- 00-001/09-00 (2009-2014) [Details of the project ...](#)
- **Mechatronic control, diagnostic and security system in opencast mining machines** UDA-POIG.01.03.01-00-043/08-00 (2008-2013) [Details of the project ...](#)
- **A device for cleaning mineral aggregate** UDA-POIG.01.03.02-00-015/09 (2011-2013) [Details of the project ...](#)
- **The way of hydrocarbon degradation in soils with use of slaughterhouse waste of III category** UDA-POIG.01.03.02-00-034/09 (2010-2013) [Details of the project ...](#)
- **Pre-drying of brown coal for energy purposes** UDA-POIG.01.03.01-00-040/08-00 (2010-2013) [Details of the project...](#)

Projects funded under the Research Fund for Coal and Steel:

- **Bucket wheel excavators operating under difficult mining conditions including unmineable inclusions and geological structures with excessive mining resistance** RFCR-CT-2015-00003 (2015-2018) [Details of the project ...](#)
- **Smarter Lignite Open Pit Engineering Solutions** RFCR-CT-2015-00001 (2015-2018) [Details of the project ...](#)
- **Hydrogen oriented underground coal gasification for Europe** RFCR-CT-2007-00006 (2007-2010) [Details of the project...](#)

Projects funded under Sectoral Operational Programme – Improvement of the Competitiveness of Enterprises:

- **Scenarios of technological development of brown coal mining and processing industry**
WKP_1/1.4.5/2/2006/4/7/585/2006 (2006-2008) [Details of the project...](#)

Projects funded under the Central Europe Programme:

- **Effective development of dispersed renewable energy in combination with conventional energy in Regions**
3CE393P3 (2011-2014) [Details of the project...](#)
- **Environmental and Economic Benefits from Biochar Clusters in the Central area** 4CE535P3 (2012-2014) [Details of the project ...](#)
- **Dynamic Light – Towards Dynamic, Intelligent and Energy Efficient Urban Lighting**
CE452 (2016-2019) [Details of the project...](#)
- **CE-HEAT – Comprehensive model of waste heat utilization in CE regions** CE622 (2016-2019) [Details of the project...](#)

Polish Technology Development Centre (former Wrocław Research Centre EIT+) (PORT Polski Ośrodek Rozwoju Technologii sp. z o.o.)

<http://www.port.org.pl/>

ul. Stabłowicka 147

54-066 Wrocław

Phone: +48 71 720 16 01

email: biuro@eitplus.pl

I. Description of Organization's activity

The Wrocław Research Centre EIT+ is a research and development organization focused on the development of new technologies by conducting research on the needs and in cooperation with the industry. In order to fulfill the role, the EIT+ WRC combines the features of an enterprise and a research institute whose aim is to support the Polish economy by developing new technologies and conducting interdisciplinary scientific research.

Science for Business is our mission, which is why the EIT+ is created by unique people for whom science has a practical dimension and serves the development of the economy. They have been collecting their experience and still deepen it in cooperation with the best centers cooperating with the industry in the world, such as: Berkeley, Princeton, Fraunhofer Institute, Gent University.

We conduct research, as well as research and development projects in the areas of biotechnology, medical diagnostics, material engineering, chemistry, photonics and electronics, and nanobioengineering.

One of the main pillars of the Wrocław Research Centre EIT+ is to apply and participate in research projects of various types: from basic research to application. We acquire projects, but we are also members of larger consortia or subcontractors in implementation projects. The interdisciplinary nature of our unit enables applying for grants from various sources of financing. We manage projects

from the stage of submission to the stage of settlement and, in the case of partnership in implementation projects, we provide experience in coordinating project work.

Employers' Organization of Polish Copper (Związek Pracodawców Polska Miedź)

www.pracodawcy.pl

ul. Chopina 2, 59-300 Lubin

tel.: 076/ 847 85 85

e-mail: sekretariat@pracodawcy.pl

I. Description of Organization's activity

The Employers' Organization of Polish Copper (Związek Pracodawców Polska Miedź) was established in 1996 by KGHM Polska Miedź S.A capital group, a leading producer of copper and silver. It was a response to the ongoing revolutionary change in the Polish economy, of ownership in particular, but also as an answer to the strong position of trade unions, which were then the only social partner in negotiations over directions for system transition.

We are the biggest, independent and not-for-profit regional employers' organization whose goal is to represent and protect employers' interests in the Lower Silesia (Poland). In its mission, the Employers' Organization of Polish Copper engage in dialogue with government, local authorities and trade unions. We take responsibility for disseminating good management practices and entrepreneurship through organizing training sessions, seminars and conferences for both members and non-members. Additionally, we provide services to our members with regard to EU policy and a network for information exchange and co-operation throughout industry sectors worldwide.

The Employers' Organization of Polish Copper is a member of Employers of Poland, the old-est, the biggest and the most representative Polish employers organization.

We promote common interests of the Polish employers through engagement in social dialogue and working closely with every level of government, the EU, as well as local authorities, chambers of commerce and other influential organizations, we strive to eliminate business barriers and facilitate business growth by providing high quality consultancy and development in areas of organizational change, leadership, compliance with employment law, governance and local democracy. We support and develop industrial relations, and ensure a strong employers' position

We have been closely monitoring Polish and EU legislation and we have managed to stop multiple unfavourable legal acts. We have submitted 524 positions on Polish and EU legal acts.

Employers' Organization of Polish Copper is always looking for partners among European employers and industrial organizations to facilitate international cooperation between member companies, exchange of best practices and maximize our impact.

We have a lot of experience in in the field of mining and geological, commercial and labor law. We participate in various international projects in the field of industrial relations, raw materials, legislation, economics, health and safety, R&D (eg. Promotion of Flexible Forms of work through social dialogue from Employers perspectives, Mine of The Future, Recognizing trends in accidents Causes and Promoting Relevant guidelines and best practises, Smart Mine of The Future etc).

Our representatives are members and experts of Sectoral Social Dialogue Committee for the Extractive Industries EC, Standing Working Party on Extractive Industries as well as the Euromines Committees.

We have have practical experience in participation in European legislation process, lobbying campaigns, organization of seminars and conferences and public appearances.

II. Examples of conducted projects

- Polish Technological Platform on Raw Materials (Integration of scientific and industrial partners crucial for mineral raw materials sector; Developing long-lasting strategy for development of Polish mineral raw materials industry; Initiation of joint R&D projects and economic undertakings aimed at using new, innovative technologies and solutions),
- Comprehensive monitoring of the potential and barriers of the regional labor market „Wiedza Plus 2” - monitoring and analysis of labor market, Presentation of the project results during the international conference „Equally Diverse
- „Flexible form of Work” - preparation of Common Position Paper Flexible Forms of Works, presentation of the project results during an international conference in Prague
- „ Legislation Monitoring Center”
- Creation of Positive Image of the Extractive Industry at Polish Mining Industry Forum
- Regional and Innovation Development Group of the Lower Silesian Economic Council and the Group for the Business Information Service of Lower Silesia of the Lower Silesian Economic Council (at the Office of the Marshall of the Lower Silesian Voivodship)
- Mine of The Future (Coordinator of the Polish part of the project: WP3: The Attractive Workplace)
- Smart Mine of the Future (Work Package 13: The Attractive Workplace)
- "Mining Industry - Strategic branch of Polish economy" (4 mining seminars concluded with the conference "Mining as a strategic industry - barriers and opportunities for development in the global economy"). The results of the project served as a substantive contribution to the publication: "Polityka surowcowa Polski. Rzecz o tym, czego nie ma, a jest bardzo potrzebne"; Fundacja Gospodarki i Administracji Publicznej.
- EU-Canada MIF Project - Feasibility Study for an EU-Canada Mineral Investment Facility
- Program Board and Organizing Committee of the 4th Polish Mining Congress - Session: Factors determining the attractiveness of investments in the mining industry and its surroundings
- project of the International Labor Organization: Transnational Company Agreements (TCAs) Building Management Knowledge & Capacity (Global Industrial Relations, Transnational Company Agreements and Corporate Social Responsibility)
- research project "Attractiveness of mining investments in Poland", scientific research management made by The Mineral and Energy Economy Research Institute of the Polish Academy of Sciences; publication: The attractiveness of mining in Poland and its impact on regional development
- international program "Recognizing trends in accidents and advocating the best practices"; EC, SSDC EI
- International Labor Organization project: "STRENGTHENING THE CAPACITY OF METAL SECTOR EMPLOYERS' ORGANIZATIONS OF NEW MEMBER (CANDIDATE) STATES FOR PARTICIPATION IN SECTORAL SOCIAL DIALOGUE AT NATIONAL AND EUROPEAN LEVEL"

III. Partners:

Foreign partners:

- EUROMINES – European Association of Mining Industries, Metal Ores & Industrial Minerals, Europe

- European Technology Platform on Sustainable Mineral Resources, Europe
- Eurocoal, Europe
- Eurometaux, Europe
- IMA – Europe, Europe
- IndustriAll, Europe
- EuroGeoSurveys, Europe
- Aurubis AG, Germany
- Bergforsk – the Swedish Mining Research Foundation, Sweden
- Geokompetenzzentrum Freiberg – GKZ, Germany
- Boliden Mineral AB (BOL), Sweden
- Slovak Mining Chamber, Slovakia
- SVEMIN - Swedish Association of Mines, Mineral and Metal Producers, Sweden
- Těžební unie, Czech Republic
- Vereinigung Rohstoffe und Bergbau, Germany
- Verband der Kali- und Salzindustrie e. V., Germany
- Norsk Bergindustri - Norwegian Mining and Quarrying Industries, Norway
- Natural Resources PC, Greece
- LKAB Grupo, Sweden
- Lundin Mining, Sweden
- Fachverband Bergwerke und Stahl – Austrian Mining and Steel Association, Austria
- K+S Kali GmbH, Germany
- Hungarian Mining Association, Hungary
- CONFEDEM, Spain
- FinnMin - Kaivosteollisuus ry, Finland
- ANIET - Associação Nacional da Indústria Extractiva e Transformadora, Portugal
- Bulgarian Chamber of Mining and Geology, Bulgaria
- Assimagra - Recursos Minerais, Portugal
- Lulea University of Technology, Sweden
- University of Leoben, Austria

Domestic partners:

- AGH University of Science and Technology, Cracow
- Wrocław University of Technology, Wrocław
- State Mining Authority, Katowice
- District Mining Office in Wrocław
- Institute of Non-Ferrous Metals, Gliwice
- Institute of Mechanised Construction and Rock Mining, Wraszawa
- Mineral and Energy Economy Research Institute of the Polish Academy of Sciences, Kraków
- Polish Geological Survey – PGI, Warszawa
- “Poltegor-Institute” Opencast Mining Institute, Wrocław
- IATI, Wrocław, Krakow
- KGHM Polska Miedź S.A., Lubin
- Przedsiębiorstwo Budowy Kopalń PeBeKa S.A., Lubin
- Nitroerg S.A., Bieruń
- KGHM ZANAM S.A., Lubin
- Energetyka SP. z o.o., Lubin
- KGHM CUPRUM sp. z o.o. – Centrum Badawczo-Rozwojowe, Wrocław
- INOVA Centrum Innowacji Technicznych Sp. z o.o., Lubin
- KGHM Metraco S.A. Legnica
- Walcownia Metali Nieżelaznych „Łabędy” S.A, Gliwice
- Uzdrowiska Kłodzkie S.A. Grupa PGU, Polanica Zdrój
- Mine Master Sp. z o.o. Wilków

- Przedsiębiorstwo Robót Górniczo Montażowych „Polkowice” Sp. z o.o., Polkowice
- Przedsiębiorstwo Robót Górniczych KUPRYT II Sp. z o.o., Rudna
- Legnicki Park Technologiczny LETIA S.A.; Legnica
- BUMECH SA, Katowice
- Firma Kret i S-ka, Chojnów
- DB Energy SA, Wrocław

EIT RAW MATERIALS Eastern Co-Location Centre

<https://eitrawmaterials.eu/clc-location/clc-east/>

ul. Stabłowicka 147
54-066 Wrocław
Phone: +48 532 517 603

I. Description of Company’s activity

Innovation Hub CLC East provides expertise in mining under difficult geological conditions; environmentally friendly geo-metallurgical and mineral extraction processes; recycling of valuable raw materials from waste streams, industrial residues, urban and landfill mining. Innovation Hub CLC East operates through three strategic pillars addressing challenges in primary and secondary resources: deep-intelligent mine; zero-waste programme; and advanced supplier’s solutions.

The ambitious vision of EIT RawMaterials will be realised by the creation of a structured collaboration within the Knowledge Triangle, which is the basis of the KIC model. A structured dialogue between academia, research institutes and business will facilitate an exchange of needs, ideas, research results and best practices. New entre- and intrapreneurs, with innovative ideas, will be supported to turn their ideas into business opportunities through our innovation system. This approach will leverage impact through synergies and will provide a powerful way of maximising opportunities in the raw materials sector and securing raw materials supply for Europe. Operationally the projects are managed through the Co-Location Centres, which also support the partners in their strive for new, innovative projects.

II. Examples of currently conducted projects

- AMCO: Automated Microscopic Characterization of Ores
- ARCHUB2: Arctic Network Hub
- AutoBatRec2020
- AVAR: Added Value Alumina Refining
- BioFlex: Flexible Biometallurgy Infrastructure and Expertise network
- CaproKIC: Upscaling of one step process for automotive continuous fiber Polyamide 6 composite parts based on the in situ polymerization of e-caprolactam
- CERA: Certification of raw materials
- COFREE: Developing cobalt-free substitutes for cemented carbide tools – for use in mining and manufacturing
- COPPLEX: New Sustainable Process to Treat Complex Raw Materials, Revaluating Residues
- DIM ESEE: Dubrovnik International ESEE Mining school

- DISPLAY: Upscale of material recovery from display applications and Printed Circuit Boards
- ECO COM'BAT: Ecological Composites for High-Efficient Li-Ion Batteries
- ElectroFlex: (Bio)Electrochemical extraction and recovery of metals from low grade ores and residues
- EMFIS: European Material Stock and Flow Intelligence Service
- EnEx: Enhanced exploration
- ERMAT: Efficient use of Residual Materials
- EWT-CYNCOR: Electrochemical water treatment for cyanide and nitrogen compounds removal
- EXTREME: Substitution of CRMs in components and coatings used under extreme conditions
- FASTRAM: Upscaling of FAST sintering processes for the substitution of critical materials: W and Co
- FLAME: FLy Ash to valuable MinErals
- REECATS: Critical raw materials-FREE CATalystS
- Go-4-0: From iron and manganese oxides wastes to valuable metal alloys using novel carbon sources materials
- iDeepMon: Intelligent Deep Mine Shaft Monitoring
- IEDDA: Innovative Exploration Drilling and Data Acquisition
- iMine: European Demonstration and Test Facilities
- InnoLOG: Innovative geophysical logging tools for mineral exploration
- inSPECTor: Integrated spectroscopy sensor system for laser-induced fluorescence and hyperspectral imaging
- INSPIRE: Intensified Flow Separator Infrastructure and Expertise Network
- intCEB: International Intelligence and Business Development Network on Circular Economy Business Opportunities with China
- iRIS – intelligent Risk Identification System for safer mines
- LightBody: Infrastructure and expertise network for Lightweight mobility, body and chassis
- MaDurOS: Material Durability for Off-Shore
- MagNet: Magnetometry Network
- MetLight: Network of Infrastructure for Metal-based Lightweight Materials
- MetNet: European Pilot Plant Network for Extractive Metallurgy and Mineral Processing
- MICRO–ECOS: Microscale and Electrometallurgically assisted Cleaning of Complex Sulphide Ores
- MIN-PET: Mineral products from Petrit-T sidestream technology
- MineService: Mining/Mineral Support Services
- MiRaCLE: MIneral RAW materials replacement with nanoComposites by renewablE ResourceS
- Modelling Factory: Collaborative modelling, simulation and decision making through shared Modelling Factory
- MONICALC: Integrated system for Monitoring and Control of Product quality and flexible energy delivery in Calcination
- MULSEDRO: Multi-sensor drones for geology mapping
- NANOGREAT: Graphene NANOcomposites REActors at preindustrial Technology readiness
- NetFlot: Flotation-Network

- NewEco: Towards a New European industrial ecosystem for strategic metals production
- OpTaRec: Optimising the Tantalum Recycling Process through Conditioning of Raw Materials, Process Automation and Material Logistics
- OPTNEWOPT: Materials substitution in optoelectronic devices
- PCRec: Product Centric Recycling
- PreFlex: pre-treatment and physical separation of complex low grade ores and residues
- PyroFlex: network on pyrometallurgical expertise and infrastructure for residue treatment
- RACE-TP: Lightweight Recyclable Automotive thermoplastic Composite structural parts for large series production
- RawMaterials4E-Energy: Raw Materials Solutions for E-Energy Technologies in the European Mobility Industry
- RAWMATS-4-POWERTRAIN – Raw Material Solutions for the European Powertrain Industry
- RE-ACTIVATE: Developing superior technical infrastructure throughout EIT RawMaterials community to foster technologies and methodologies for re-activation of former mine sites
- RECOVER: Innovation in Motion: Red mud and Copper slag Valorisation in Engineered Products
- RED_SCOPE: Recovery of Effluent Discharge for Sustainable Copper Processing in Europe
- ResiduFlex: infrastructure and technology network on residue valorisation
- ReSiELP: Recovery of Silicon and other materials from End-of-Life Photovoltaic Panels
- REVALUE: REcycled carbon fibres for high VALUE composites
- RIGaT: Recovery of Indium, Germanium and Tin
- Rock Vader: Smart Hard Rock Mining System
- RoStar: Upscaling of the RoStar ultra fine grinding mill for liberation of high valued ores
- RUN. Key success factors for ReUse Networks
- SIRIUS: Silicon nanoparticles based composites Upscaling
- SO4Control. Scale-up of Solution for Mining Water Sulfate Control with Side-product Recovery
- SOLVOFLEX: Solvometallurgy Infrastructure and Expertise Network
- SPARK: Substitution and recycling of critical elements in materials for ionizing radiation detection
- SSIC: Sustainability Support and Information Centre
- STINGS: Supervision of Tailings by an Integrated Novel Approach to combine Ground-based- and Spaceborne Sensor data
- SUPRIM: Sustainable Management of Primary Raw Materials through a better approach in Life Cycle Sustainability Assessment
- Think Tank – Circular Economy Business Ecosystem
- TiSPHERO: Manufacturing of spherical powders from scraps for special applications
- UpDeep: Upscaling deep buried geochemical exploration techniques into European business
- Virtual Upscaling: Virtual Upscaling through Modelling Factory
- Visual3D: Visualisation of 3D–4D models in exploration and geosciences
- WEEE REC: Upscaling of key technology for a recycling facility for 30,000 t/a WEEE-concentrate
- X-TRIM: X-ray transmission in mining applications