UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Critical raw materials and the environment

2223-BbetweenSDG-08-06

Module description

The module aims to provide the scientific and technical basis for a broad understanding of raw materials, industry and the environment. Introduction to mineral resources, from metallic ores (ore minerals) to industrial minerals, dimension stones and aggregates (sand and gravel). Basic concepts for describing a deposit, both geometrically-morphologically and genetically (magmatic, hydrothermal, sedimentary deposits), as well as mineral prospecting techniques are provided. The importance of raw materials: types and quantities used in industry. Critical raw materials: what they are, what are their uses, criticality. The peculiarities of Europe and Italy, strengths, and weaknesses. The concept of environmental impact, the extraction-processing-use-recycling cycle. Raw materials and the "green economy": from greenwashing dreams to harsh reality. Recycling: is it possible to recycle everything easily? Future prospects: extract less and better, diversify production, illusions and concrete hopes.

Learning goals

General goal

To provide the basic scientific knowledge and skills for understanding issues related to raw materials, mining, industrial uses and environmental impact. Through appropriate real-world examples, the complexities and interdisciplinary nature of mining and industry are shown. Critical raw materials for the ecological transition: not everything is as green as it seems. The importance of a multidisciplinary approach to meet the challenges of the future.

Specific skills and competences

Basic scientific skills and competencies, to be supplemented with sector-specific skills. Independent management skills and competencies in understanding scientific texts, for free, quality, multidisciplinary education.
Complex thinking skills and competencies, able to argue rationally in favor of choices and decisions consistent with the idea that peace is functional to sustainability (and vice versa).
Social and communication skills and competencies, to foster discussions about the true nature and issues related to raw materials (critical and non-critical), industry and the environment.
Skills and competencies related to the mental processes of reading, understanding, conceptualizing, analyzing, synthesizing and/or evaluating information acquired or arising from the observation and study of real cases, in Italy and around the world, in the field of raw materials, environment and sustainability.
Ability to recognize, evaluate and use scientific information of different types to objectively interpret and evaluate complex and interdisciplinary issues.

Sustainable Development Goals of the 2030 UN Agenda

The proposed module is consistent with some Goals of Agenda 2030: Goal 4, Quality Education and Goal 16, Peace, Justice and Sound Institutions
Specifically, it is ascribable to initiatives aimed at:
Goal 4.1: Provide "[...] free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes."
Goal 7.1 Ensure access to energy services that are affordable, reliable and modern by 2030
Goal 8.4 Progressively improve, by 2030, global efficiency in resource consumption and production and attempt to decouple economic growth from environmental degradation, [...]
Goal 9.b Support domestic technological development, research and innovation in developing countries, including by ensuring a favorable environmental policy, inter alia, for industrial diversification and added value to products

Breakdown of meetings

The 16-hour module is divided as follows: 8 meetings, two hours each.
Detail:

1. 2 hours: raw materials, what are they and what are they used for? Metallic minerals (ore minerals), industrial minerals, energy minerals
2. 2 hours: Critical Raw Materials. What they are and why they are so important to industry and the green economy.
3. 2 hours: quarries and mines. The search for deposits, their development and exploitation, regulatory aspects.
4. 2 hours: mineral resources and reserves, China's key role, Europe's (many) difficulties. Are deposits evenly distributed around the world?
5. 2 hours: the environmental impact of mining activities. Hints of LCA (life cycle assessment) for mining activities. The ecological transition hides many critical issues and dark spots.
6. 2 hours: recycling and future developments. Can our needs for critical raw materials be met by recycling? Is everything easily recyclable in equal measure? What possible virtuous developments for the future?

Number of participants

There is no numerical limit to participants.

The module is delivered in face-to-face lectures (preferred).

Language used in meetings

Italian

Delivery period of the module

March - April 2023

Methods of assessing the outcomes of the learning process

In-depth reading of bibliographic material; closed-question test and brief oral discussion.

Department of affiliation of the teacher

Department of Earth and Environmental Sciences - DISAT

Sustainable Development Goals

QUALITY EDUCATION | AFFORDABLE AND CLEAN ENERGY | RESPONSIBLE CONSUMPTION AND PRODUCTION