



OpenYourMine 2021 3rd edition of Master education project

October 2021 – December 2021

Supported by



This activity has received funding from the European Institute of Innovation and Technology (EIT), a body of the European Union, under the Horizon 2020, the EU Framework Programme for Research and Innovation



Field trips support





OpenYourMine (OYM) is a Master education project dedicated to mineral resources and sustainability. It is an education program for master students financially supported by European Institute of Innovation and Technology (EIT) and EIT Raw Materials.

This project consists in organizing away lectures, workshops and field projects/classes for students of partner universities. Such meetings were assumed to be organized annually by a different partner, and their topics were to cover geological, technological, environmental, social and legal aspects of the exploitation of non-fossil resources in a given country.

The project is conducted by three universities: Université Grenoble Alpes (UGA) - project coordinator (France), New University of Lisbon (Portugal), Wrocław University of Science and Technology (WUST) (Poland) and KGHM CUPRUM Ltd. Research and Development Centre. The task of the industrial partner is to provide geological and environmental data to prepare case studies and project assignments for students. The project received funding for three years, from 2019 to 2021.

The project is open to MSc students (about 30 every year) having backgrounds in geology, economy, sociology, and environmental protection. The OpenYourMine Master education program aims at strengthening MSc students creativity, entrepreneurship and skills for the sustainable development of mineral resources in Europe.

Every year, the project will bring together about 30 MSc students to attend 4 teaching units (3 ECTS each) dedicated to mineral resources and sustainable development in a European perspective, namely i) Mineral resources and sustainable development, ii) Raw material energy nexus, iii) New communication strategies for mining business, and iv) Field projects/classes. These ECTS are included and shared among already existing master curricula dedicated to resources, the economy of sustainable development, and sociology of innovation from the 3 partner universities (University Grenoble Alps - France, Nova University of Lisbon – Portugal, and Wrocław University of Science and Technology - Poland).

OpenYourMine relies on innovative educational approaches based on blended-learning, inverted pedagogy, crowdsourcing contest, and use of state of the art tools for data visualization and integration. It also relies on a strong industry involvement (e.g. AREVA-Orano, Rio Tinto, KGHM, Almonty) at several levels in the proposed curricular: co-creation of case study, participation to short-courses and workshops, adaptation of teaching contents, and placement of the student. By embedding these experts within the university curriculum the project builds a strong dedicated network of skilled geoscientists that can steer the mineral resources industry going forward, following the principles of environmental protection and social coexistence. To ensure the conditions of sustainable mineral supply, the project opens the mind and imagination of the next generation of mineral resource managers. The objective of this education project is to train students in geology, environment, economy and sociology to work together successfully.

In 2021 all the 4 teaching units are open to all participating students (30 students: 10 from UGA, 10 from Nova Univ and **10 from WUST The Faculty of Geoenineering, Mining and Geology**). They started in September and will end in December 2021. They are as follows:

- 1 Mineral resources and sustainable development – 3 ECTS teaching unit
- 2 Raw material energy nexus – 3 ECTS teaching unit
- 3 Communication and sustainability in the Mining Industry – 3 ECTS teaching unit

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4. Field projects/classes: Metallogeny, ore targeting, mining and ore processing, environmental remediation – 3 ECTS teaching unit.

In 2021 the project planning had to be changed due to SARS-CoV-2 pandemic constrains. It was impossible to travel through Europe. Therefore, each project partner organized field projects/classes in their own country: field classes in Poland, in France and in Portugal.

1) Field project/classes

The topics of the field projects cover different aspect of mining activities: metallogeny, ore targeting, mining and ore processing, environmental remediation, mining heritage, mine and society. The objectives of the field projects are the same whatever their location. Each student will attend a 4 to 6 day field project (either consecutive or split over several weeks). Teachers, experts, engineers guide the students in the field.

During the field classes:

- students and teachers use live communication web platform (Facebook, Tweeter) to exchange comments, videos, pictures, and documents;
- students and teachers film their field investigations (drone, Go-pro camera, smartphone)

After the field classes:

- students have to prepare a 15-20 minutes movie covering one particular aspect of the field trips (e.g. ore processing, environmental remediation, type of Cu mineralization, environmental humanities). It is an international team works where students have to cooperate and share their knowledge, skills, information;
- the movies will be used to communicate and disseminate the knowledge. They will be on display on OYM website (<https://www.openyourmine.eu/>), on YouTube, and they will be exchanged with the mining companies that support our initiative.

Field trips organized by WUST and KGHM CUPRUM:

Six-day field project was organized, one day at one place. It lasted from October the 11th to October the 16th

11th of October

1) KGHM PM S.A. Concentration Plant (Copper Ore Enrichment Plant)

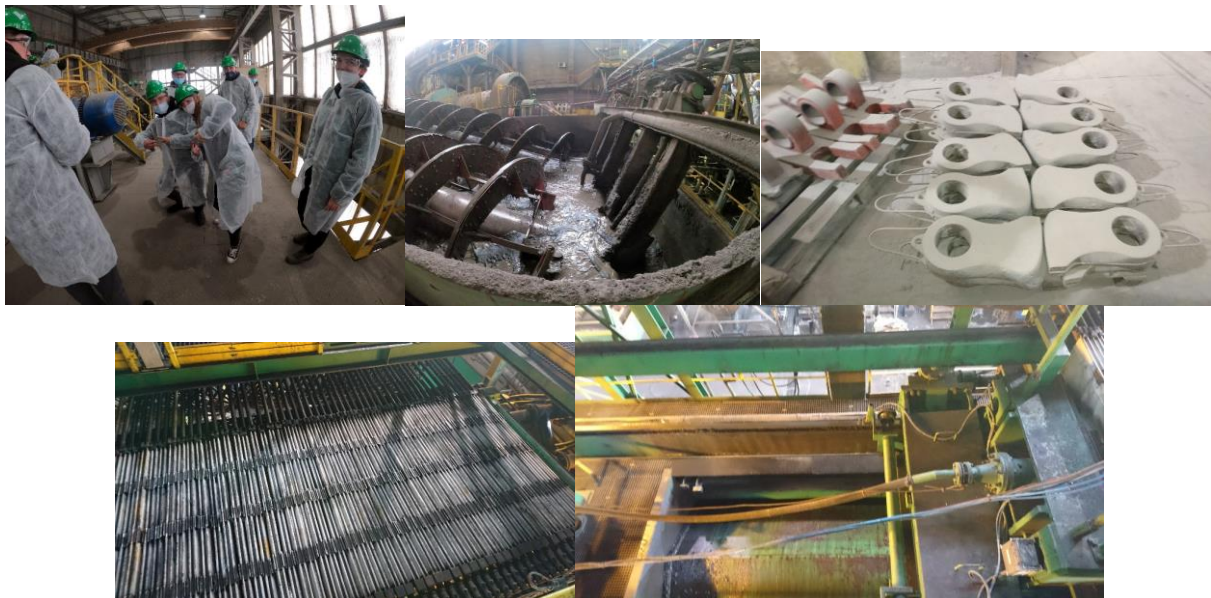
The students visited KGHM Concentration Plant (Copper Ore Enrichment Plant). They were guided by experts. The whole copper ore processing procedure was presented, they saw preparation stage, crushing, milling, enrichment stage and then transportation of the copper concentrate to the Copper Smelter and Refinery.

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WUST students in front of KGHM Copper Ore Enrichment Plant



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Copper Ore Enrichment Plant

2) KGHM PM S.A. Hydrotechnical Plant/Żelazny Most tailings pond



WUST students at Żelazny Most Tailings pond

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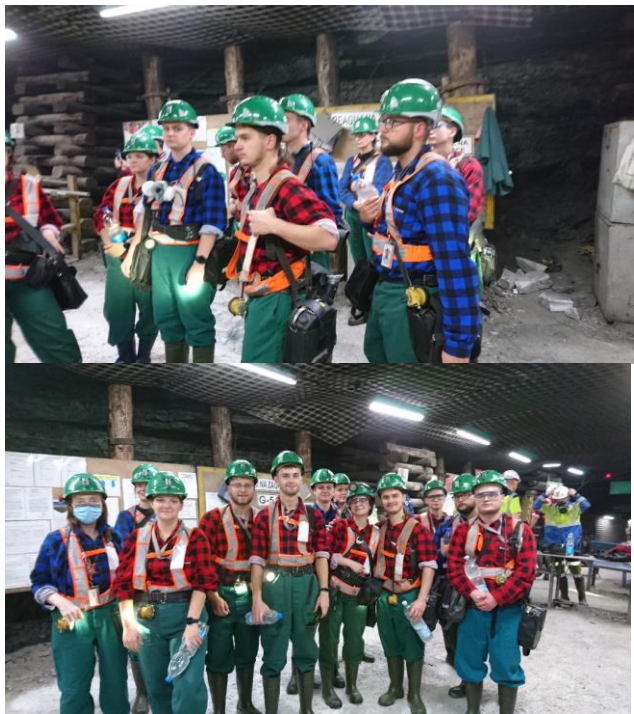
12th of October

The students visited the **KGHM PM S.A. Polkowice-Sieroszowice underground copper ore mine and Mine Geophysical Station**. Underground at 1000 meters depth they saw the technological cycle of copper ore extraction: drilling, blasting, bolting, transporting, crushing big rocks into small parts. At the Mine Geophysical Station the students were familiarized with the seismological way of tremors and rockburst hazard monitoring.



At the shaft before going underground

At 1000 meters underground



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Crushing



Drilling for blasting

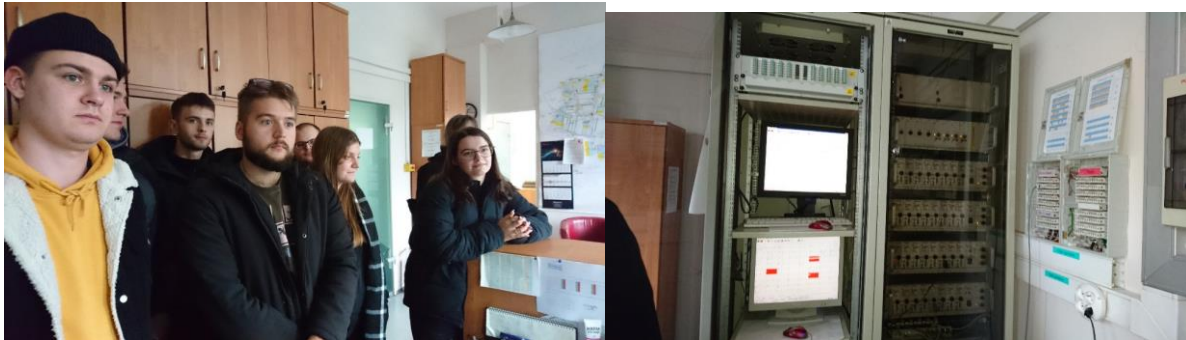


Bolting for supporting

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Driving back to the shaft to go to the surface



The students in the Mine Geophysical Station

13th of October

The students visited the **KGHM PM S.A. Głogów Copper Smelter and Refinery**. They saw the process of copper production.



The students in front of the Copper Smelter and Refinery

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14th of October

In Tarnowskie Góry, the students visited the historic silver mine, underground mining heritage route, Black Trout adit as well as the mine drainage system and mining waste heap.

Black Trout Adit



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At Historic Silver Mine



Silver mine mining waste heap

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Part of the Historic silver mine drainage system

15th of October

In Kletno, the students visited the **historic uranium mine: mining heritage route „By the traces of the former mining”** as a model example of protection and adaptation of selected post-mining facilities.



The old mine of uranium in Kletno



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Kletno underground



The Kletno mining waste heap exploring

16th of October

In Geopark Krobica-Mirsk, the students visited the **underground mining heritage route** as a model example of protection and adaptation of selected post-mining facilities, Saint John mine-Saint Leopold Adit

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Geopark Krobica from a drone perspective



The students at the Saint Leopold adit in Krobica-Mirsk

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The Sericite slate mine in Mirsk-Krobica

2) Lectures and practical activities

All the lectures are recorded via ZOOM application. They are recorded and shared on the website (<https://www.openyourmine.eu/>). Students can be either physically present in the conference room, following live the lecture, or podcasting it whenever they want. Here are the lectures that are given within the October-November period.

Lectures and practical activities are in the afternoon.

The lectures:

- a) Metals and main type of geological fluids
- b) SW Iberia Ore deposits
- c) Mine sustainable development: case studies and remediation
(Case studies: Guaniamar and Huelva (Spain), Rio Dolce (Brazil), Salsigne, Carnoulès (France)
Remediation : Waste surface impermeabilization, Under Seawater safe mine waste deposit, Phytostabilisation (and phytoextraction), Particle outflow sedimentation and photodegradation (e.g. CN⁻), Waste bioleaching (Cu), AMD treatment, AMD filtration to recover REE, Future use of red muds and phosphogypsum)
- d) The role of external and internal stakeholders in achieving sustainable development goals by the mining sector
- e) Raw Material Energy Nexus
- f) General context of the mining industry
 - a) World trade and consumption of raw materials since 1970 Imports and exports of raw materials in Europe and the US Europe and the US lose ground to Asia Consumption of raw materials goes up and public opinion of the mining industry down
 - b) Socio-environmental context of mine closures in Europe Why? How? Social and environmental impacts of the mining industry
 - c) Public opinion on the mining industry Environmentalists' role in raising awareness
- g) Mining, past and present. From the Confident Destruction of Nature to NIMBY (Not In My Backyard) and BANANA (Build Absolutely Nothing Anywhere Near Anything)
- h) Methods used in the exploration of sediment-hosted, stratiform copper (SSC) deposits located in the SW Poland
- i) Natural hazards in mines
- j) Salt mining—methods of exploitation, processing and market future prospects
- k) Green transition – regulations, challenges and opportunities

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3) Practical activities

All practical activities are done remotely.. 2 practical activities rely on computer modelling (Leapfrog and Vencim).

- a) Geostatistics for resources evaluation – Leapfrog, introduction + demonstration with two case studies
- b) Microscopy techniques in copper ore studies on the example of Kupferschiefer deposits in SW Poland
- c) Students will have to prepare a journalistic report (team work) on a case study dealing with either i) social conflict induced by mining activities – planned or on going, ii) socio-environmental issues related to mining, iii) the development of new mining practices: green mines, bio-mining, environmental remediation, iv) impact of energy transition on mining activities
- d) Field analysis of ore using portable instruments: example of LIBS and XRF
- e) Stock and flux modeling using VENSIM software – a joint project on macro-economic, society, and mining activity – practice and case studies

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