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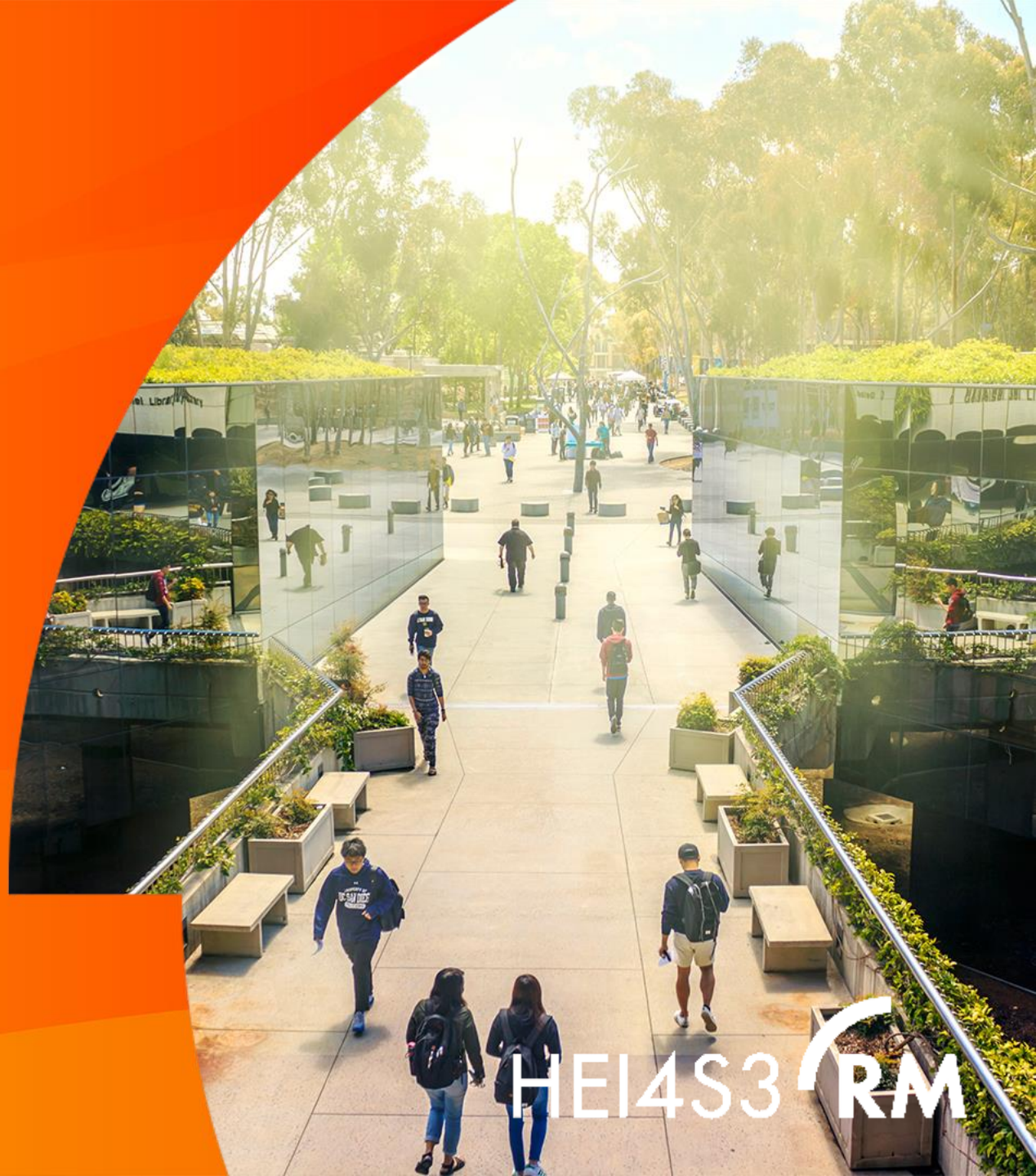
HEI Initiative

Communication to the Society and Awareness of the circular economy approach in the raw material sector



Module III: 15.12.2022 - 17:00 -19:00

Head of Education and Head of HEI Initiative

15 December 2022

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Biodiversity impacts and dependencies of energy and mining developments

Impact of mining in the biodiversity (Module III)

- Energy & Raw material projection
- Convention on biological Diversity and the sustainable Development Goals
- Opportunities toward sustainable raw material industry
- Mineralogy and Geochemistry Research Group (RENSMA-UHU)

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Biodiversity impacts and dependencies of energy and mining developments

Impact of mining in the biodiversity (Module III)

Not to focus on the impacts mining and energy activity on the environment, but to understand that these sectors must go hand in hand in the near future and that

working together with the protection of biodiversity is possible.

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Energy & Raw material projection

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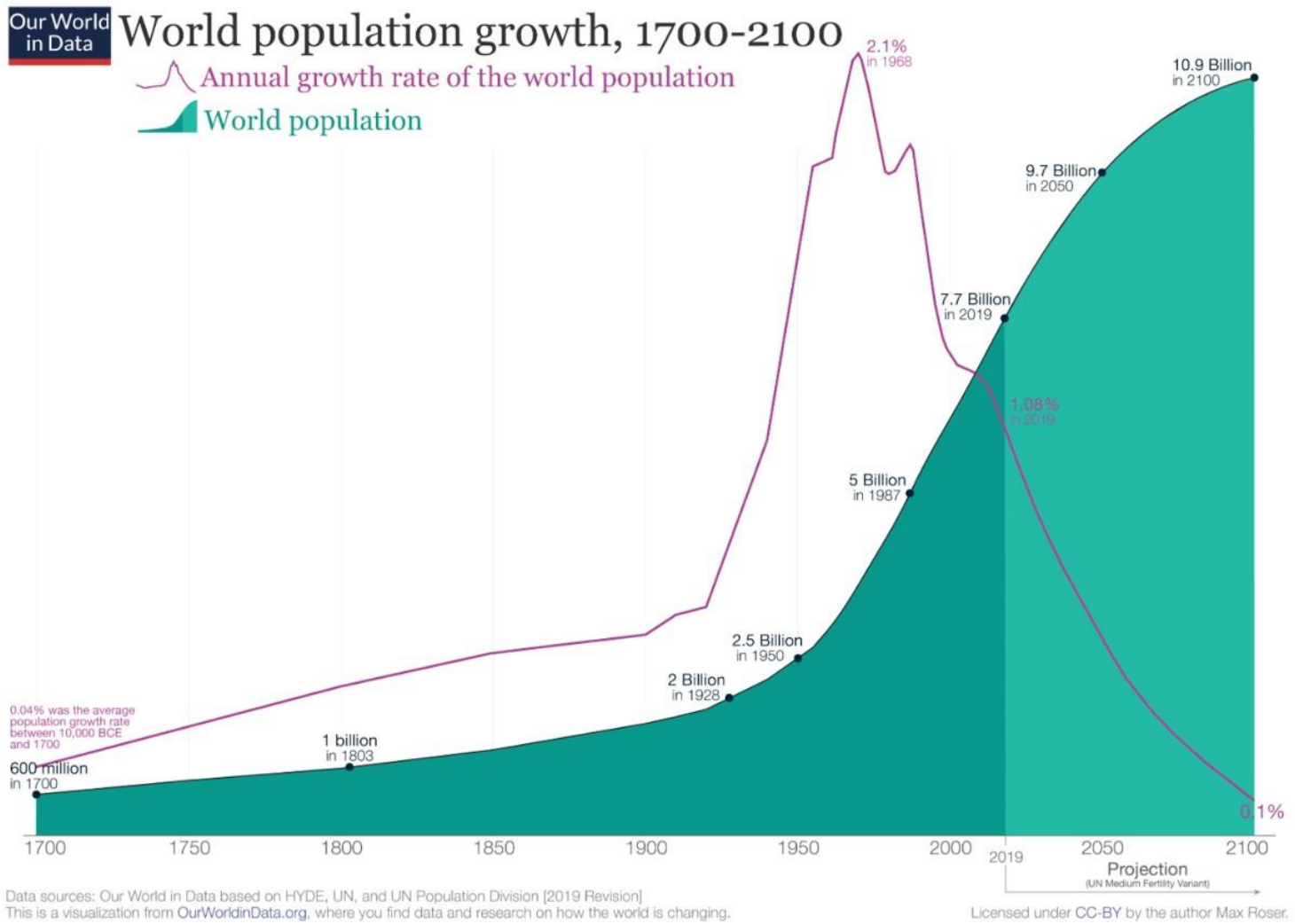
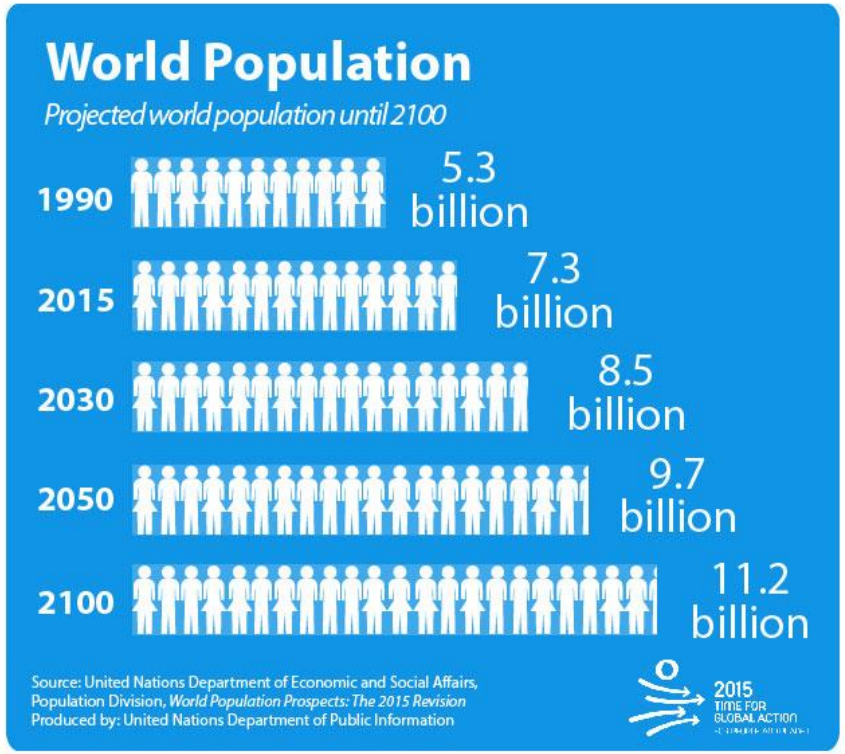
Energy & Raw material projection



Current World Population

8,004,585,685



http://www.worldometers.info/world-population/

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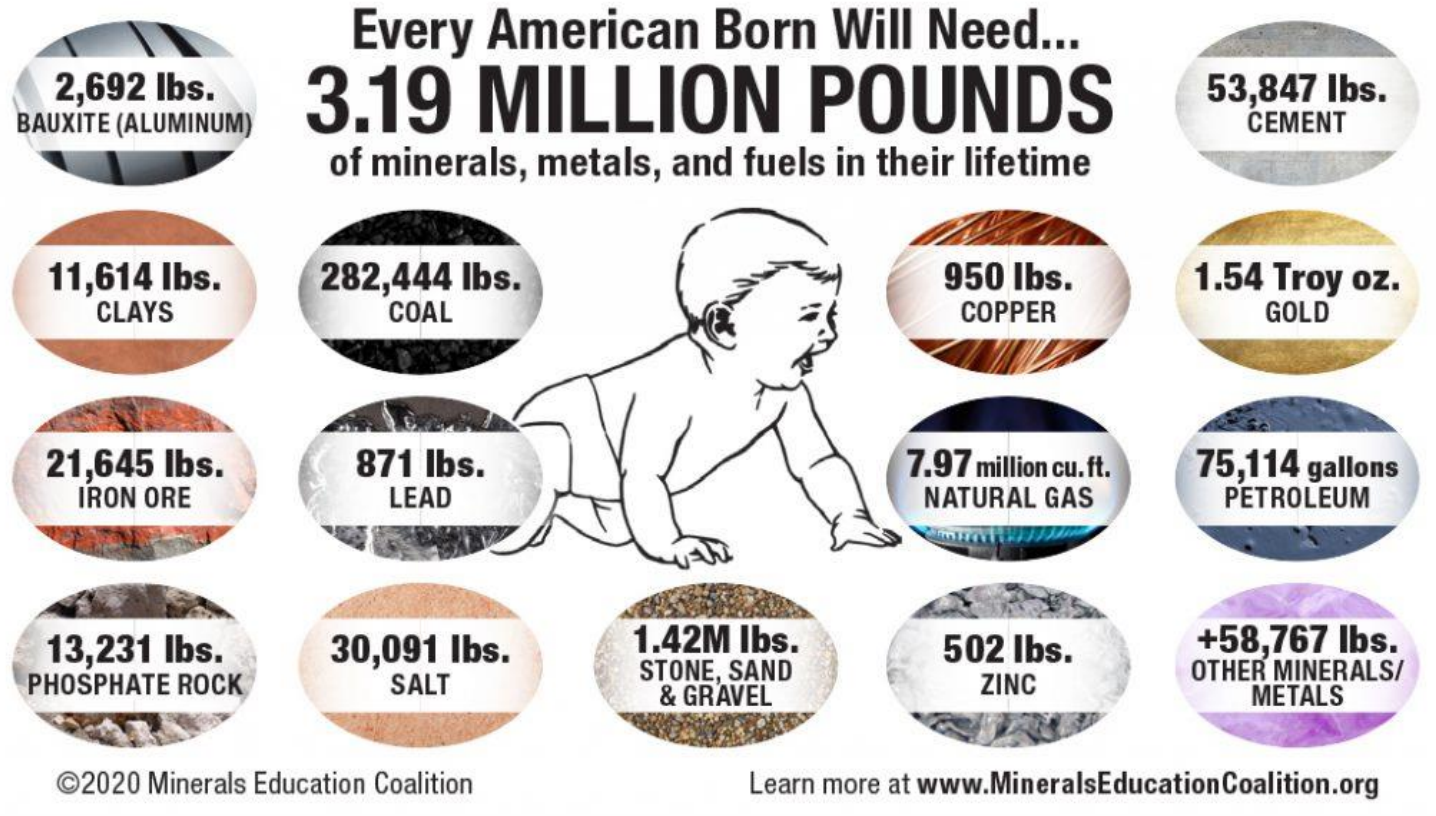
Energy & Raw material projection



To maintain the standard of living of about 300 million Americans, 7.1 billion tons of rocks and minerals are needed

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Energy & Raw material projection

A wide range (and amount) of minerals and metals are required to maintain the standard of living of 8 billion people.

The actual projection of society demands is being further amplified by the accelerated world need for the transitions to clean energy, which is supplied by raw material to power it, support it and build it.

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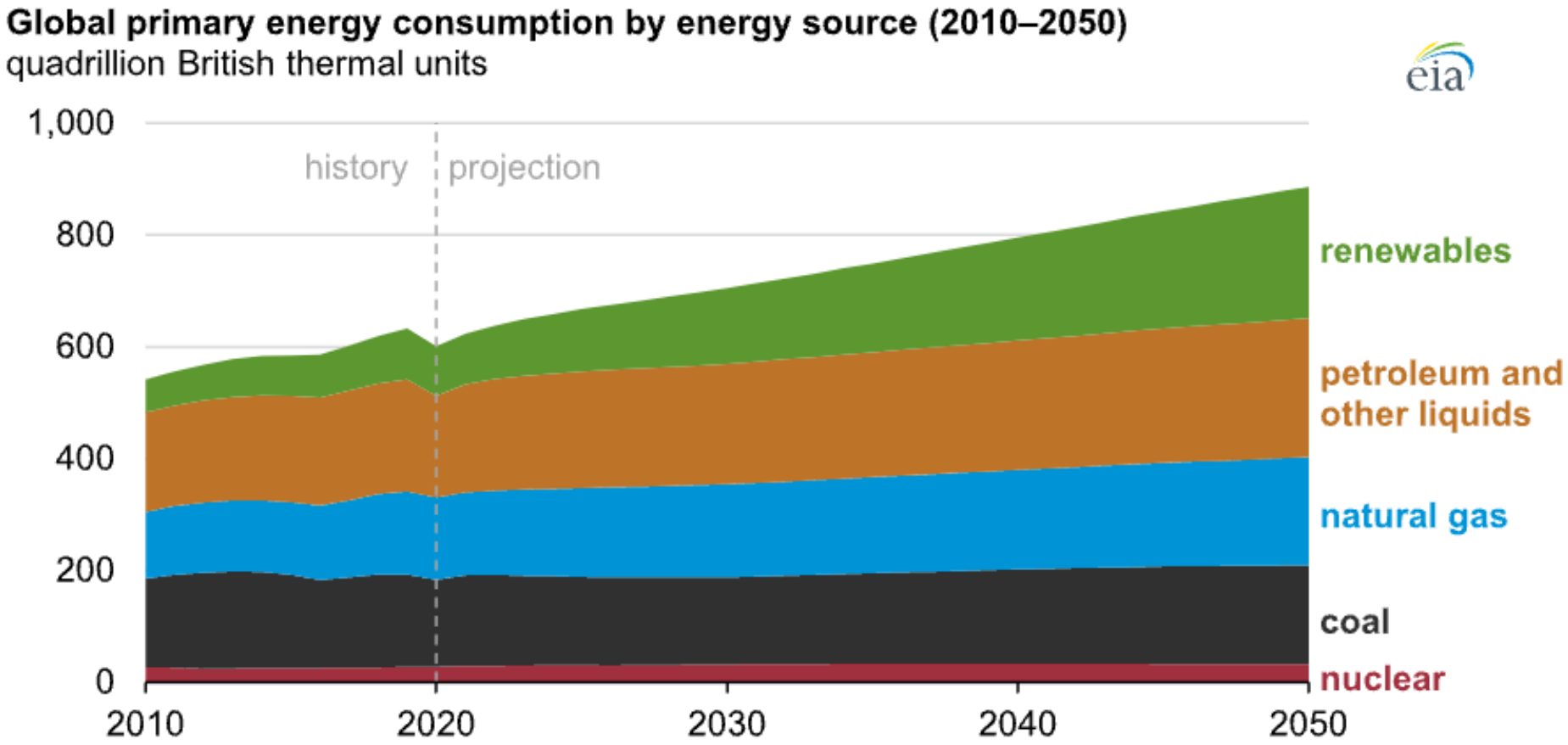
Energy & Raw material projection

Global energy demand to grow 47% by 2050, with oil still top source: US EIA



Fuente: US Energy Information Administration, *International Energy Outlook 2021* Caso de referencia
Nota: El *petróleo y otros líquidos* incluyen biocombustibles.

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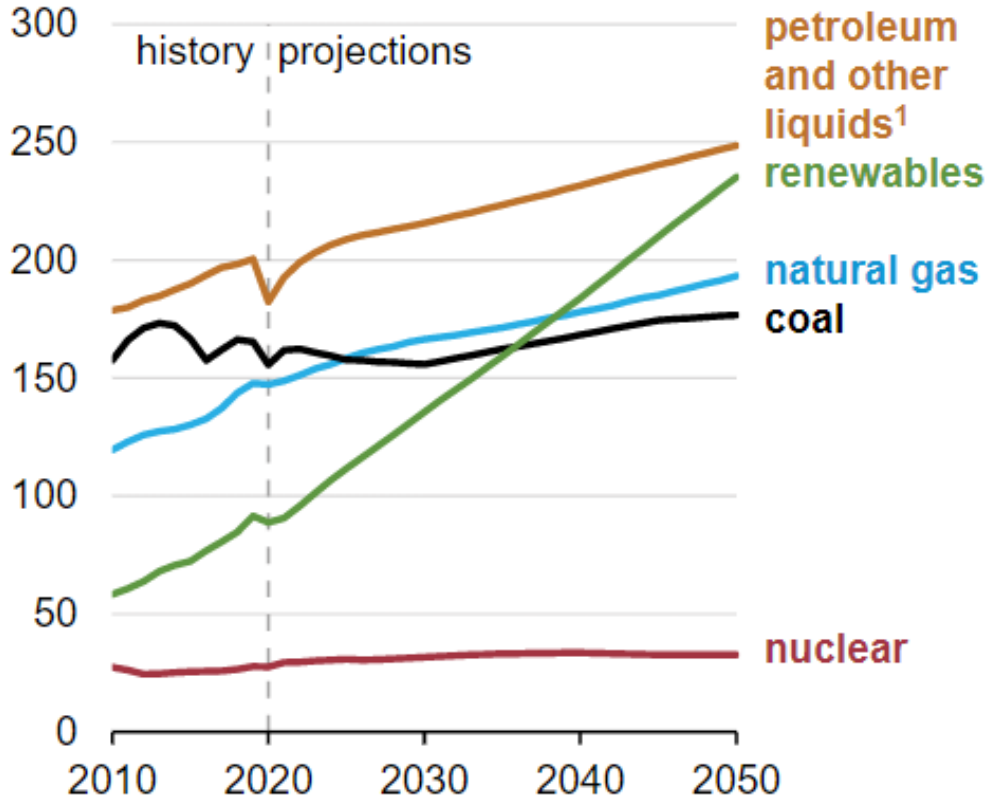
Energy & Raw material projection

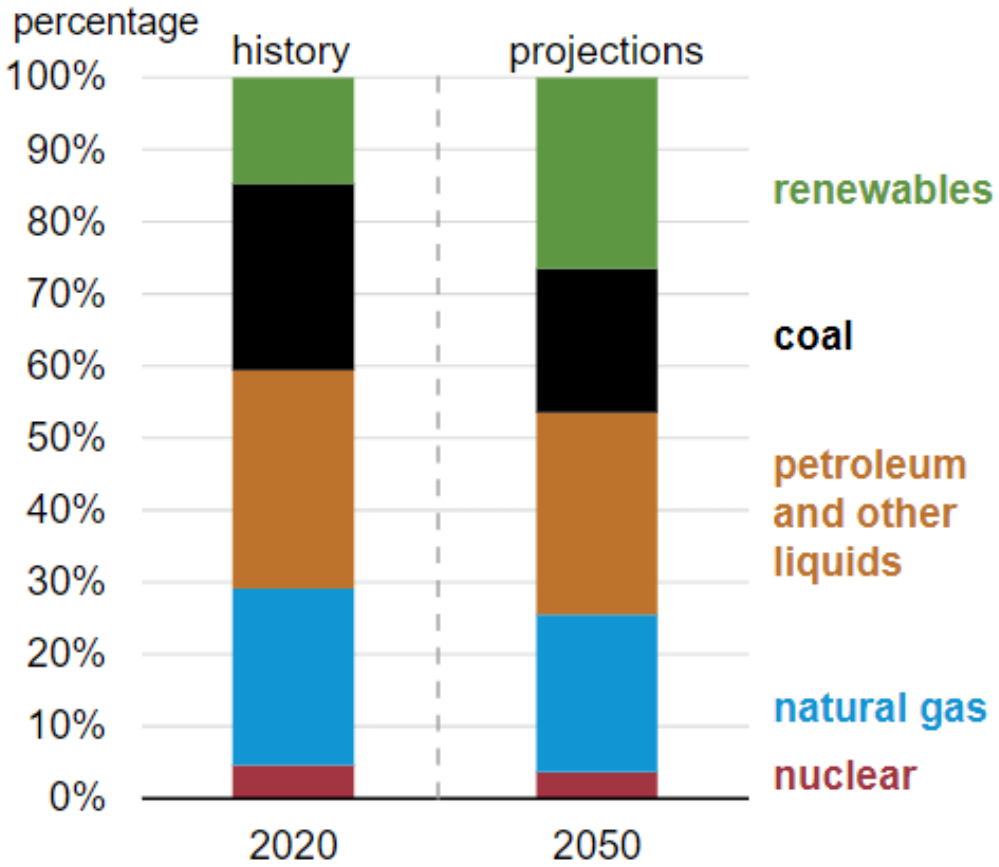
Liquid fuels remain the largest source of primary energy in the reference case, but renewables use grows to nearly the same level

Primary energy consumption by energy source, world

quadrillion British thermal units



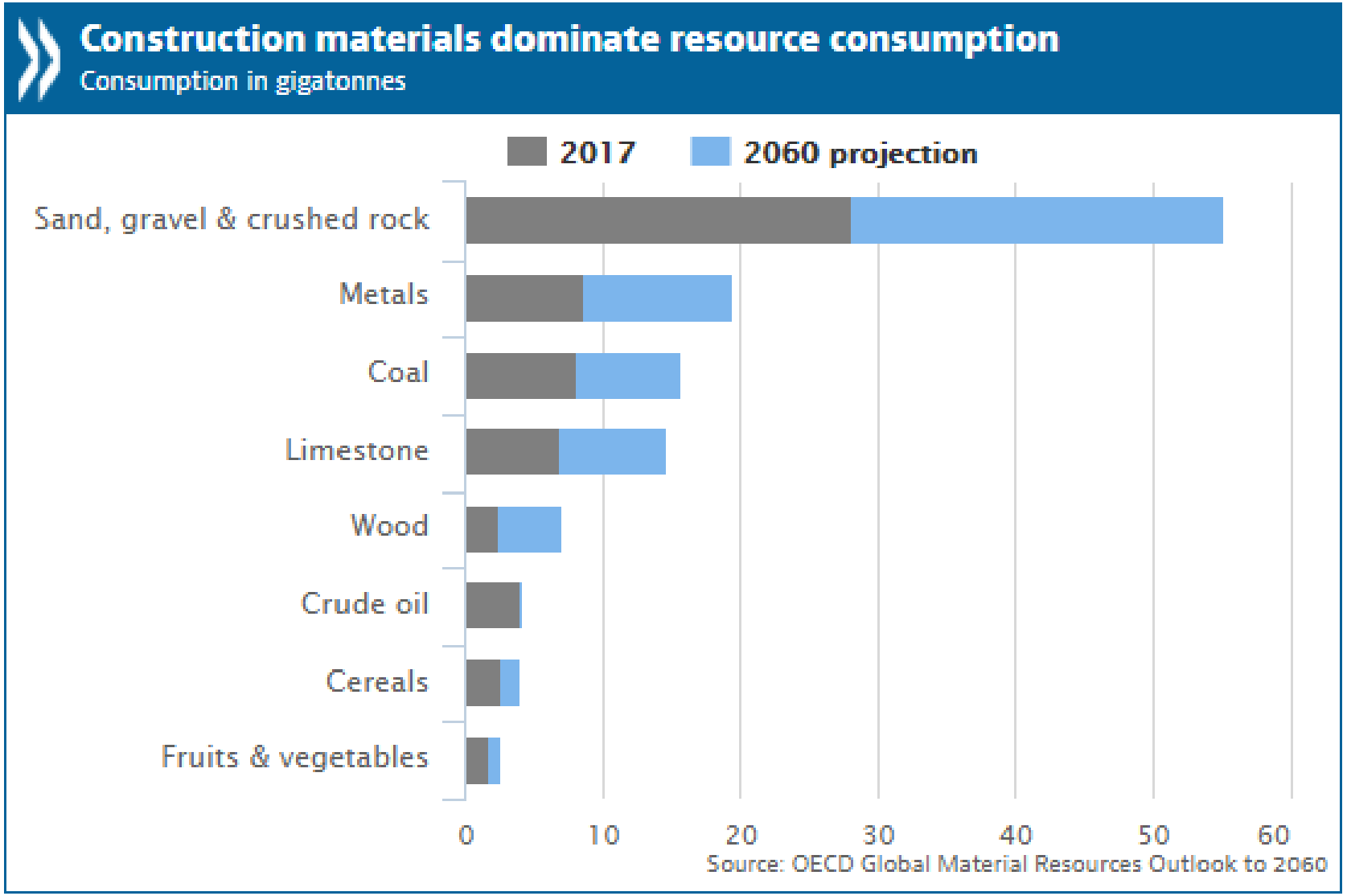
Share of primary energy consumption by source, world



Source: U.S. Energy Information Administration, *International Energy Outlook 2021* (IEO2021) Reference case

[1] includes biofuels

Energy & Raw material projection



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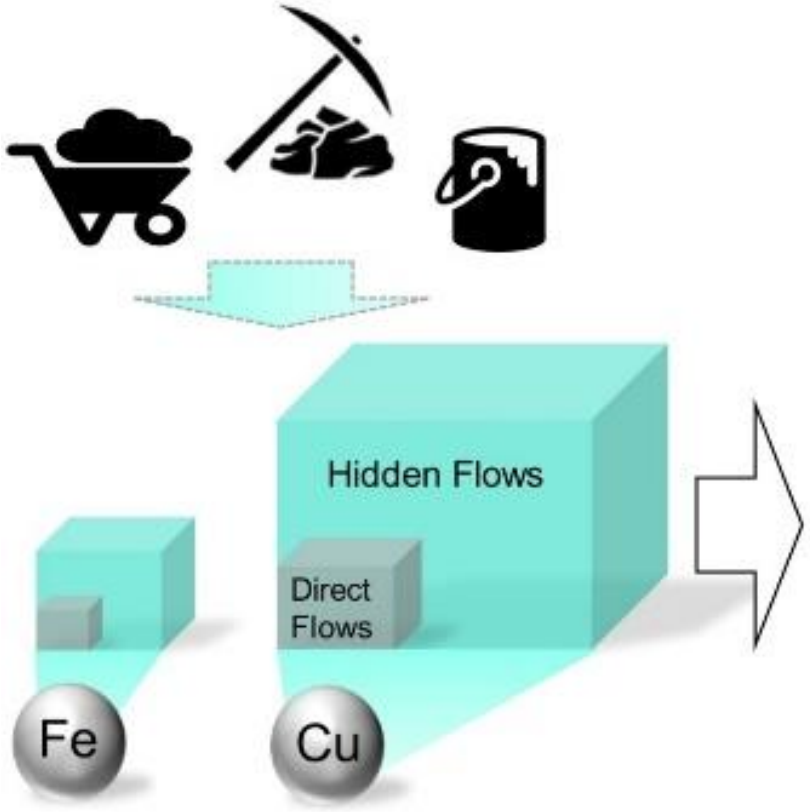
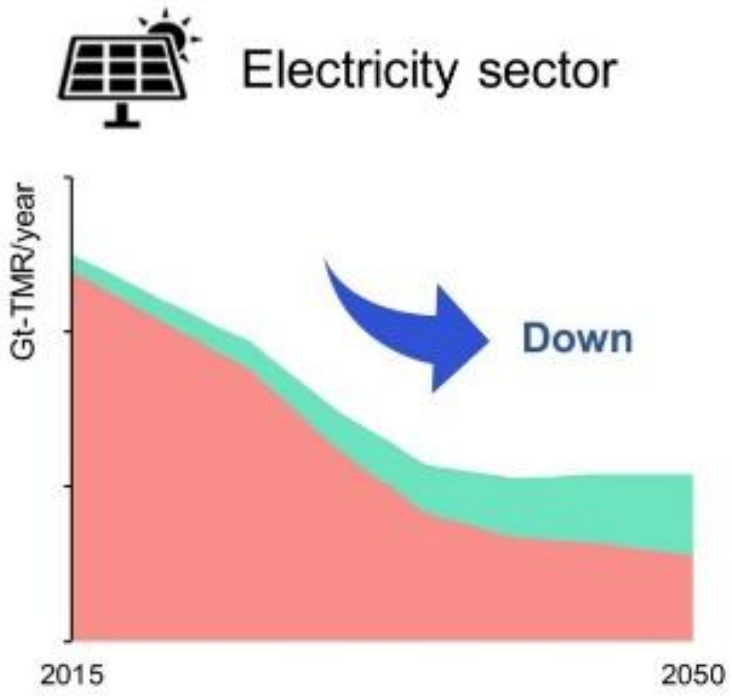
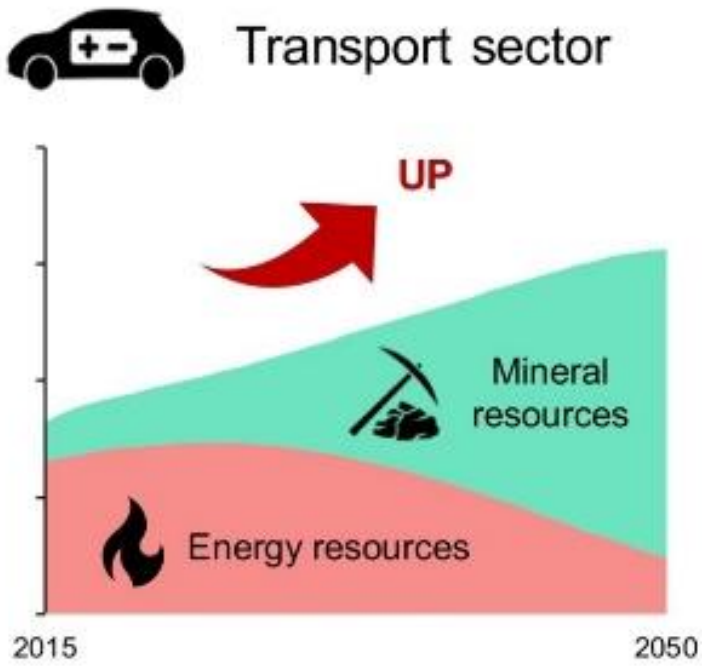
Energy & Raw material projection







Watari et al., 2019 https://doi.org/10.1016/j.resconrec.2019.05.015

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Energy & Raw material projection

In Europe, we consume about **a quarter of the world's raw materials** but produce only **three percent**. We are therefore largely dependent on imports.

The EC highlights four crucial areas with regards to raw materials:

- Robust value chains for EU industry
- Reduced dependence on primary raw materials, through enhanced circular economy
- Increased **production** and **processing** of raw materials within the EU
- **Diversified supply through sustainable international trade**

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Energy & Raw material projection

The European Commission has classified 30 raw materials as **critical** for our society and industry. These critical materials are defined according to two main criteria for each individual raw material: **its economic importance for the European industry and its supply risk, that is, the risk of interruptions in the supply to Europe.**

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Energy & Raw material projection

The **materials** that are presently considered as **critical** are: **antimony**, **baryte**, bauxite, beryllium, bismuth, borate, **cobalt**, coking coal, fluorspar, gallium, germanium, hafnium, heavy **rare earth elements** (HREE), **indium**, light rare earth elements (LREE), **lithium, magnesium**, natural graphite, natural rubber, **niobium**, **phosphate rock**, phosphorus, **platinum group metals** (**PGM**), scandium, silicon metal, strontium, tantalum, titanium, tungsten and vanadium.

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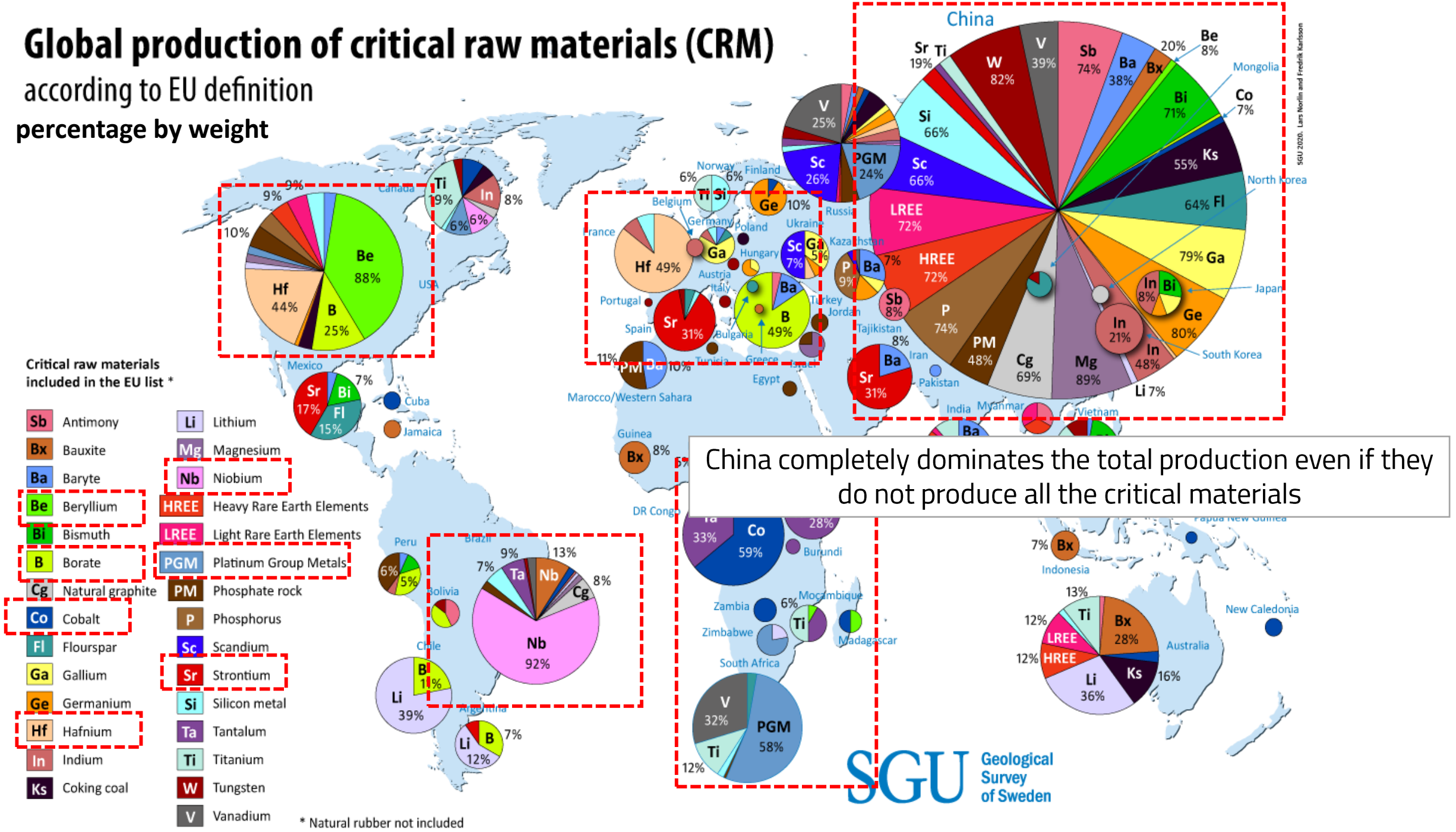
Global production of critical raw materials (CRM)

according to EU definition

percentage by weight



Critical raw materials included in the EU list *

Sb	Antimony	Li	Lithium
Bx	Bauxite	Mg	Magnesium
Ba	Baryte	Nb	Niobium
Be	Beryllium	HREE	Heavy Rare Earth Elements
Bi	Bismuth	LREE	Light Rare Earth Elements
B	Borate	PGM	Platinum Group Metals
Cg	Natural graphite	PM	Phosphate rock
Co	Cobalt	P	Phosphorus
Fl	Flourspar	Sc	Scandium
Ga	Gallium	Sr	Strontium
Ge	Germanium	Si	Silicon metal
Hf	Hafnium	Ta	Tantalum
In	Indium	Ti	Titanium
Ks	Coking coal	W	Tungsten
		V	Vanadium

* Natural rubber not included

China completely dominates the total production even if they do not produce all the critical materials

SGU Geological Survey of Sweden

Energy & Raw material projection

Energy and **Mining** encompass a range of activities and economic sectors involved in the **exploration**, **extraction**, **processing** and **distribution** of oil, gas, coal, minerals and metals and the **generation, distribution and delivery** of energy from fossil and non-fossil resources.

- Renewables: biofuel production, geothermal, wind farms, hydroelectric power, hydropower and large dams, nuclear energy, solar energy;
- Oil and gas: unconventional, conventional, onshore, offshore and deep sea exploration;
- Mining: surface, sub-surface, onshore, offshore and deep sea exploration, artisanal and small-scale mining (ASM);
- Associated activities: ancillary developments (e.g. worker camps, waste facilities, access roads), services (e.g. waste, energy), infrastructure (roads, railways, offshore, pipelines, power stations, pylons, energy transmission) and transport (e.g. shipping).

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Energy & Raw material projection

The energy and mining sectors are closely interrelated. Materials and fuels may be extracted by mining, before being used to generate energy or as component parts in energy generation (e.g. photovoltaic cells) or storage equipment (e.g. batteries). They are also closely linked to other sectors, such as infrastructure. Infrastructure is both required for, and often funded by revenues from, the energy and mining sectors.

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Energy & Raw material projection

Table 5.2. Illustrative examples of mining activities, aspects and biodiversity impacts

Activity	Examples of Aspects	Examples of Biodiversity Impact
Extraction	Land clearing	Loss of habitat, introduction of plant disease, siltation of watercourses
Blasting	Dust, noise, vibration	Smothering stomata, disturbance of fauna
Digging and Hauling	Dust, noise, vibration, water pollution	Disruption of watercourses, impacts on aquatic ecosystems due to changes in hydrology and water quality
Waste Dumping	Clearing, water and soil pollution	Loss of habitat, soil and water contamination, sedimentation, acid mine drainage
Processing/ Chemical use	Toxicity	Loss of species (fish kills, for example) or reproductive impacts
Tailings Management	Land clearing, water pollution	Loss of habitat, toxicity, sedimentation, water quality and streamflow
Air emissions	Air pollution	Loss of habitat or species

Significant impact in the Environment

JNEP-WCMC (2017)

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Energy & Raw material projection

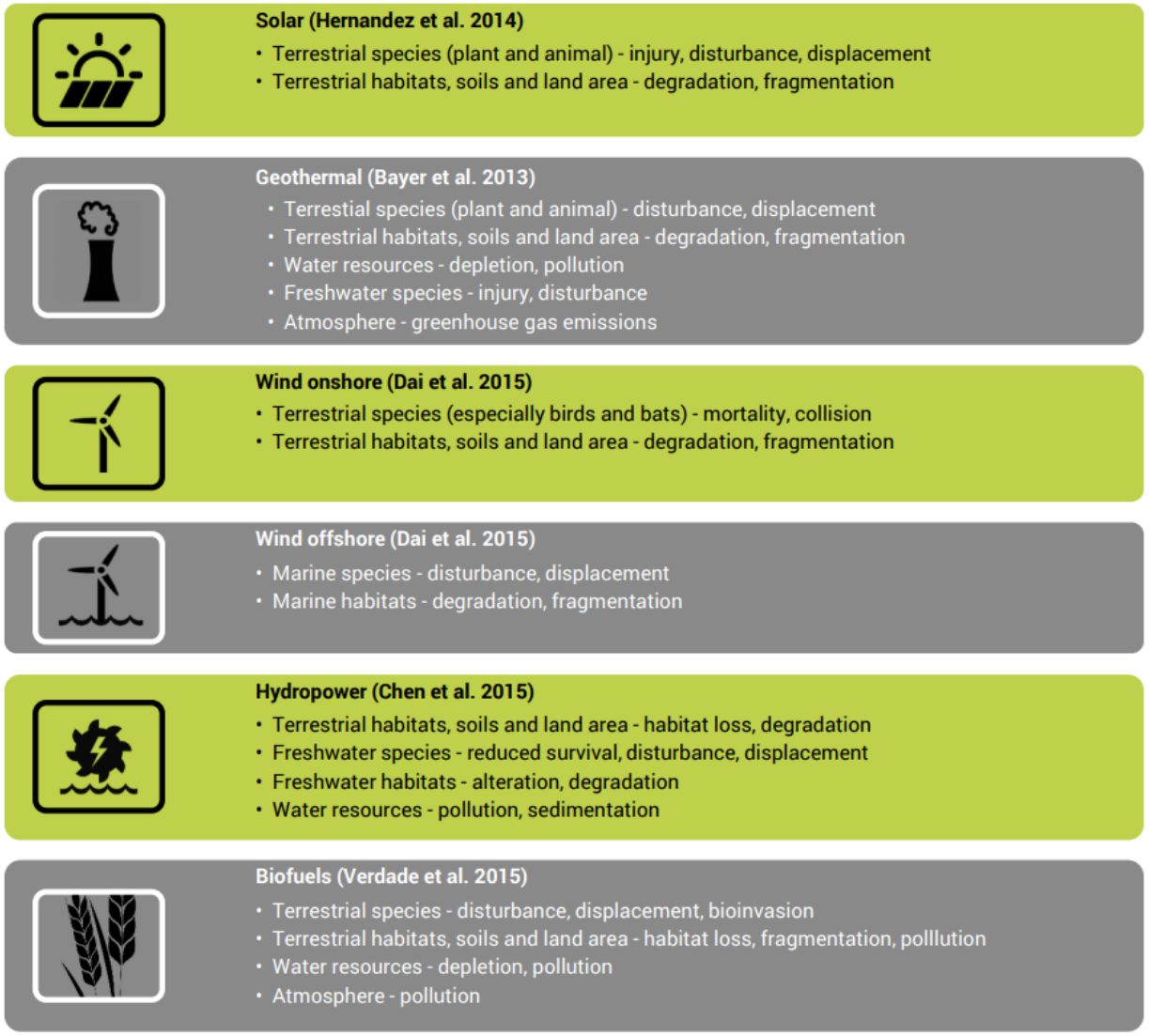

Figure 2: Summary of Direct Impacts of Renewable Energy on Biodiversity and Ecosystem Services [55]

Significant impact in the Environment

UNEP-WCMC (2017)

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Distribution of operating metal mines and prospecting projects among Earth's terrestrial biomes (Sonter et al., 2018)

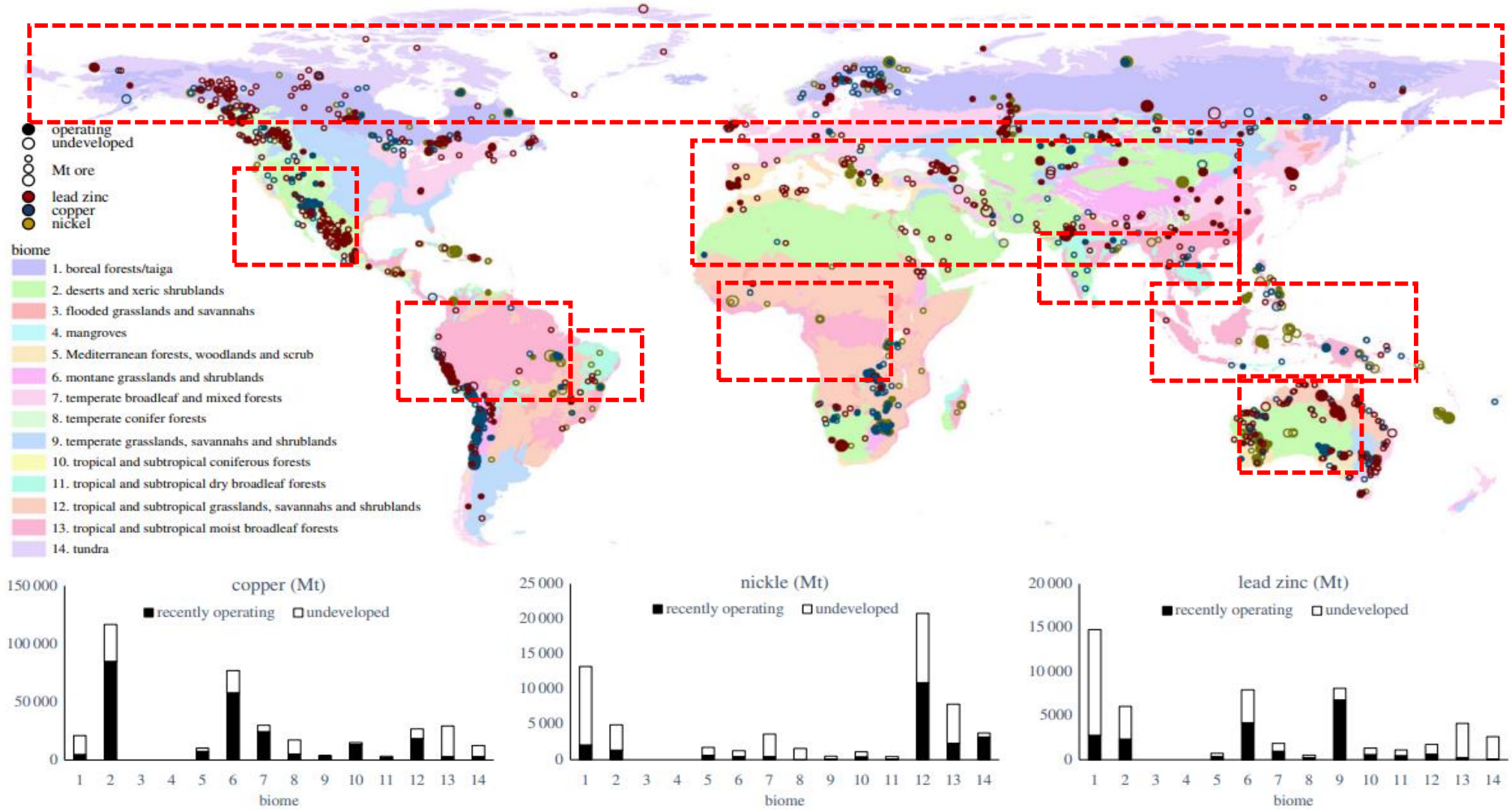

Figure 2. Distribution of operating metal mines and prospecting projects [39] among Earth's terrestrial biomes [40]. Mine symbol colour distinguishes between metals (lead/zinc, copper, nickel) and symbol size depicts reserve size (Mt). The three bar graphs represent each metal tonnage per biome and the biome numbers are found in the key.

Energy & Raw material projection

Mining is a basic activity for the economic and technical development of Humanity

Mining is among the most relevant human activities affecting habitat loss and degradation, which is ranked first threat to biodiversity

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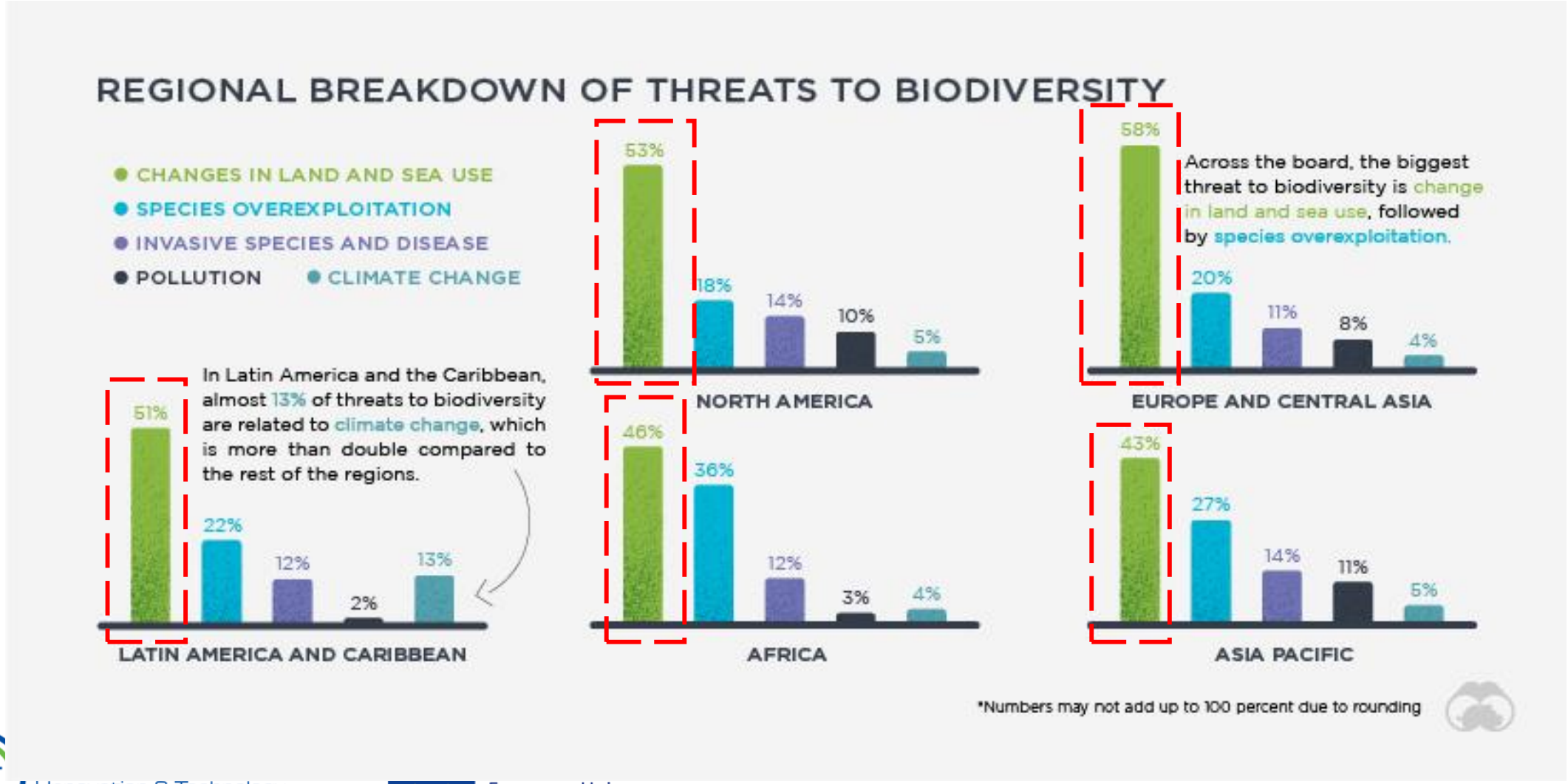
Habitat degradation is the primary cause of extinction and endangerment globally and in most nations



Energy & Raw material projection

- Mining and energy sectors are basic activities for the economic and technical development of Humanity
- However, mining is among the most relevant human activities affecting habitat loss and degradation, which is ranked first threat to biodiversity.
- The society future lies in finding consensus strategies between the conservation of nature, industry and cross-sectoral decision makers.

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Convention on biological Diversity and the sustainable Development Goals

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Convention on biological Diversity and the Sustainable Development Goals

The United Nation's Sustainable Development Goals (SDGs), alongside the Convention for Biological Diversity's 2030 Strategic Plan

Coordination among multiple stakeholders, including **conservation scientists, industry and cross-sectoral decision-makers**, to understand and manage an increasingly diverse, distant and interacting suite of threats to species and ecosystems

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Convention on biological Diversity and the Sustainable Development Goals

The goals address the needs of people in both developed and developing countries, emphasizing that no one should be left behind

the Agenda addresses the three dimensions of sustainable development: **social, economic and environmental**, as well as important aspects related to **peace, justice and effective institutions**

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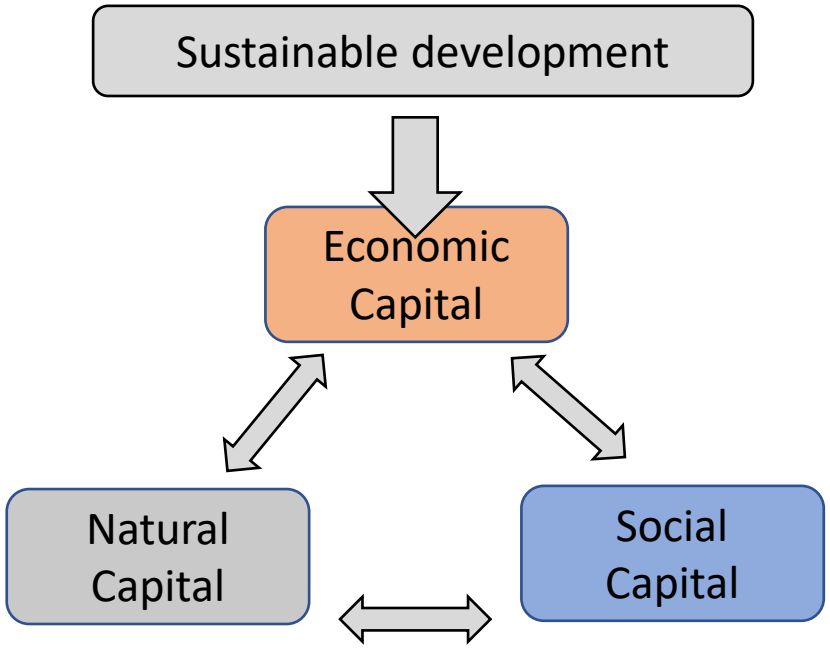
Convention on biological Diversity and the Sustainable Development Goals

Sustainable Development (Brundtland Inform "Our common future", 1987):

The development that meets the needs of the present without compromising the ability of future generations to meet their own needs



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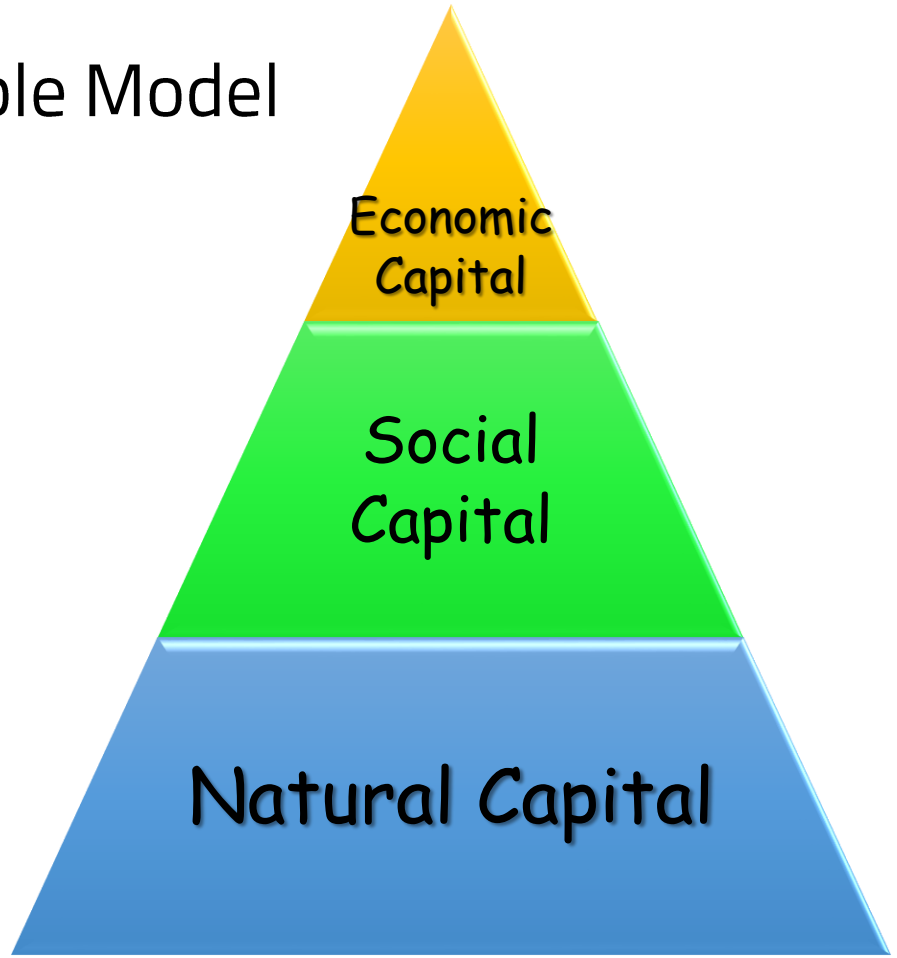
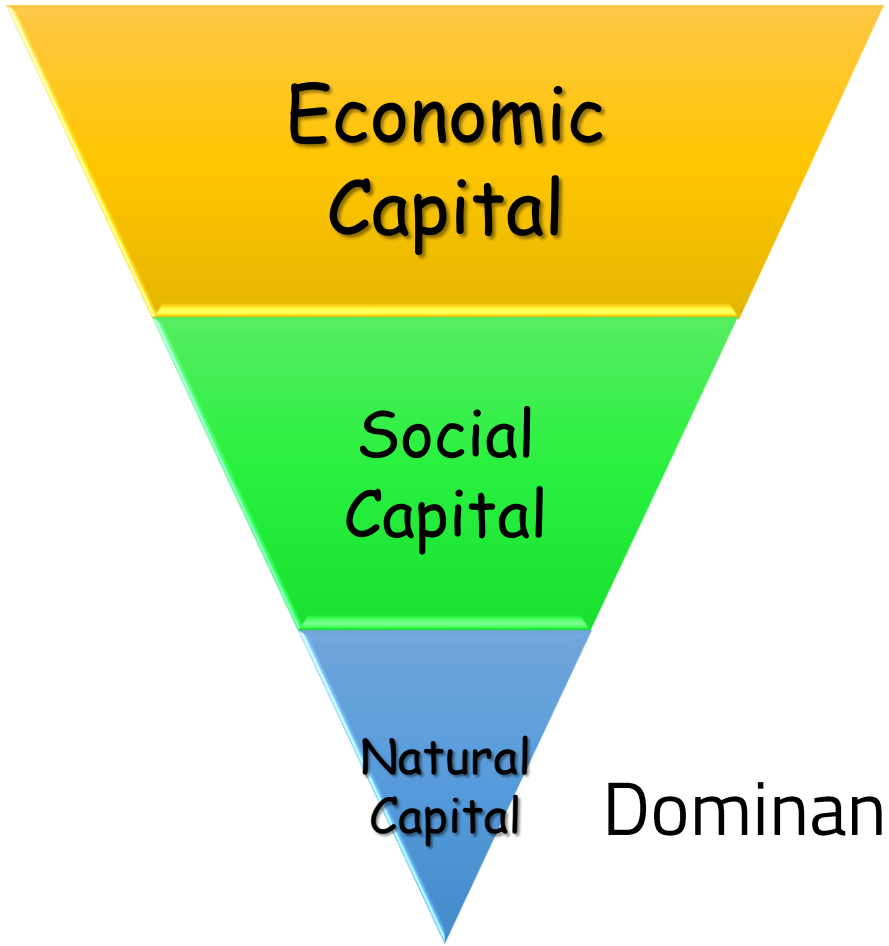
Convention on biological Diversity and the Sustainable Development Goals

Sustainable Model





Dominant Model

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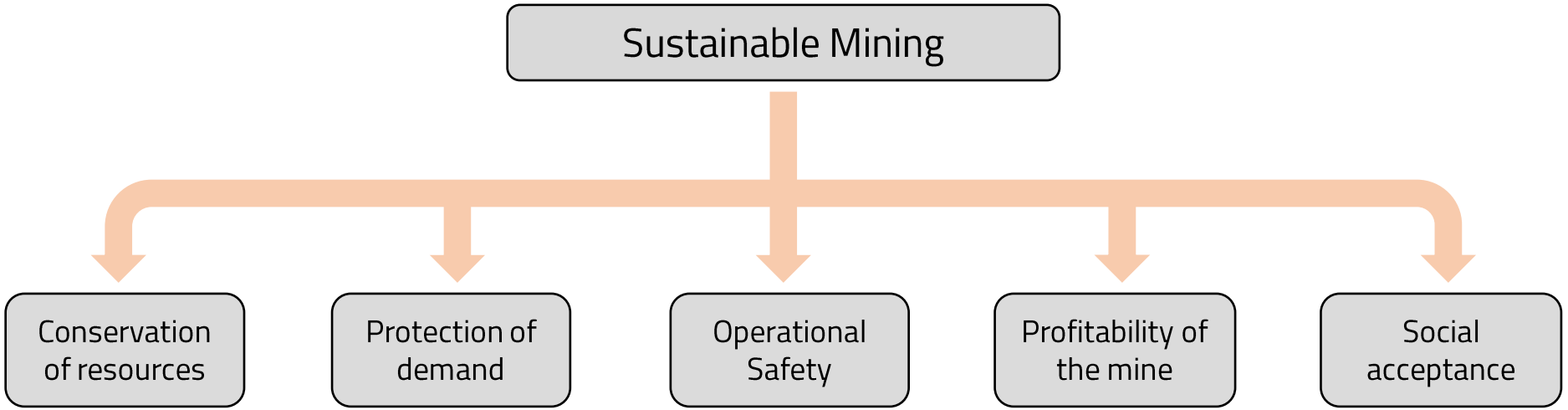
Convention on biological Diversity and the Sustainable Development Goals

All these factors lead to the search for a **sustainable mining activity**. A process whose priorities and approaches may vary from country to country, where the key ingredient is **economic development**, complemented by **social, environmental and political dimensions**



Sustainable mining as well as its conditions can be applied locally (The mine), or at the national, even global scale.

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Convention on biological Diversity and the Sustainable Development Goals

Sustainable Development **Limitations**:

- **Lack of international methodologies** for valuation of ecosystems
- Insufficient use of **natural capital** accounting by decision-makers
- Limitations on the capacity of many developing countries
- Lack of leadership to go "beyond Gross Domestic Product (GDP)"

Societies with a positive "GDP" may experience negative growth in their "Richness" if they do not respect their Natural Capital.

Actions of Governments:

- Require companies to disclose nature and impact on Natural Capital → Transparent qualitative and quantitative reporting.
- **Fiscal actions** against the erosion of natural capital; **Incentives** to companies that integrate, value and take into account **Natural Capital** in its business model.
- **Agreements** that include and extend pacts by the **Convention on Biological Diversity**.
- Requirements to inform and account for the use of Natural Capital in relation to public expenditure and public procurement.

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Convention on biological Diversity and the Sustainable Development Goals

Initiatives:

The supply side of mineral governance—i.e. the regulation of mineral prospecting, extraction and processing—is largely reliant on **national laws for biodiversity protection** and for specific countries this can be **highly variable** in terms of stringency of regulation and enforcement.

- **Individual companies** have tried to bridge the divide between demand and supply centres by making commitments to not mine in particularly sensitive areas, such as **World Heritage Sites**
- **The International Council on Mining and Metals** (ICMM) made a commitment in 2003 through its membership of companies to stop mining in **World Heritage Sites**
- In 2016, they (ICMM) **reissued a call for all companies to make a commitment in this regard**, largely owing to impacts on biodiversity

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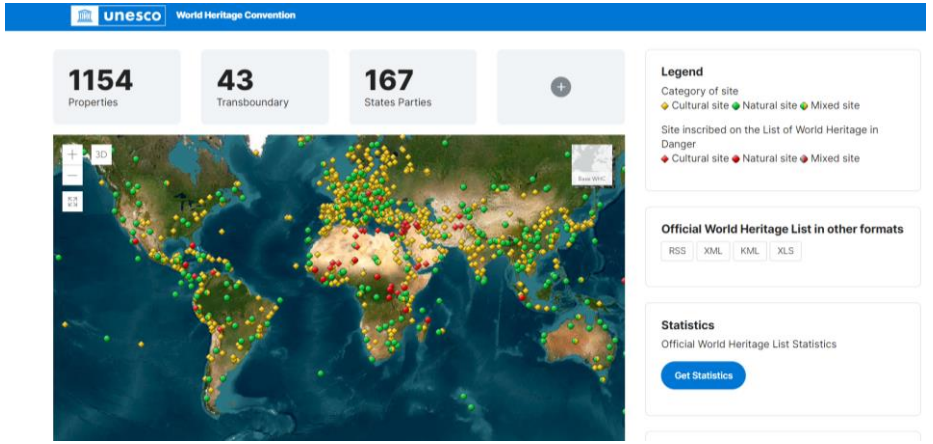
Initiatives:

- The effectiveness of such commitments has yet to be quantified, though **partnerships with groups such as the International Union for the Conservation of Nature (IUCN)** are being developed

- Such a **recognition of the limits of coexistence of mining and protected areas** in some contexts, while the willingness to **engage on mitigation measures of impact** to allow for coexistence where possible, is a **realistic and pragmatic way forward**



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Convention on biological Diversity and the Sustainable Development Goals

Initiatives:

- Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the **management of waste from extractive industries** (and amending Directive 2004/35/EC)

  http://ec.europa.eu/environment/waste/mining/index.htm

  https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02006L0021-20090807

- BAT Reference Document (Reference Document on Best Available Techniques for the management of tailings and waste-rock in mining activities) July 2004. European Commission.

- The International Council on Mining and Metals (ICMM) **Good practice guidance for mining and biodiversity.** Starke, L. (2006). Good practice guidance for mining and biodiversity.

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Convention on biological Diversity and the Sustainable Development Goals

Initiatives:

- 26 Companies with **Public commitment** to reduce or avoid impacts on biodiversity (documented, publicly accessible biodiversity-related policy to manage impacts from their operations)

- To adopt the **mitigation hierarchy approach** (a decision framework which allows for the systematic consideration of negative biodiversity impacts and mitigation options), **not to explore or develop mines in World Heritage sites**, or to aim for a **Net Positive Impact on biodiversity**.

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Convention on biological Diversity and the Sustainable Development Goals

Initiatives:

- The Responsible Mining Foundation (RMF) has **tracked mining company performance** since 2018 against four indicators of "responsible mining:"
  - meaningful integration of environmental, social, and governance (ESG) throughout the business model,
  - transparency and data-sharing,
  - a proactive rights-based approach to harm prevention,
  - and international action to promote responsible mining.

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Convention on biological Diversity and the Sustainable Development Goals

Moving the global mining (and energy) industry towards biodiversity awareness

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Opportunities toward sustainable raw material industry

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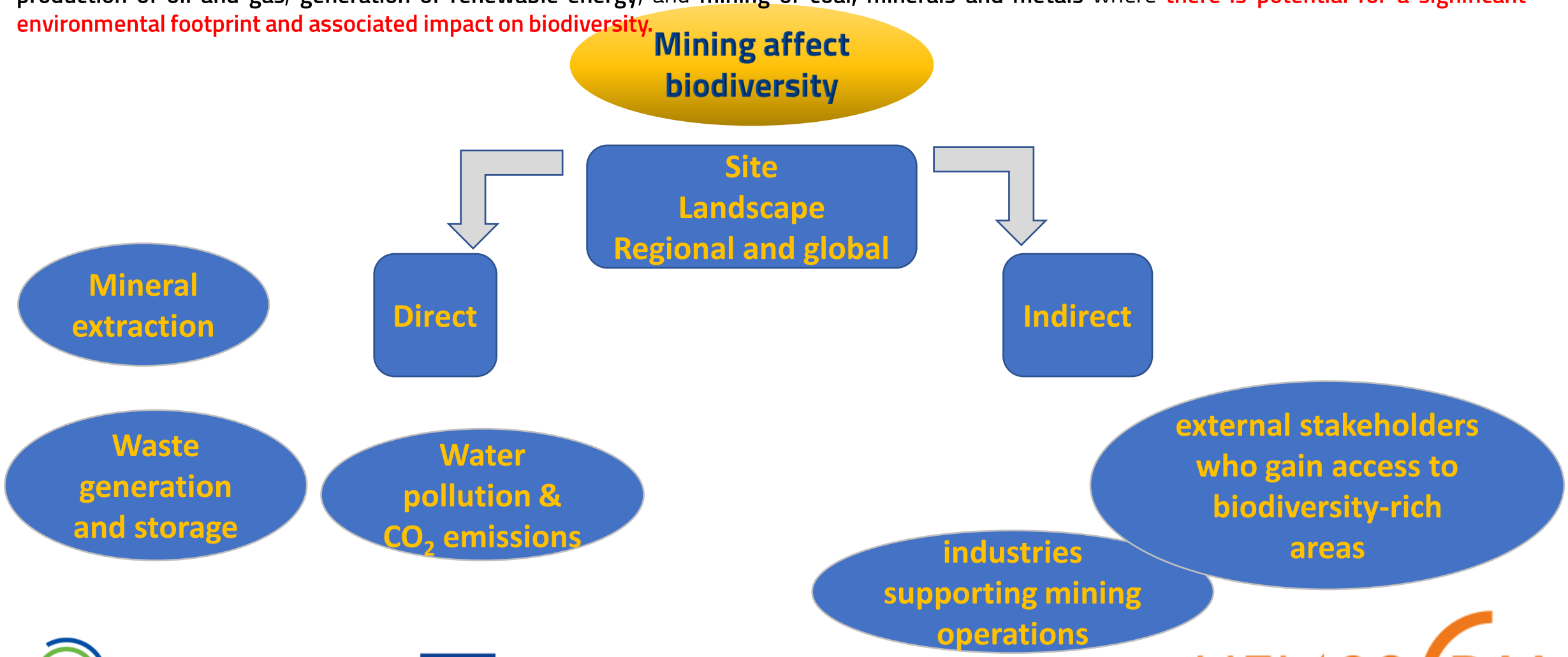
Opportunities toward sustainable raw material industry

When considering the impacts of the energy and mining sectors on biodiversity and ecosystem services, the focus is largely on the **exploration and production of oil and gas**, **generation of renewable energy**, and **mining of coal, minerals and metals** where **there is potential for a significant environmental footprint and associated impact on biodiversity.**



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Opportunities toward sustainable raw material industry

To date, most research has examined impacts at the **site-level**, emerging directly owing to habitat loss and degradation

mine expansion and waste management is a **destructive process**, **changing abiotic** and **biotic** conditions, and in some cases singlehandedly causing region-wide declines in **rare and threatened species** and **ecosystems**

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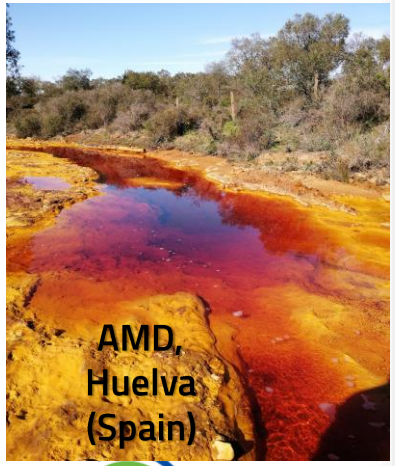
Opportunities toward sustainable raw material industry

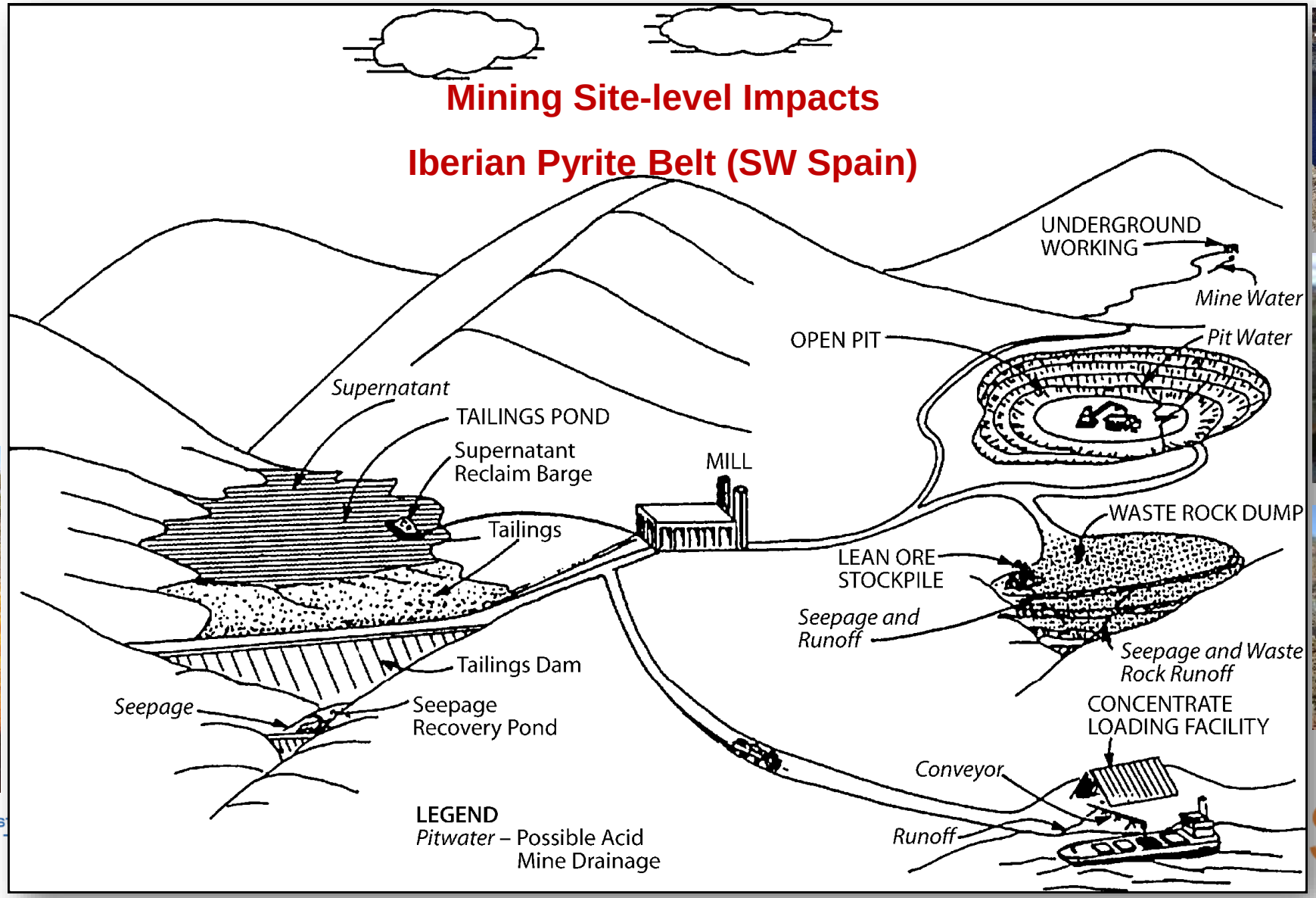
Spoil heaps and acid lixiviates (Tharsis Mine)

Melanterite $FeSO_4 \cdot 7H_2O$ formation



Mining Site-level Impacts

Iberian Pyrite Belt (SW Spain)



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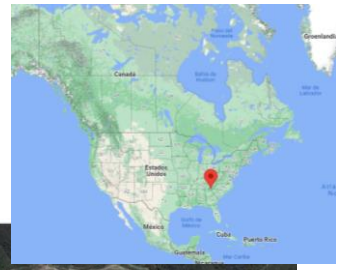
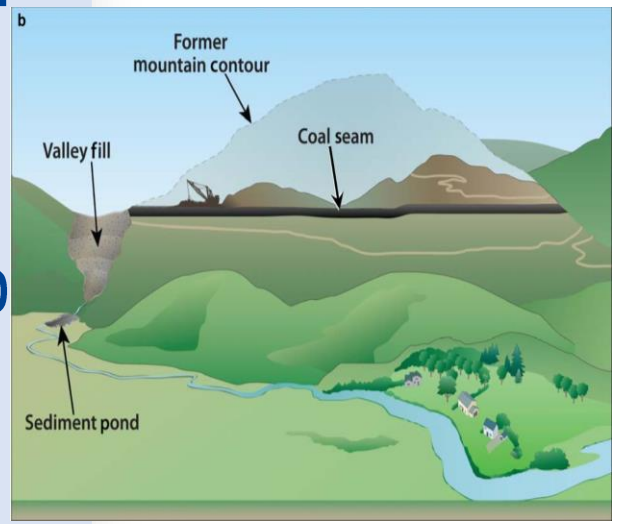
Opportunities toward sustainable raw material industry

The Overlooked Terrestrial Impacts of Mountaintop Mining

Concentrated in a 65-county area in southern West Virginia, eastern Kentucky, southwestern Virginia, and northeastern Tennessee, this process **removes the tops of mountains in order to extract underlying coal seams**

High biological diversity, with a rich mix of flora and fauna **overlay a rich coal reserve**





Great Smoky Mountains; Moutain top images **before** (a) and **after** (b) mining. Source: Google Map

Wickham, J. et al., 2013. The overlooked terrestrial impacts of mountaintop mining. BioScience, 63(5): 335-348. https://doi.org/10.1525/bio.2013.63.5.7

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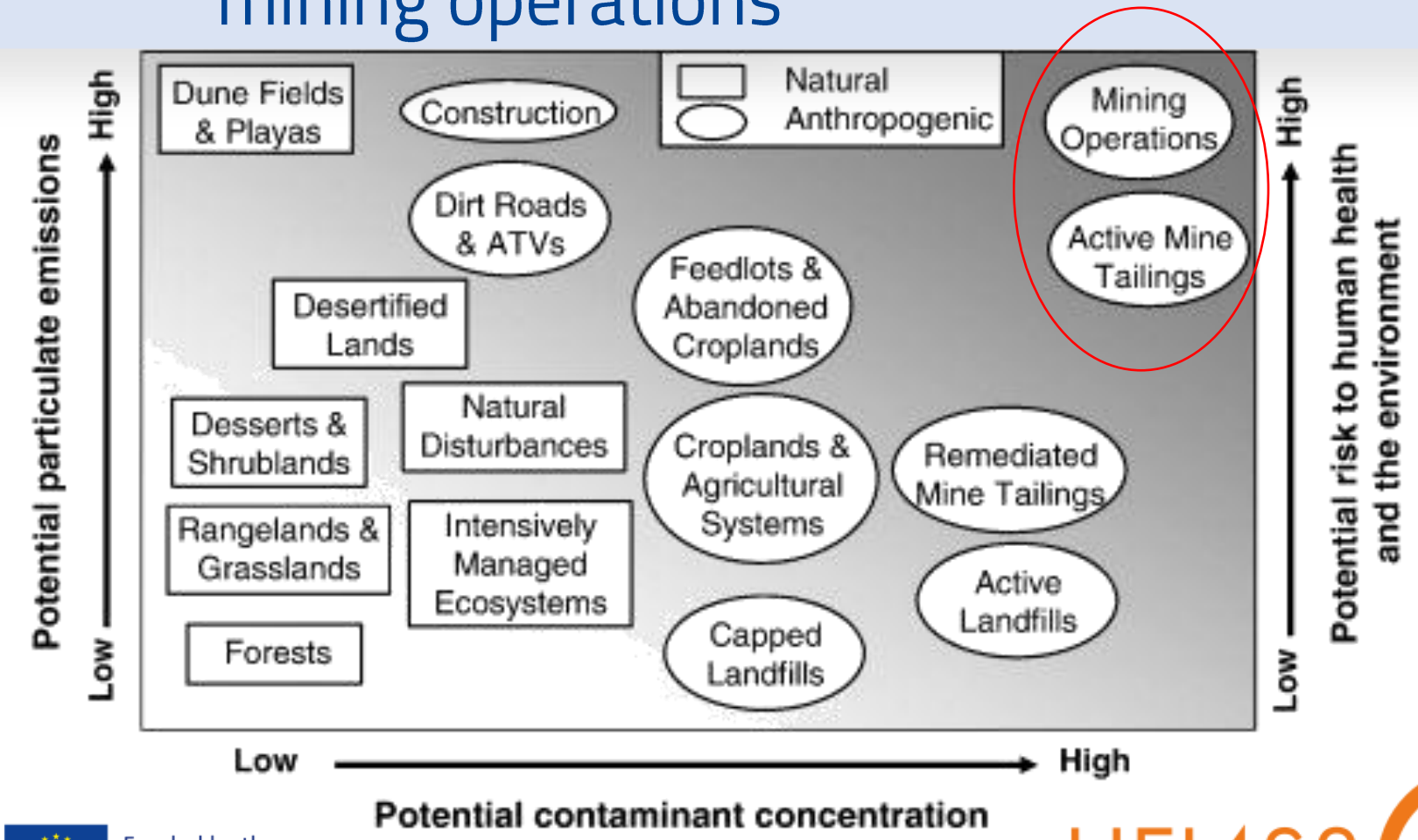
Opportunities toward sustainable raw material industry

Metals and metalloids in atmospheric dust and aerosol from mining operations



Csavina, J. et al., 2012. A review on the importance of metals and metalloids in atmospheric dust and aerosol from mining operations. Science of the Total Environment, 433: 58-73.

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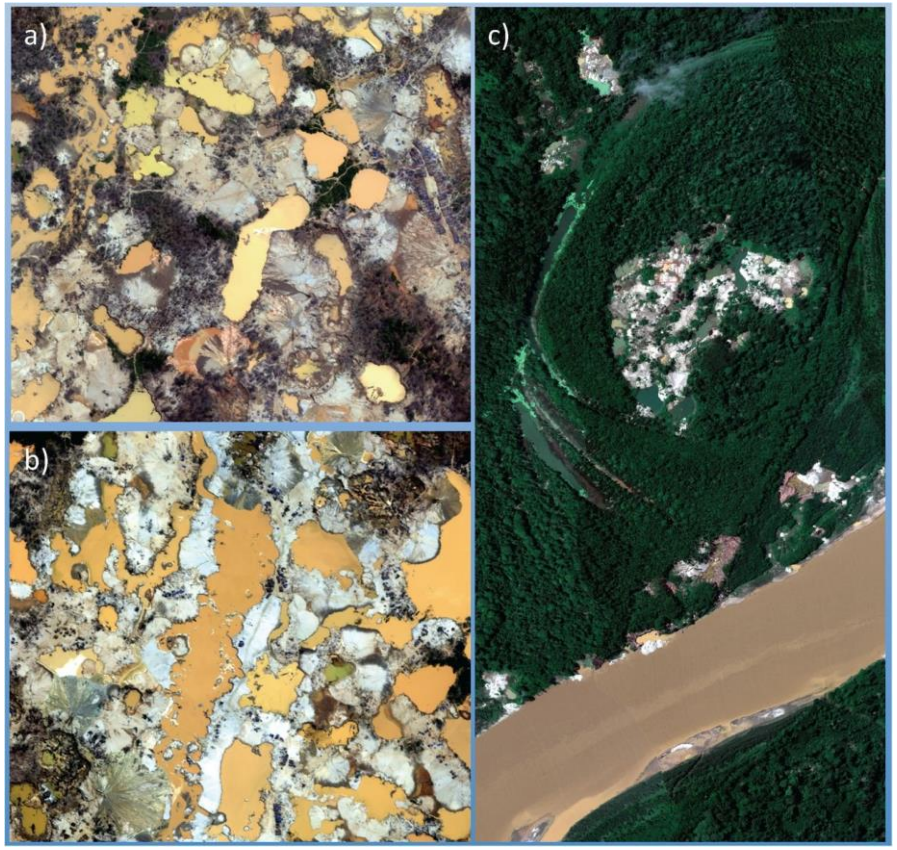
Opportunities toward sustainable raw material industry



Gold mining in the Peruvian Amazon. Photo by Rhett A. Butler

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(*A* and *B*) Typical examples of the interior conditions of the large Guacamayo and Huepetuhe mines. (*C*) Examples of small-scale mining on and set back from the edge of the Madre de Dios River. In all cases, mines are dominated by **extensive, intermixed areas of bare soil and standing pools of water resulting from the mining process.**

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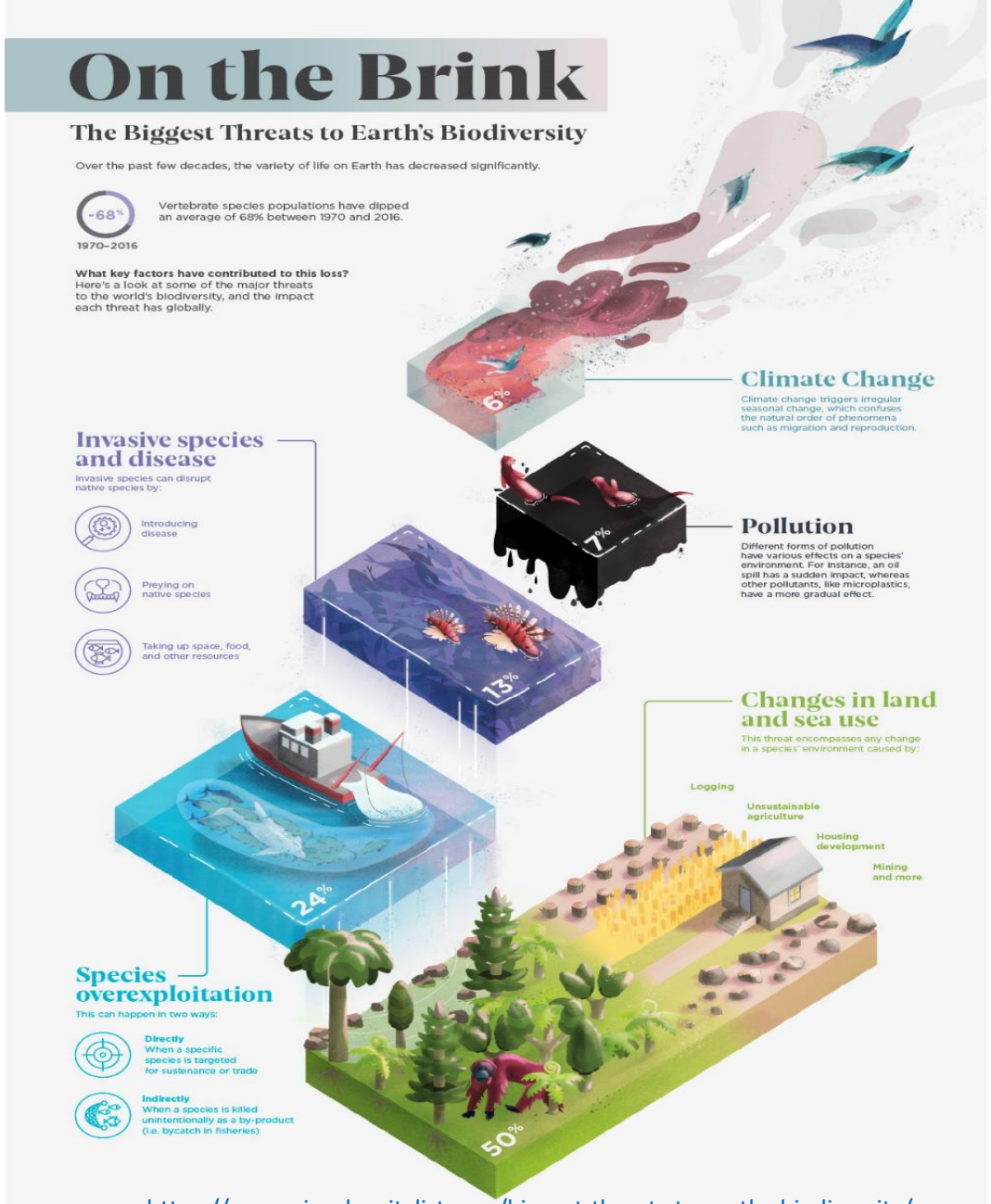
Opportunities toward sustainable raw material industry

- Habitat loss, fragmentation and/or degradation (e.g. deforestation, soil removal, waste disposal)
- Pollution (Acid Mine Drainage, cyanide, mercury, dusts and aerosols, and so on)
- Climate Change (GHG emissions)
- Invasive species
- Overexploitation (exacerbating hunting, fishing)



https://www.visualcapitalist.com/biggest-threats-to-earths-biodiversity/

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Opportunities toward sustainable raw material industry

Effective conservation strategies requires **understanding the distribution of threats**

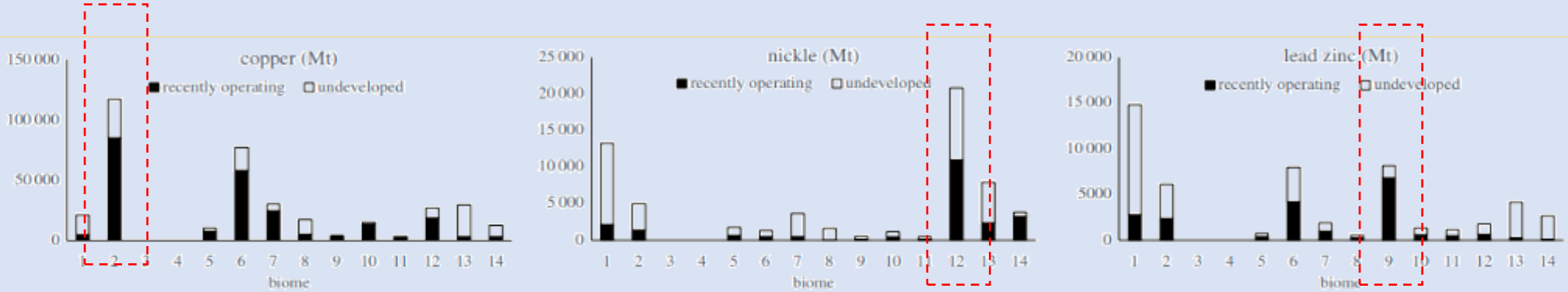

Figure 2. Distribution of operating metal mines and prospecting projects [39] among Earth's terrestrial biomes [40]. Mine symbol colour distinguishes between metals (lead/zinc, copper, nickel) and symbol size depicts reserve size (Mt). The three bar graphs represent each metal tonnage per biome and the biome numbers are found in the key.

However, co-occurrence of mined materials and biodiversity does not always translate into a threat

biome
1. boreal forests/taiga
2. deserts and xeric shrublands
3. flooded grasslands and savannahs
4. mangroves
5. Mediterranean forests, woodlands and scrub
6. montane grasslands and shrublands
7. temperate broadleaf and mixed forests
8. temperate conifer forests
9. temperate grasslands, savannahs and shrublands
10. tropical and subtropical coniferous forests
11. tropical and subtropical dry broadleaf forests
12. tropical and subtropical grasslands, savannahs and shrublands
13. tropical and subtropical moist broadleaf forests
14. tundra

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Opportunities toward sustainable raw material industry

Climate Change Impacts

The burning of fossil fuels is widely known to be a major cause of climate change, presenting a significant impact on biodiversity globally

Energy-related activities contribute approximately **70% of global greenhouse gas (GHG) emissions**; **oil and gas** together represent approximately **60%** of those energy-related emissions through their **extraction, processing and subsequent combustion**

Deforestation associated with clearing for the production of biofuel is also a **significant contributor to climate change**.

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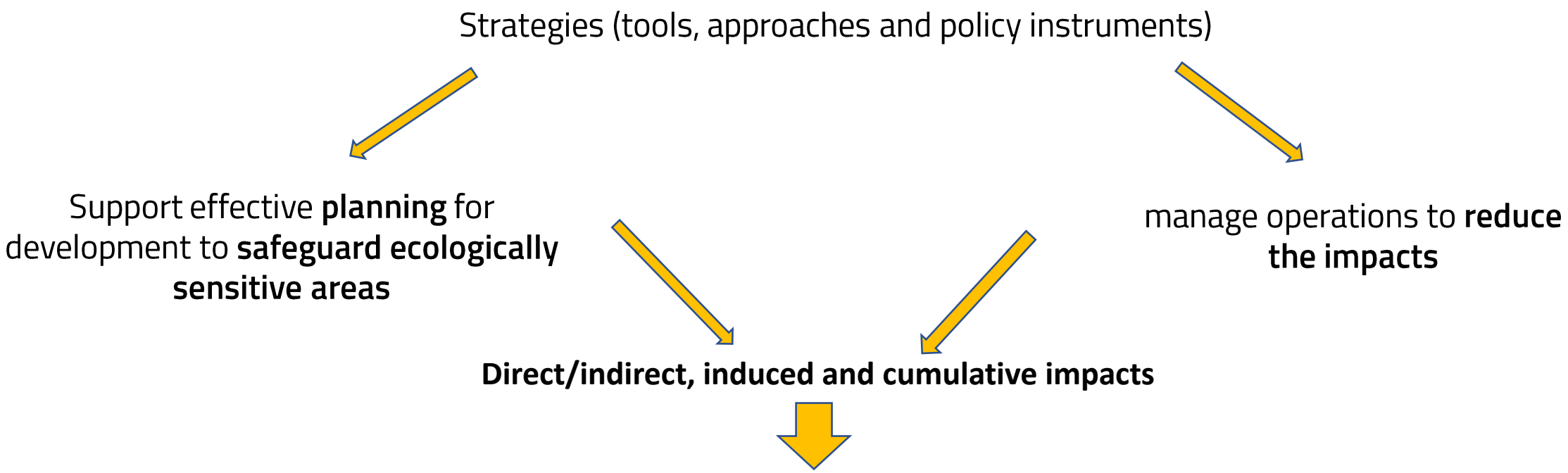
Opportunities toward sustainable raw material industry

There are opportunities to the **effective implementation of the Convention on Biological Diversity and the Sustainable Development Goals** through **mainstreaming biodiversity** into **the energy and mining sectors**



Deliver Benefits to Biodiversity and Society

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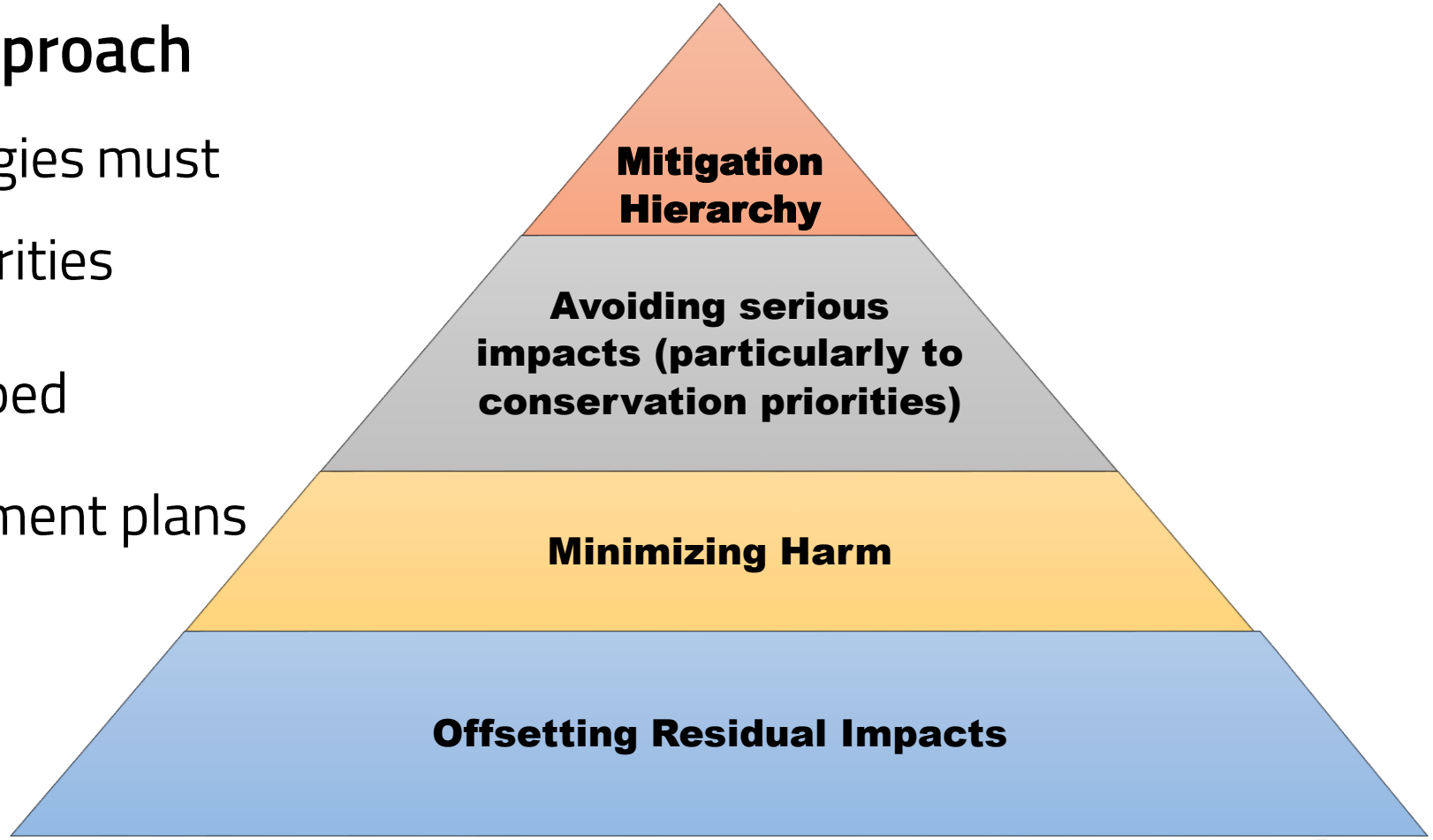
Opportunities toward sustainable raw material industry

Mitigation Hierarchy Approach

- Sensible conservation strategies must first identify biodiversity priorities
- priorities identified and mapped
- long-term strategic management plans



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Opportunities toward sustainable raw material industry

Net Positive Impact on biodiversity

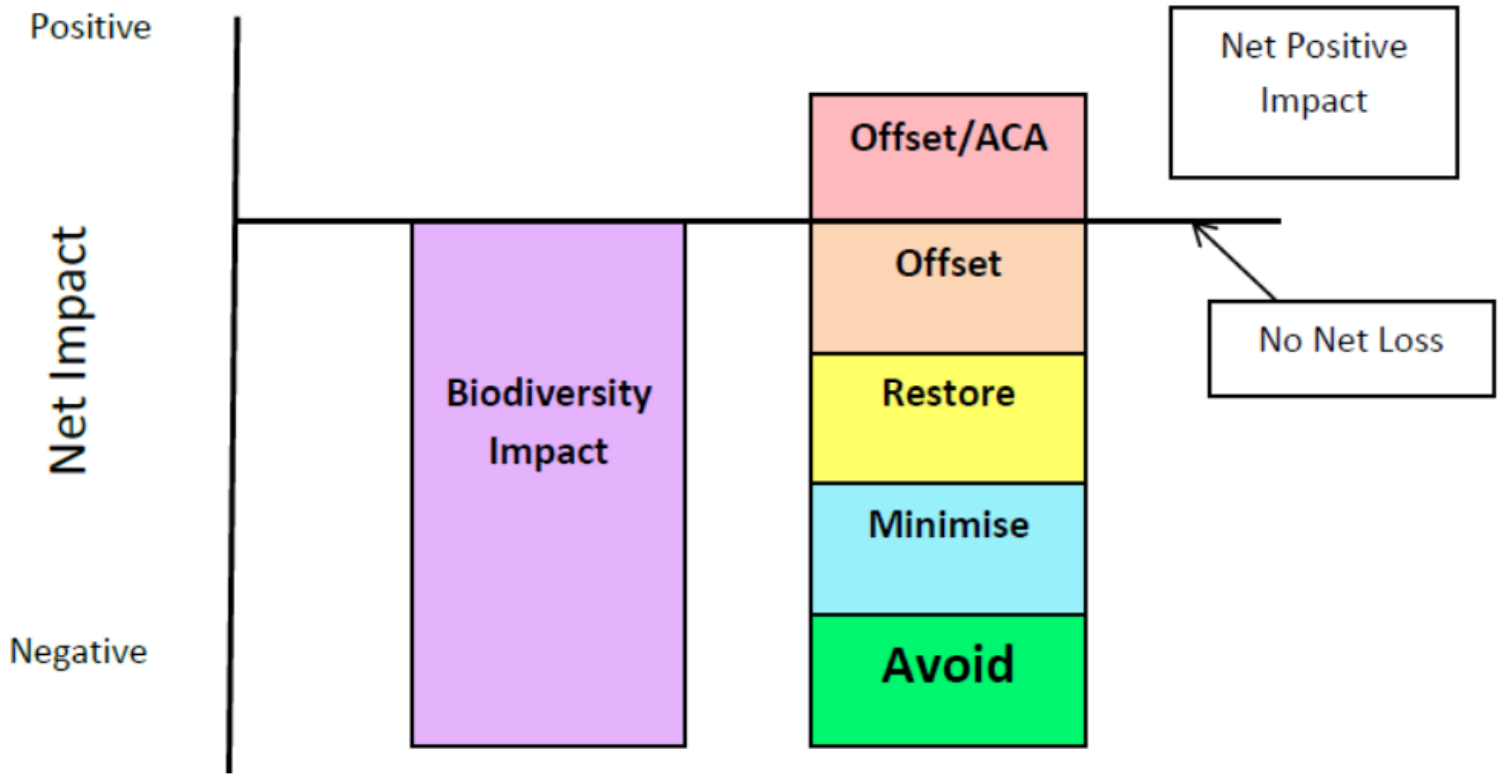
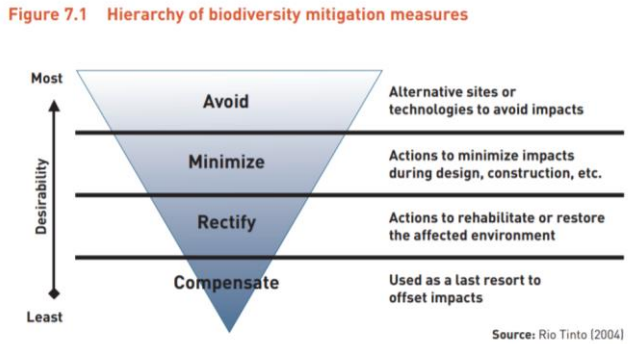


Figure 3: Illustration of the Mitigation Hierarchy in relation to Biodiversity No Net Loss or Net Positive Impact (Source: Cambridge Conservation Initiative (2015) Adapted from: The Biodiversity Consultancy (2013) [83])

An impact mitigation process that prioritises strategies to **avoid** impacts, followed by those that **minimise**, **restore** and finally **offset** or compensate for impacts and deliver gains. **Strategies to avoid or minimise impacts should be prioritised**



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Opportunities toward sustainable raw material industry

The conservation community cannot achieve biodiversity goals without engaging the **mining (and energy) Industry**

Mining companies have financial incentive to mitigate biodiversity losses caused by their operations

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Opportunities toward sustainable raw material industry

Examples

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IndoMet Coal – Kalimantan Indonesia

- The IndoMet Coal Project (IMC) is a high quality metallurgical coal resource within the Maruwai Basin in the Indonesian part of the island of Borneo
- Borneo is renowned for its **high biodiversity**, with some of the most **species-rich flora and fauna in the world**.
- The **leases** are primarily located in lowland tropical forest dissected by rivers and streams, thus making it **an area of high ecological variation and biodiversity**. The leases are located in the remote and relatively inaccessible district of Murung Raya, which is still **87% covered by tropical rain forests**.

IMC's Biodiversity Strategy aims to deliver a **net positive impact on biodiversity**

- Conservation of the Bornean orangutan;
- Strategically improving sustainable land use planning in the region where the project is located, and,
- Facilitating the process to set aside areas that offset the negative impacts of mining activities on biodiversity around the mine site

Since 2000 commissioned seven **biodiversity surveys** in order to better understand the biodiversity management challenges

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IndoMet Coal – Kalimantan Indonesia

Conservation of the Bornean orangutan	Strategically improving sustainable land use planning in the region where the project is located	Facilitating the process to set aside areas that offset the negative impacts of mining activities on biodiversity around the mine site

- The Borneo Orangutan Survival Foundation's (BOSF) Orangutan Reintroduction Centre Nyaru Menteng cares for and rehabilitates over 600 orangutans rescued from the wild or captivity
- National Orangutan Conservation Strategy and Action Plan (2007) → all orangutans held in rehabilitation centers must be released in the wild by 2015
- IMC has assisted BOSF in **identifying potential orangutan release sites**. Once identified, IMC **provided logistical support**, **safety management and helicopter transport** for four **orangutan translocation projects** (one per year)

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IndoMet Coal – Kalimantan Indonesia

Conservation of the Bornean orangutan	**Strategically improving sustainable land use planning in the region where the project is located**	Strategically improving sustainable land use planning in the region where the project is located

- The initiative focuses on improving **local government land use planning capacity** and the identification of conservation options (such as offsets) in sustainably managed forests
- **IMC Biodiversity Strategy, and Fauna and Flora International** (FFI; international environmental NGO) commenced a joint Project for the conservation of over 3 million hectares of rainforest across the archipelago

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IndoMet Coal – Kalimantan Indonesia

BIODIVERSITY MANAGEMENT OVERVIEW
Company Biodiversity Commitment:
Enhance biodiversity protection. Stand for Zero Harm to environment
"No Go" Policy:
No exploring or mining in World Heritage listed properties
Biodiversity Mitigation Hierarchy:
Yes, as guided by company sustainability policy and environmental standards and guidelines
Environmental Management System:
Yes
Biodiversity Action (or Management) Plans:
Yes, as part of the IMC Biodiversity Strategy and Land Management and individual site specific or infrastructure element Biodiversity Management Plans

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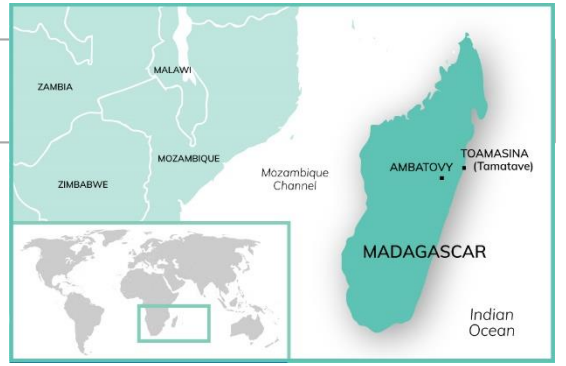
The Ambatovy Project – Republic of Madagascar



https://www.eibinafrica.eu/tag/tamatave/

- The Ambatovy Project, located in the **Republic Madagascar**, is in the construction phase of an **18 km² open pit nickel and copper mine** with an accompanying **slurry pipeline** and a US$ 2.3bn **hydrometallurgical plant**
- The mine site is in an area of **high biodiversity and species endemism**, requiring rigorous biodiversity management
- Ambatovy and its shareholders believe in demonstrating good environmental management practices to secure its license to operate
- A license to operate → **permanent support of civil society, local communities, national and international NGOs and governmental authorities** regarding the manner in which **social and environmental affaires** are managed

Coquerel's sifaka, a species of lemur, live only on the island of Madagasc
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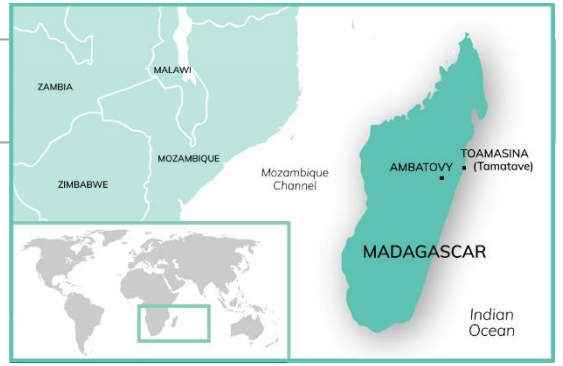
The Ambatovy Project – Republic of Madagascar



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- **Mitigation hierarchy** across all aspects of biodiversity, and residual impacts

Multifaceted Conservation Program

• **Avoidance** – analysis of pipeline route alternatives (21 major re-routes to avoid sensitive areas), re-routing and fine tuning during construction, conservation barriers created to isolate onsite conservation areas from construction activities, strict mine footprint modification protocols and a set-aside of an area of the ore body

• **Minimization** – reduction of the surface area subject to impacts through appropriate design and implementation, such as rehabilitation of areas cleared for exploration, reduction of the mine footprint through planning optimization

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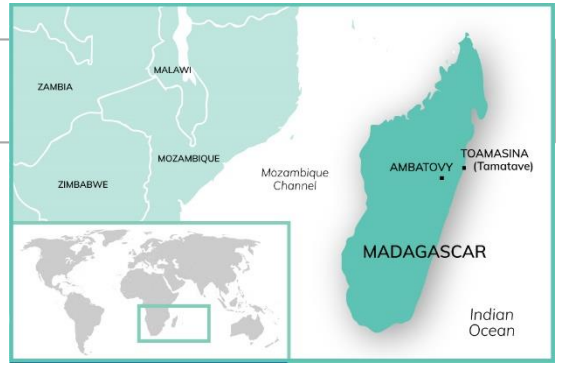

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Multifaceted Conservation Program

- **Mitigation** – a substantial minimization program was developed for construction:

Repetition of full biological surveys prior to each clearing to develop taxa-specific mitigation measures, e.g., **fitting lemurs with radio collars** to monitor their natural ability to migrate away from the impact areas and relocate to refuge areas; **identifying plant species of concern and sourcing them off-site to avoid extinction risk**; salvaging plants to nurseries and/or propagating them during this process; Management of surges in **total suspended solids** to protect **water quality and aquatic biodiversity in mine watersheds using large retention dams** (US$ 40m)

- **Restoration / rehabilitation** – progressive footprint rehabilitation with reforestation

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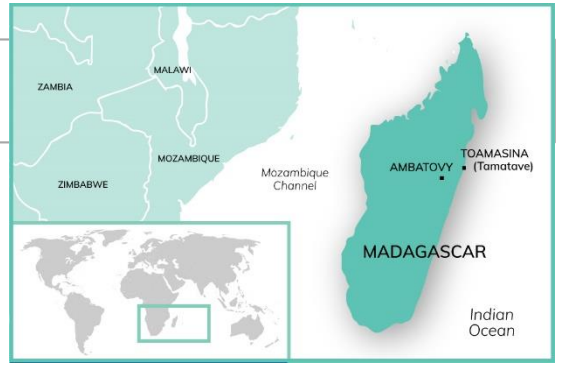

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Multifaceted Conservation Program

- **Offsets and Positive Conservation Actions** – a multifaceted program, including:
  - An offsite offset spanning 11,600 ha of **endangered forest**;
  - **On-site conservation zones** spanning 4,900 ha, including an area of sacrificed ore body;
  - A **forest corridor** ensuring **connectivity** with remaining eastern rain forests;
  - Support to **conservation of a RAMSAR wetland** adjacent to the mine site;
  - Expanded **reforestation activities** along pipeline right-of way and within mine footprint.

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RAMSAR Convention: on Wetlands of International Importance Especially as Waterfowl Habitat

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The Ambatovy Project – Republic of Madagascar

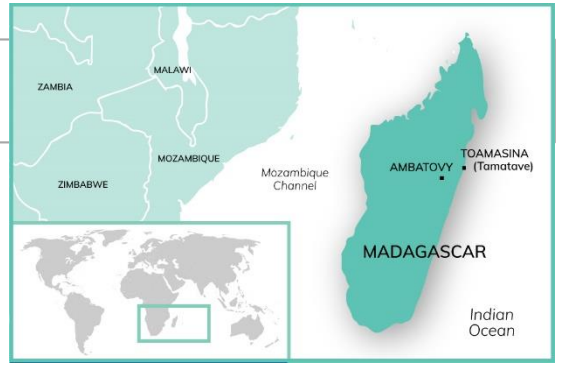
BIODIVERSITY MANAGEMENT OVERVIEW
Company Biodiversity Commitment:
No net loss (net gain preferred)
"No Go" Policy:
No species loss, priority habitat viability maintained
Biodiversity Mitigation Hierarchy:
Yes
Environmental Management System:
Yes
Biodiversity Action (or Management) Plans:
Yes

Biodiversity Reporting:

Monthly report to shareholders
Annual Sustainability Report
Independent audits and Scientific Consultative Committee
Regulatory reporting
Local community and stakeholder meetings
Business and Biodiversity Offsets Program meetings

Sources of Biodiversity Guidance:

International Finance Corporation, Performance Standard 6
Business and Biodiversity Offsets Program
ICMM Good Practice Guidance on Mining and Biodiversity
IUCN
IPIECA
NGOs
Scientific Consultative Committee
Consultants



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Conclusions

- Biodiversity is a term used to describe the breadth of life on earth – from animal species to genes and ecosystems. Concern for the conservation of biodiversity is related to its decline as a result of human activity on the planet.

- Given the current magnitude of the biodiversity crisis, and the diverse impact humans have on the planet, mining and energy must be placed thoughtfully within a wider environmental context.

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Conclusions

- **Anticipating and acting on foreseeable development-conservation** decisions that will harm biodiversity **will ensure** effective conservation solutions because the cost of conserving species and communities increases rapidly as they become less widespread and options for their conservation narrow
- **To effectively manage biodiversity in mining regions, the full extent and distribution of threats must be better understood and incorporated into conservation plans and decision-making**

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Conclusions

- Fundamental need to **minimize encroachment of activities** that promote habitat loss, degradation and fragmentation
- **Biodiversity Action Plans - Proactive activities** including limiting road expansion, reducing negative impacts of hunting through legal controls coupled with sustainable resource use strategies, and preventing large-scale developments such **forestry**, and **agriculture** following a mining action, are essential in retaining the integrity of ecosystems
- Fundamentally, evaluating the full impact on biodiversity at all scales is a critical prerequisite to taking advantage of conservation opportunities.

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Conclusions

Most countries have regulations in place **to reduce biodiversity impacts from mining industry investments**. Requirements for environmental and social impact assessments, mine closure and rehabilitation, and biodiversity offsetting provide tools for mitigating forest and biodiversity harms from mining operations. **However,** often these regulating policies are poorly designed and do not reflect best practice in avoiding biodiversity impacts. Even where policies are adequate on paper, enforcement may be lax.

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The mining industry has both the opportunity and the potential to contribute positively to the achievement of all 17 SDGs

Mining and Poverty Eradication (SDG1)

Integration into Core Business

Pay taxes and royalties
- Publicly disclose details of payments to governments
- Use arms-length rule transfer pricing

Leverage local procurement
- Develop local supplier capacity
- Strengthen local value chains

Champion inclusive employment
- Facilitate equitable access to employment opportunities
- Offer training and apprenticeship programs

Preserve land access
- Begin land access planning early in projects
- Fully restore resettled communities

Collaboration and Leverage

- Collaborate to leverage resources for poverty alleviation
- Support non-mining livelihood options
- Broaden implementation of anti-poverty strategies via CDAs

Mining and Zero Hunger (SDG2)

Integration into Core Business

Explore synergies with agriculture
- Manage water resources transparently
- Minimize land take
- Share infrastructure benefits with agricultural community

Keep farmland pollution-free
- Conduct baseline and ongoing geochemical surveys
- Monitor water quality and soil fertility regularly

Collaboration and Leverage

- Strengthen watershed management
- Partner with the agricultural sector
- Support programs to reduce childhood malnutrition and hunger

Mining, Good Health, and Well-Being (SDG3)

Integration into Core Business

Champion occupational health and safety
- Promote workplace health
- Establish rigorous workplace health and safety monitoring and reporting
- Focus on road safety

Combat Tuberculosis and HIV/AIDS
- Reduce silica dust
- Run HIV/AIDS education, prevention and counseling programmes

Offer and encourage preventative care
- Screen for NCDs
- Provide healthy canteen food options and good hygiene protocols
- Prevent toxic emissions to the environment

Increase mental health awareness
- Approach health holistically
- Set up confidential counseling programs
- Regularly test for drug and alcohol use and abuse

Collaboration and Leverage

- Support community health programmes
- Participate in response to and recovery from epidemics
- Train community health workers
- Recognize and strengthen traditional medicinal practices

Mining and Quality Education (SDG4)

Integration into Core Business

Assess and upgrade the local skills base
- Routinize skills baseline assessments and gap analyses
- Sponsor apprenticeships, scholarships, and graduate programmes

Train and educate the workforce
- Train workforce in technical and management skills
- Ensure training opportunities are made available to employees at all levels and across all backgrounds

Collaboration and Leverage

- Link academic programmes with TVET
- Collaborate with universities to design curricula
- Participate in classrooms and workshops
- Work with schools to keep children in school
- Train for sustainable livelihood opportunities beyond mining

Forum, W.E., 2016. Mapping mining to the sustainable empowered lives. Resilient nations. Development goals: An Atlas.

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Mining and Gender Equality (SDG5)

Integration into Core Business

Offer equal opportunities for women

- Recruit more women
- Pay women and men equally
- Promote more women to visible leadership positions
- Adopt, where possible, flexible schedules for accommodating childcare

Practice gender inclusion across the business and project life-cycle

- Offer gender-specific PPE
- Provide gender-sensitive career development planning
- Incorporate perspectives of women, men, and children in community-related decisions
- Include men and women in negotiations

Collaboration and Leverage

- Make social investments gender-inclusive
- Offer educational scholarships for women
- Remain vigilant against gender-based violence
- Establish gender-sensitive grievance mechanisms
- Provide women's health monitoring

Mining and Affordable, Clean Energy (SDG7)

Integration into Core Business

Improve Energy Efficiency

- Undertake energy audits
- Improve energy infrastructure maintenance
- Reduce energy demand onsite

Incorporate renewable energy

- Deploy off-grid wind, solar, or geothermal power
- Diversify power sources for reducing outages
- Replace diesel generators

Collaboration and Leverage

- Support local energy initiatives
- Integrate into rural electrification schemes
- Share benefits of energy infrastructure
- Explore co-financing arrangements

Mining, Clean Water, and Sanitation (SDG6)

Integration into Core Business

Conserve and recycle water

- Recycle and/or recover metals from wastewater
- Reduce water consumption
- Use alternative water sources (greywater, seawater)

Monitor water quality

- Monitor water sources both near-mine and downstream
- Involve the community in monitoring and share water data openly

Manage water holistically

- Align with government water management policies
- Integrate technical, social, economic, and political water concerns
- Identify high-value water areas
- Maintain long-term water balance throughout projects
- Incorporate water reporting and disclosure

Collaboration and Leverage

- Support potable water and sanitation planning and infrastructure
- Clearly delineate watershed management responsibilities
- Share benefits of water infrastructure
- Explore co-financing arrangements
- Support local capacity-building in water and sanitation management

Mining, Decent Work, and Economic Growth (SDG8)

Integration into Core Business

Communicate opportunities and limits of mining

- Provide decent work
- Catalyze indirect and induced employment
- Clearly communicate the capital-intensive nature of mining

Drive economic growth with local procurement

- Diversify local economies
- Make bidding accessible to local contractors
- Train local suppliers how to meet corporate supply requirements

Collaboration and Leverage

- Collaborate with local chambers of commerce, finance institutions and NGOs
- Establish business incubators
- Work with local suppliers to build capacity and increase product quality
- Connect suppliers with external markets
- Collaborate to end child labor

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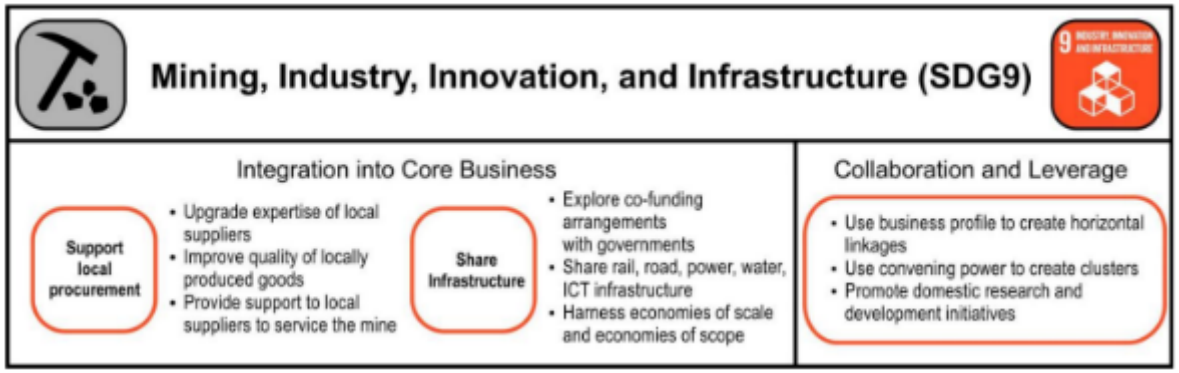

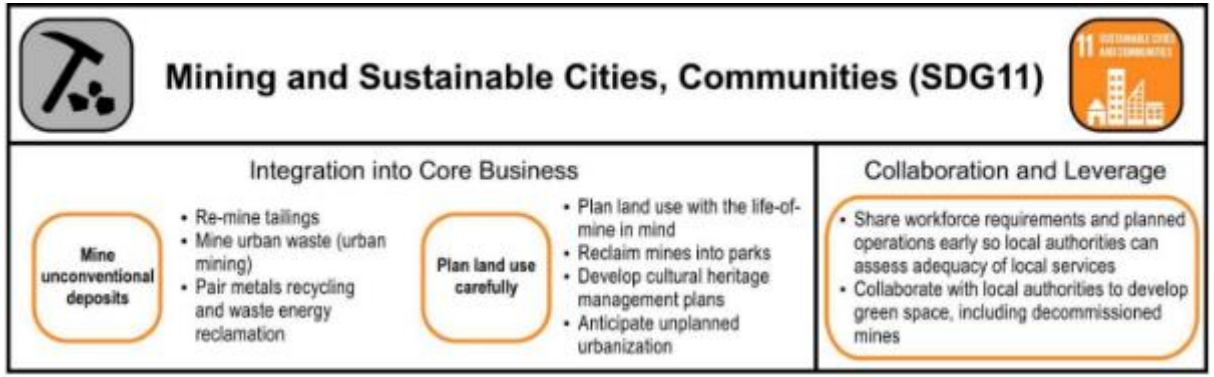

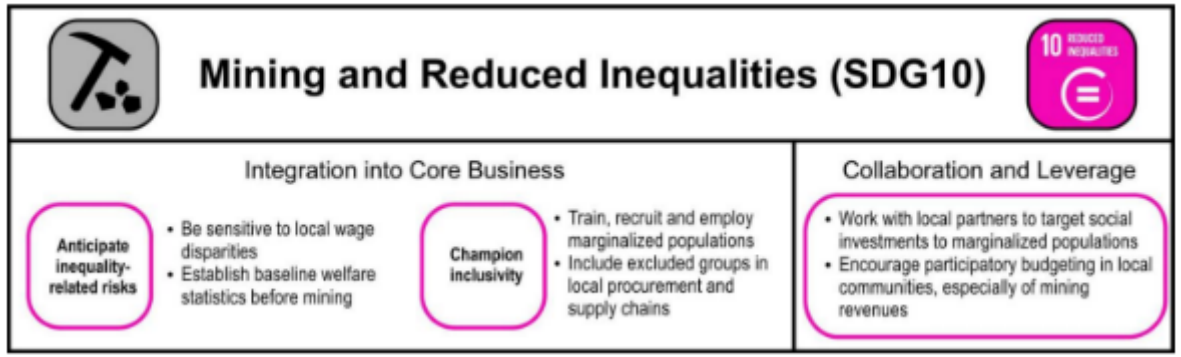

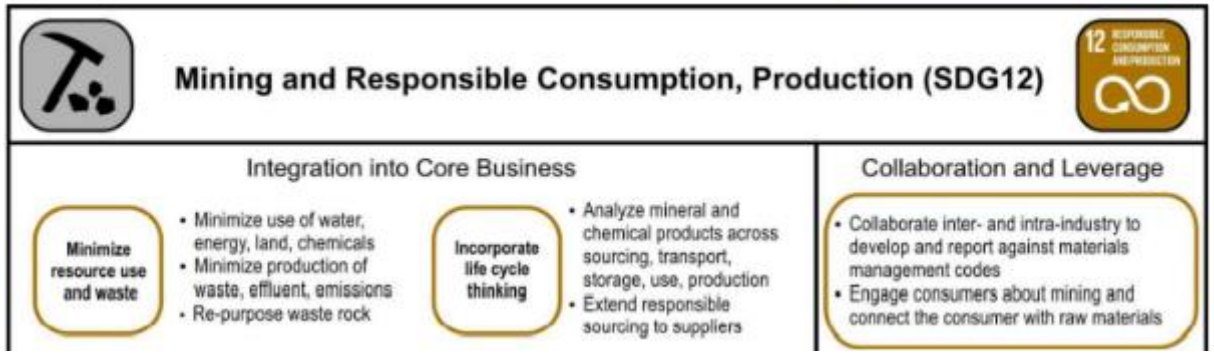

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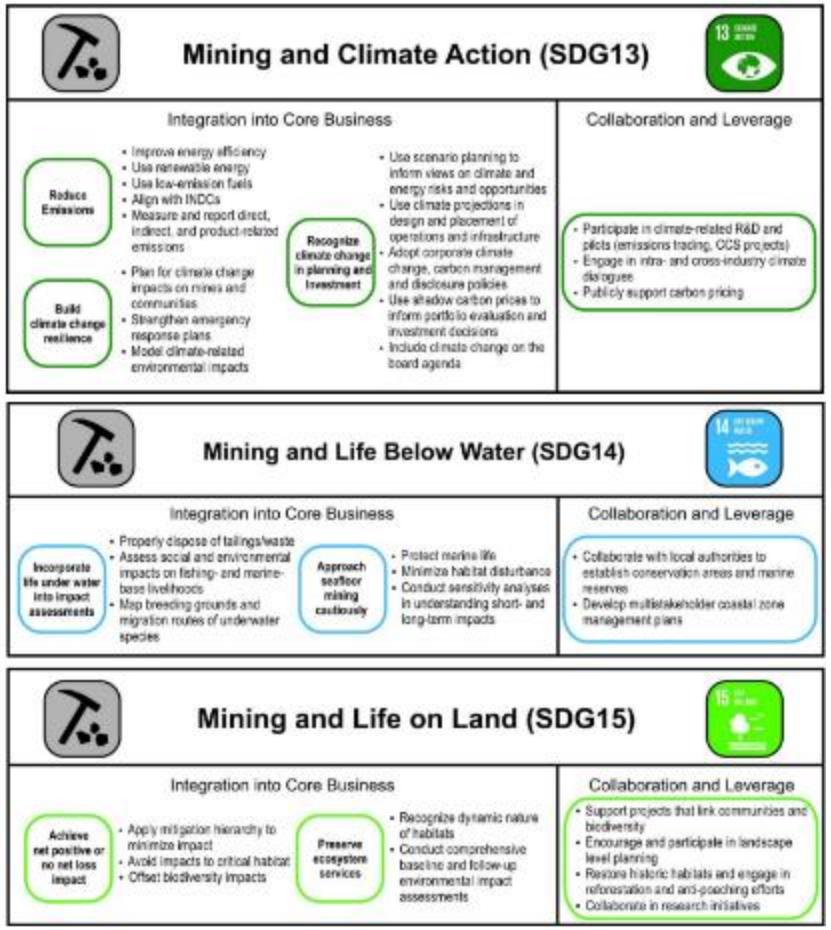

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http://www.uhu.es/rensma/en/members-mga/

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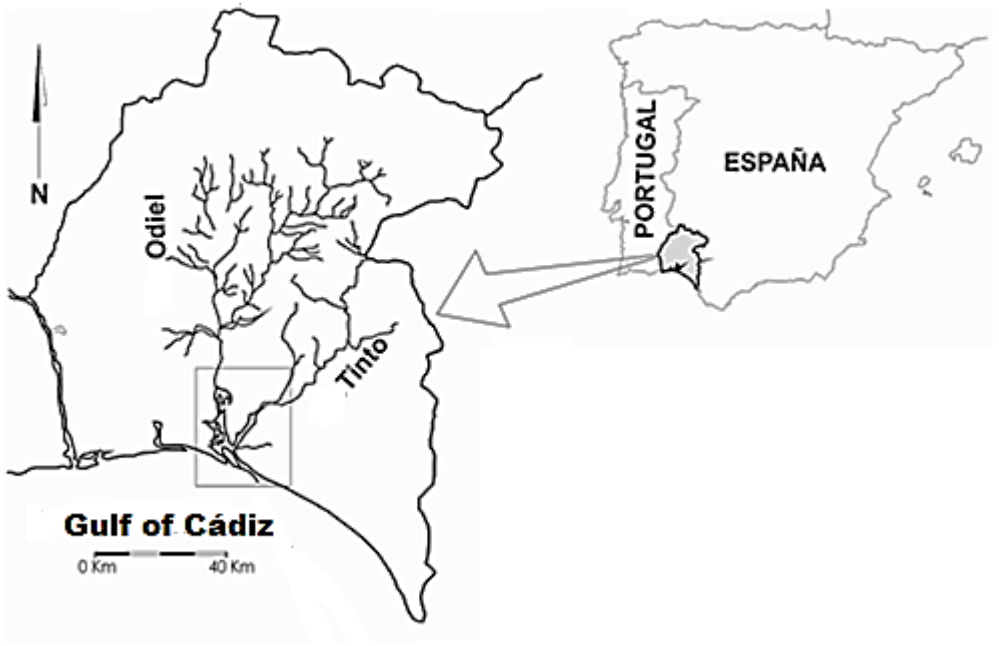
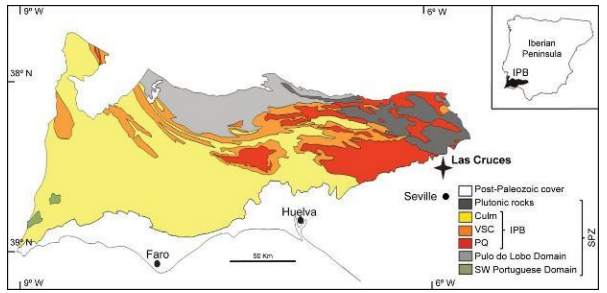
The Iberian Pyrite Belt (IPB)

One of the largest polymetallic massive sulphide deposits in the world

Subjected to intense mining activity since ancient times (>3000 yr)





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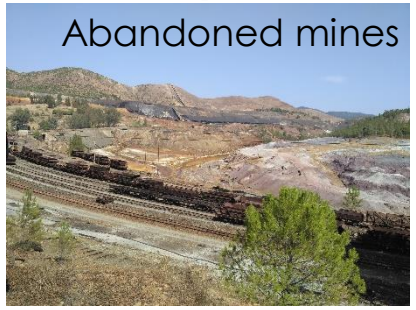
Acid Mine Drainage - AMD
oxidation of pyrite and other sulphide minerals



total absence of control measures

-Low pH
-Elevated metals
-Elevated sulphate

degraded water quality

The Estuary of Huelva suffers chronic metal exposure due to intense mining activities

Contaminant load transported by the Tinto and Odiel rivers

	Tinto River t/yr	Odiel River t/yr	Tinto-Odiel t/yr	Global Flux t/yr	Fraction (%)
As	12	23	36	10,000	0.4
Cd	4	7	11	340	3.3
Cu	469	1252	1721	10,000	17.2
Fe	5075	2847	7922	1,400,000	0.6
Mn	163	1452	1615	280,000	0.6
Pb	15	12	27	2000	1.3
Zn	863	2612	3475	5800	59.9
Co	9	62	71	1700	4.2
Ni	2	34	36	11,000	0.3

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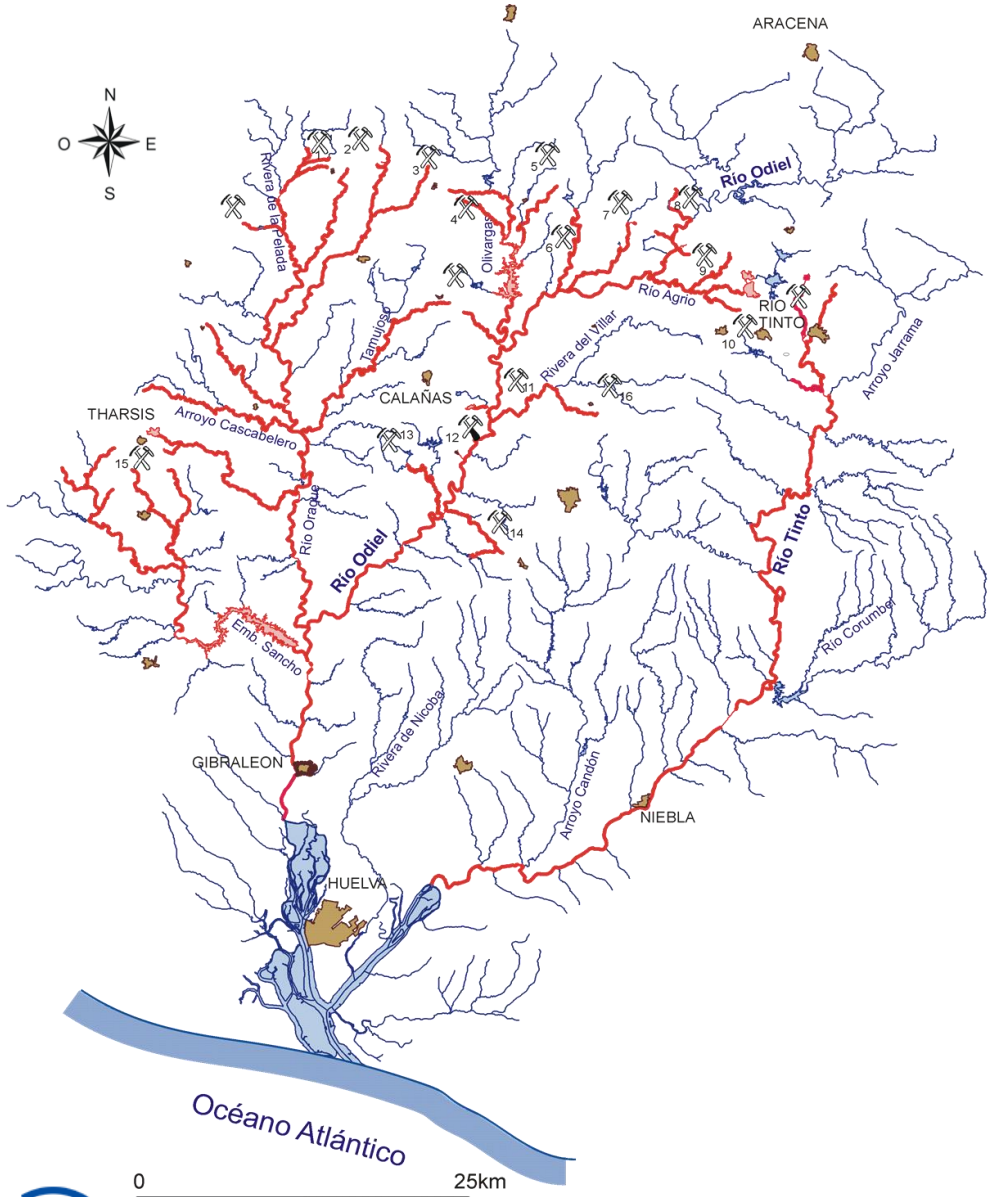
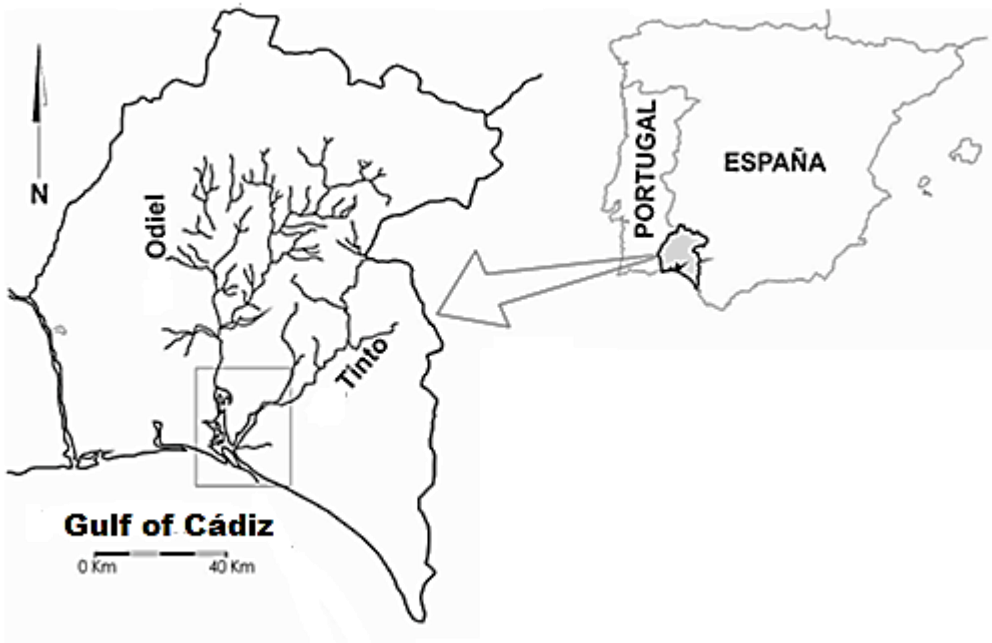
The Ria of Huelva Estuary
ARACENA
RIO TINTO
CALAÑAS
THARSIS
GIBRALEON
NIEBLA
HUELVA
Río Odiel
Río Tinto
Océano Atlántico

The Ria of Huelva Estuary





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1. Passive treatment of mining and industrial wastewaters
2. Characterization and revalorization of solid wastes
3. Recovery of Critical Raw Materials from solid wastes
4. Metal pollution in rivers and estuaries
5. Mineral CO_2 sequestration using industrial wastes

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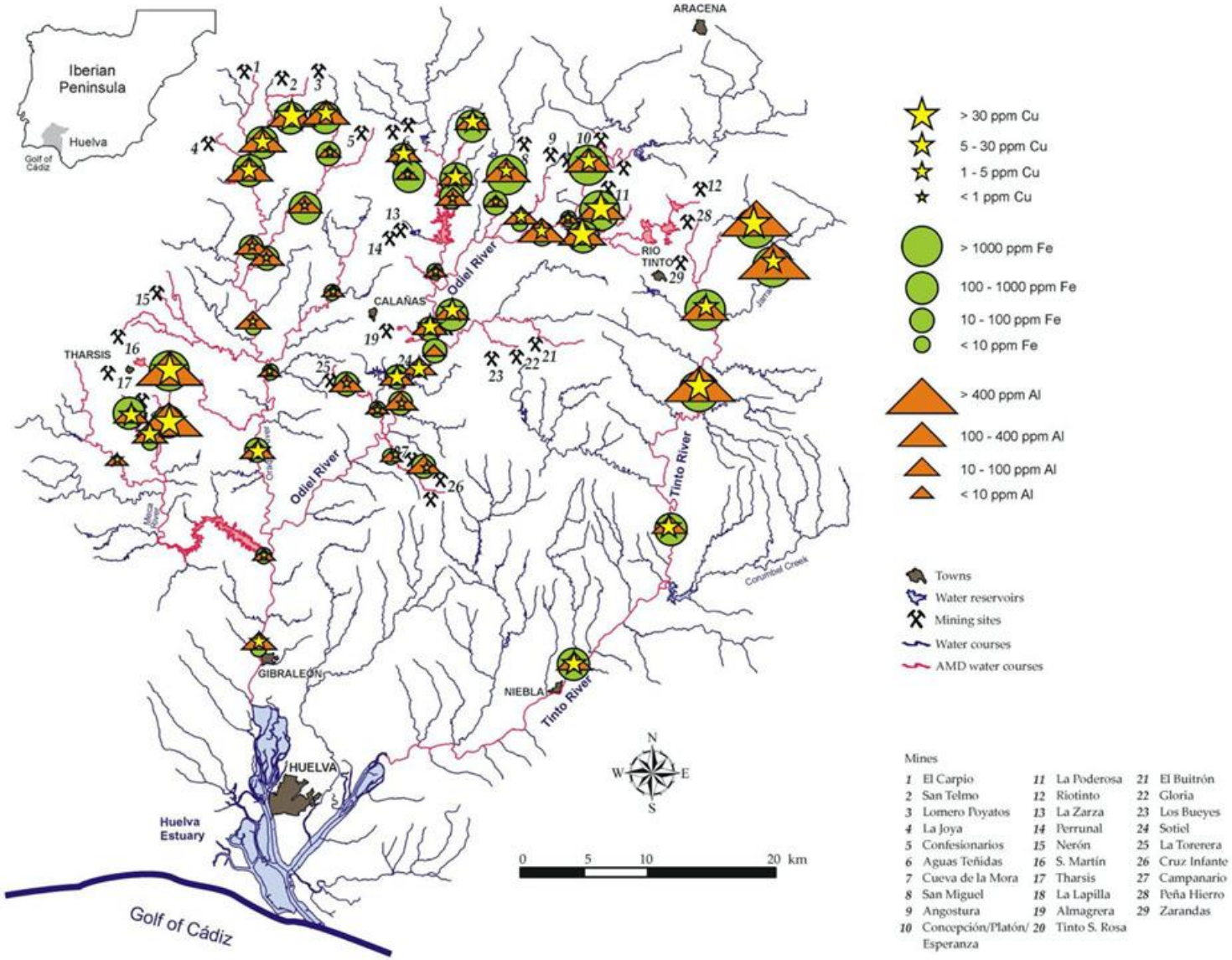

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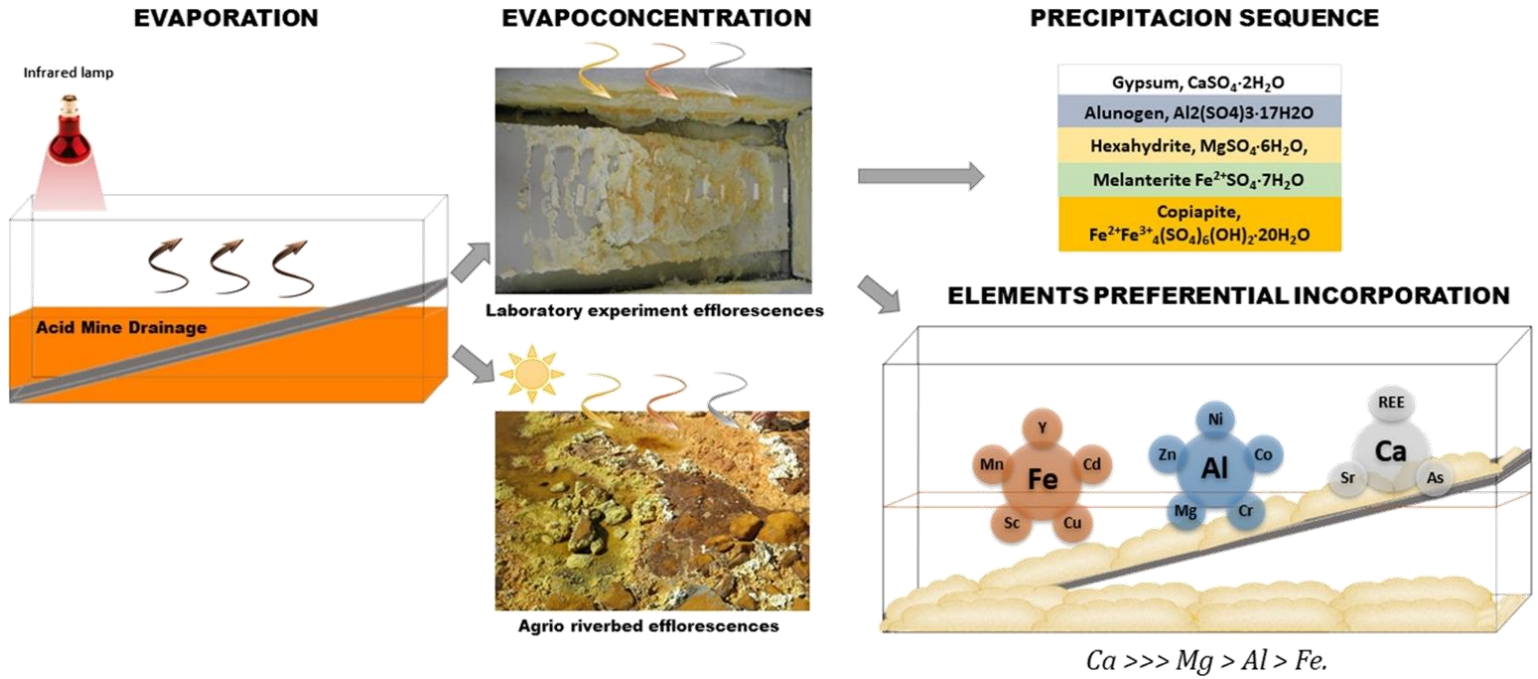

Mineralogically-induced metal partitioning during the evaporative precipitation of efflorescent sulfate salts from acid mine drainage
https://doi.org/10.1016/j.chemgeo.2019.119339

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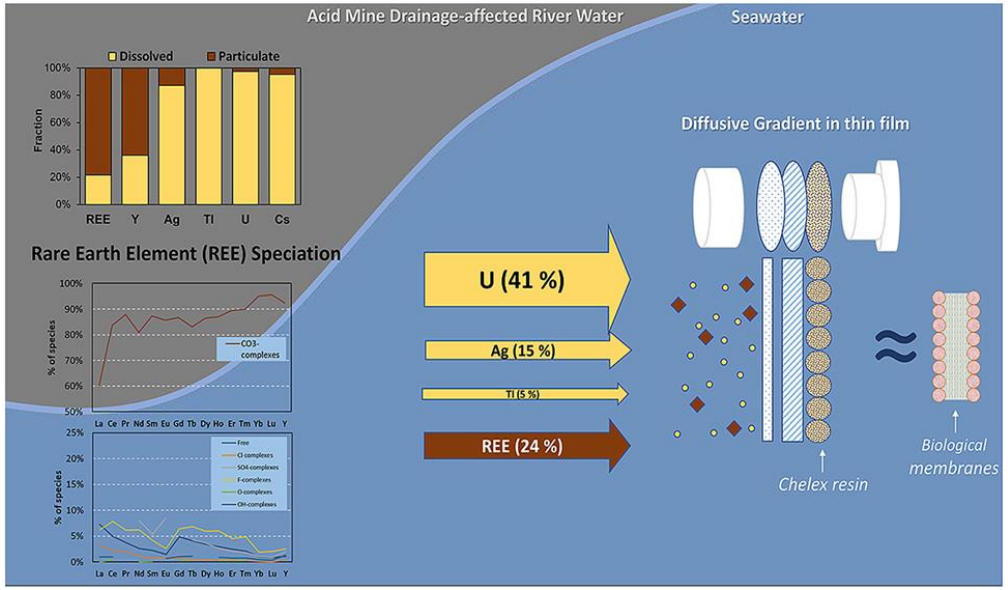
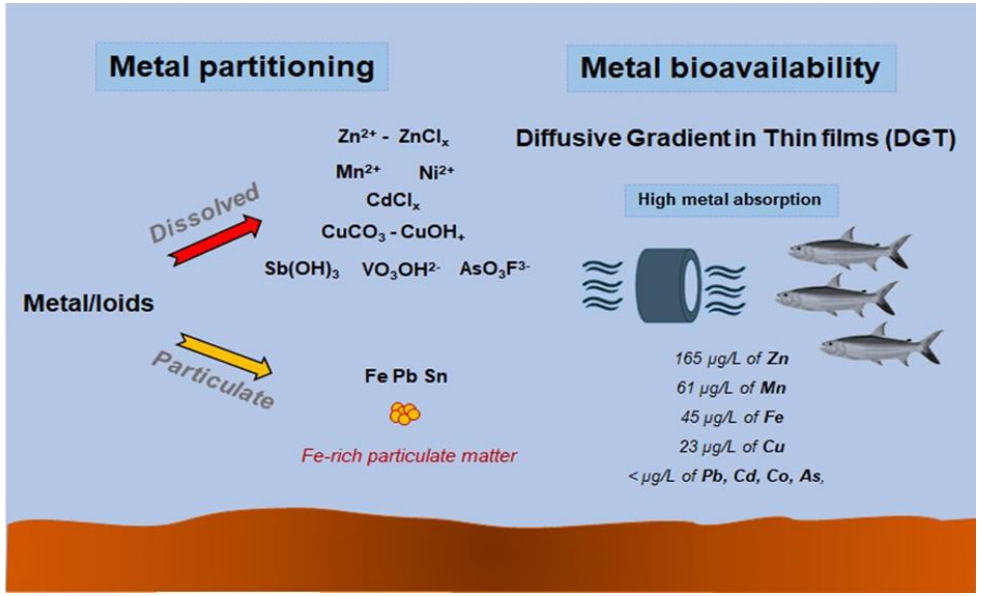
Metal pollution in rivers and estuaries

Distribution and availability of rare earth elements and trace elements in the estuarine waters of the Ría of Huelva (SW Spain)
https://doi.org/10.1016/j.envpol.2020.115506

Metal partitioning and speciation in a mining-impacted estuary by traditional and passive sampling methods
https://doi.org/10.1016/j.scitotenv.2020.137905





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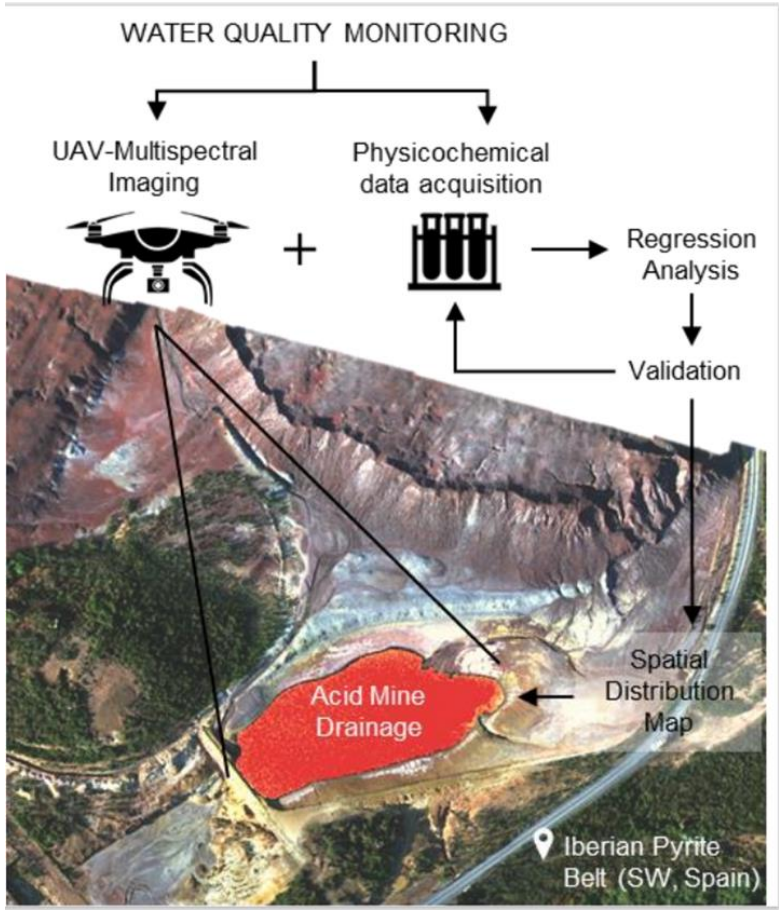
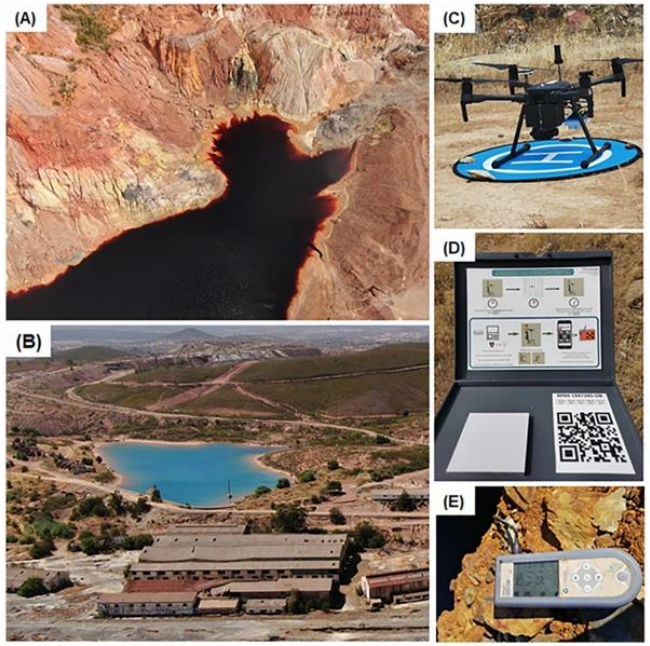
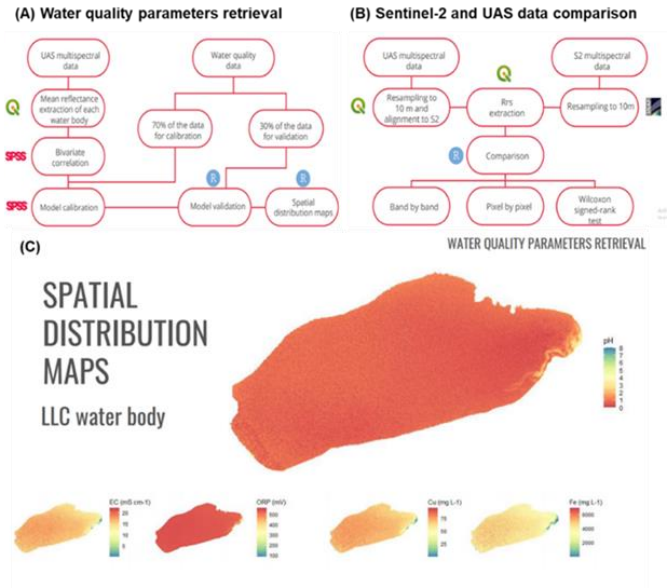


Unmanned Aerial System-Based Multispectral Water Quality Monitoring in the Iberian Pyrite Belt (SW Spain)
https://doi.org/10.1007/s10230-021-00837-4





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Metal pollution in rivers and estuaries

Campaña de calibración vicaria para el Proyecto CHIME (*The Copernicus Hyperspectral Imaging Mission*) de la Agencia Espacial Europea (ESA), dirigida por la Dra. Cindy Ong (CSIRO Energy, Australia) para la intercalibración de los **sensores hiperespectrales** *Airborn Visible InfraRed Imaging Spectrometer - Next Generation* (**AVIRIS-NG; NASA-JPL 2021**) y el spaceborne imaging spectroscopy data from the Design of the DLR Earth **Sensing Imaging Spectrometer (DESIS)** en la estación espacial internacional.

http://hdl.handle.net/10261/252082

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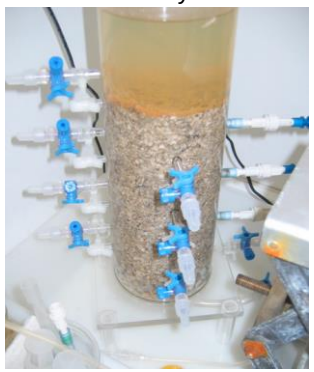
Passive treatment of mining and industrial wastewaters

1 day



1 month

7 months

Escala laboratorio

Upscaling

Escala piloto

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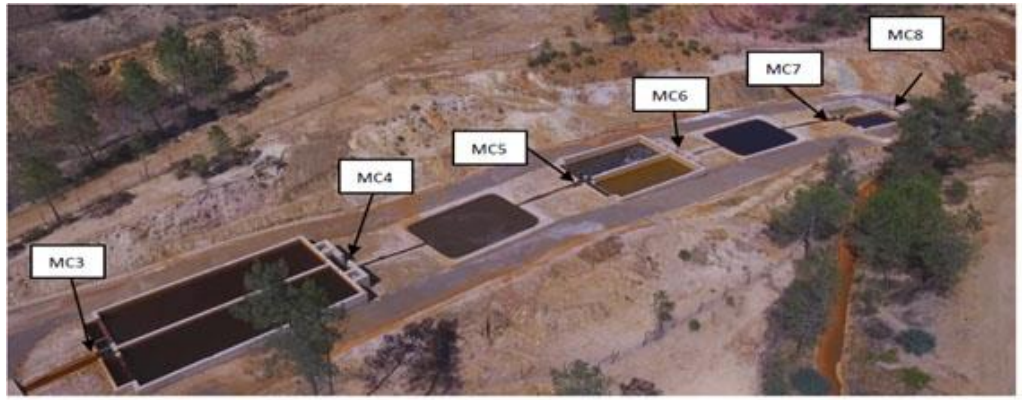
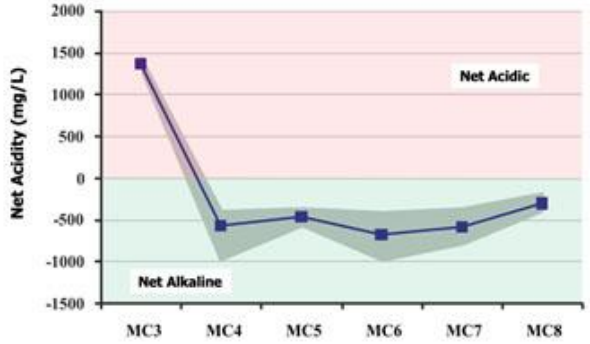


LIFE-ETAD
Ecological Treatment of Acid Drainage



Ecological treatment of acid mine drainage (LIFE-ETAD). Ref. LIFE12 ENV/ES/000250.

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Extraction of Rare Earth Elements from Acid Mine Drainage (AMDREY). Ref. PCIN 2015-242.

ERA-MIN 2nd Joint Call on Sustainable Supply of Raw Materials in Europe

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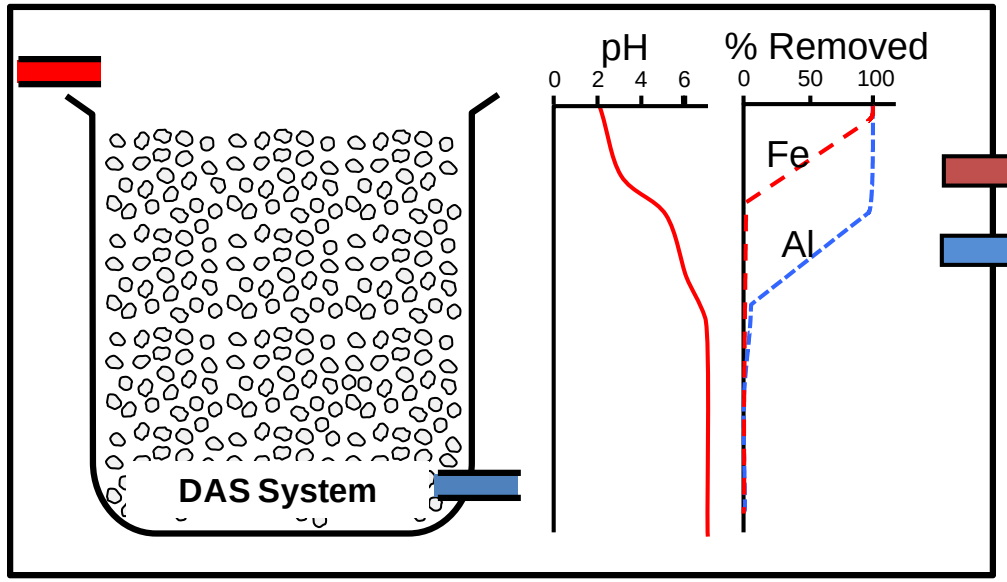
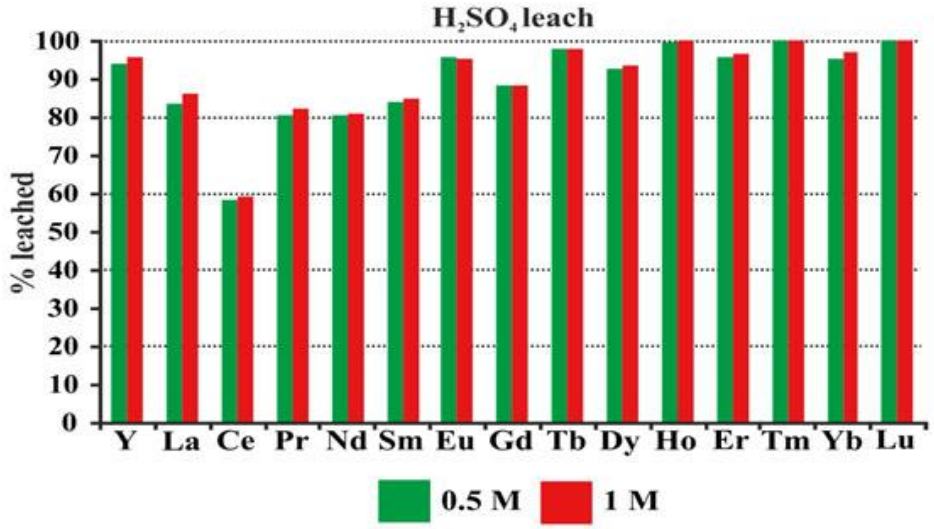


Fe(III), As +/- Cr, Sb, Mo ...

Al, Cu +/- Zn, Cd, Co, Ni .... and **REY**



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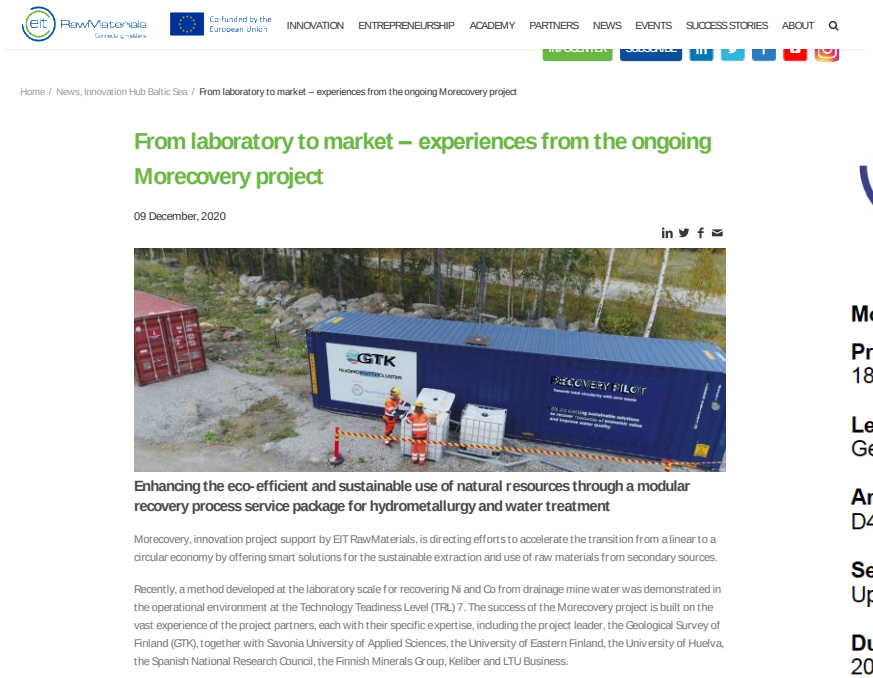

RawMaterials Co-funded by the European Union INNOVATION ENTREPRENEURSHIP ACADEMY PARTNERS NEWS EVENTS SUCCESS STORIES ABOUT

Home / News, Innovation Hub Baltic Sea / From laboratory to market – experiences from the ongoing Morecovery project

From laboratory to market – experiences from the ongoing Morecovery project

09 December, 2020

Enhancing the eco-efficient and sustainable use of natural resources through a modular recovery process service package for hydrometallurgy and water treatment

Morecovery, innovation project support by EIT RawMaterials, is directing efforts to accelerate the transition from a linear to a circular economy by offering smart solutions for the sustainable extraction and use of raw materials from secondary sources.

Recently, a method developed at the laboratory scale for recovering Ni and Co from drainage mine water was demonstrated in the operational environment at the Technology Teadiness Level (TRL) 7. The success of the Morecovery project is built on the vast experience of the project partners, each with their specific expertise, including the project leader, the Geological Survey of Finland (GTK), together with Savonia University of Applied Sciences, the University of Eastern Finland, the University of Huelva, the Spanish National Research Council, the Finnish Minerals Group, Keliber and LTU Business.

RawMaterials

Morecovery. Modular recovery process services for hydrometallurgy and water treatment

Proposal Number
18190

Lead Partner
Geologian tutkimuskeskus, GTK (Geological Survey of Finland)

Area
D4 Validation & Acceleration

Segment
Up-scaling projects (D4.2)

Duration
2019-01-01 - 2021-12-31

Morecovery: Modular recovery process services for hydrometallurgy and water treatment

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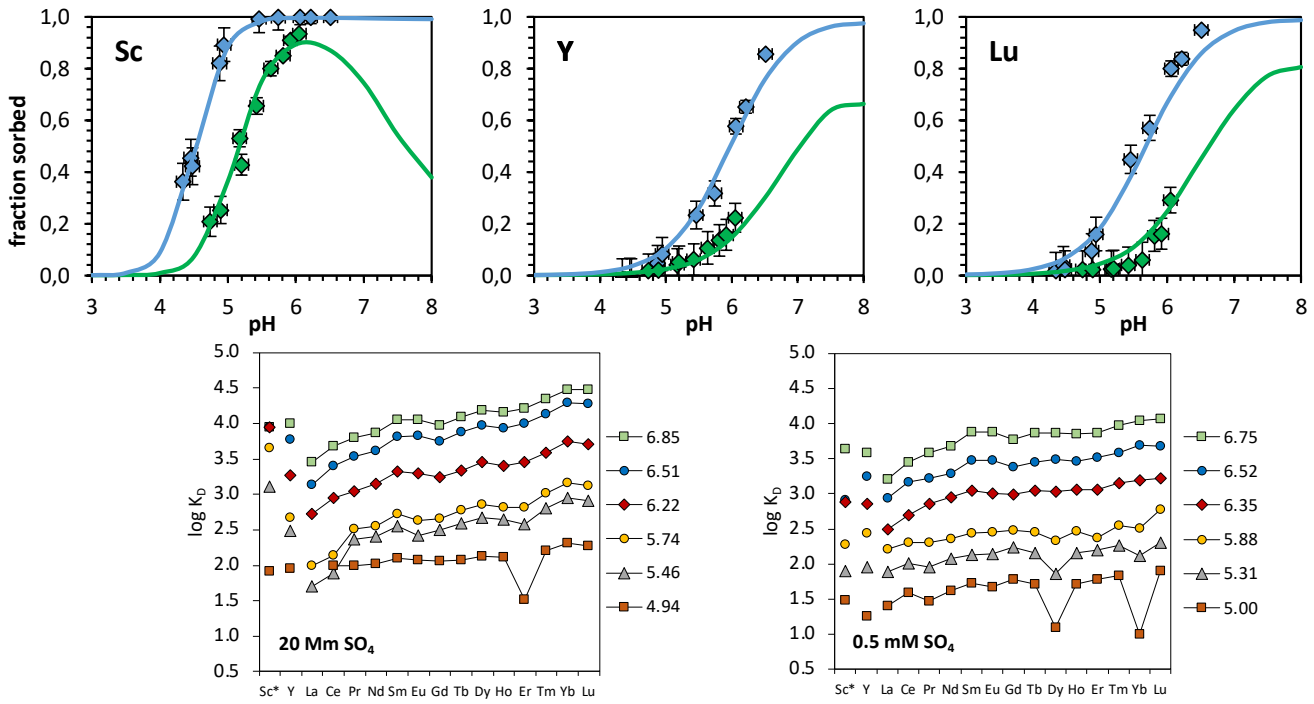
Passive treatment of mining and industrial wastewaters



Morecovery: Modular recovery process services for hydrometallurgy and water treatment

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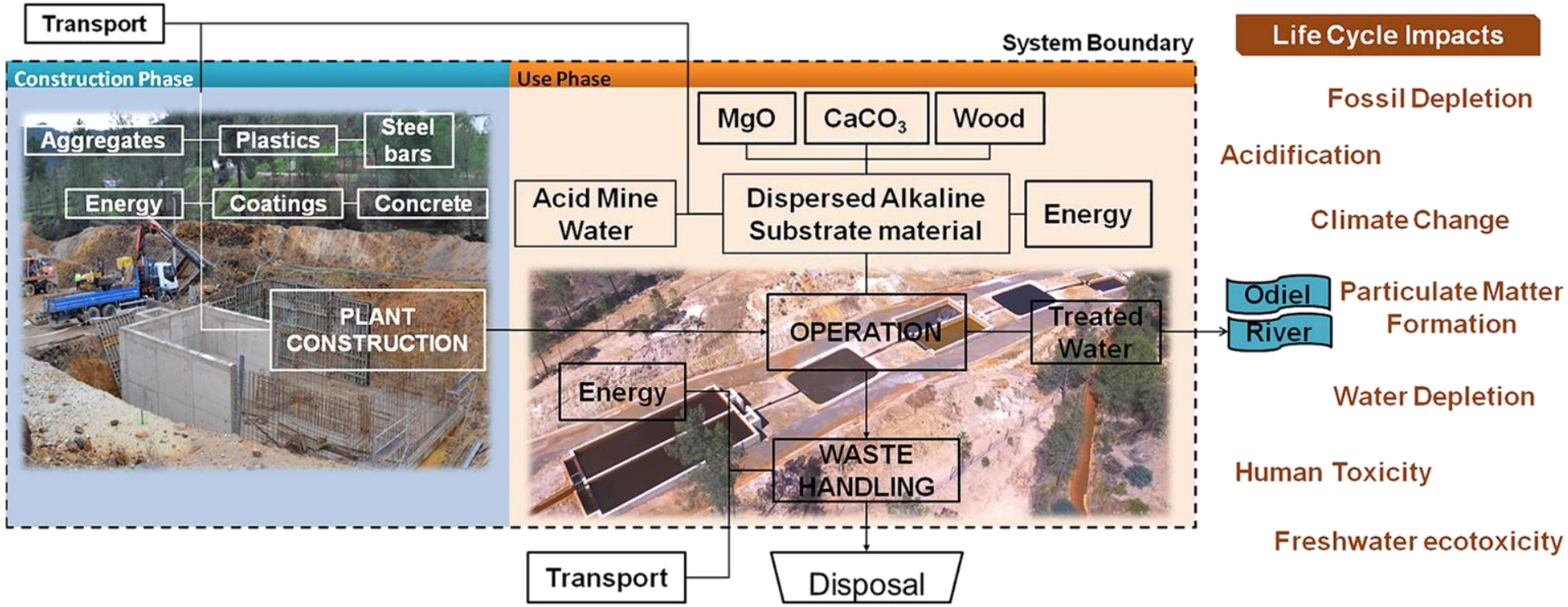

Life cycle assessment of a passive remediation system for acid mine drainage: Towards more sustainable mining activity
https://doi.org/10.1016/j.jclepro.2018.11.224

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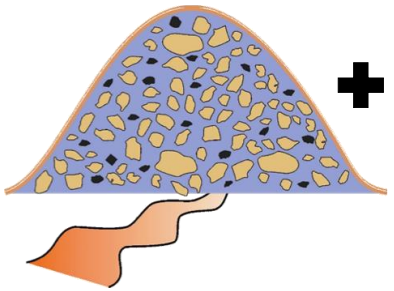
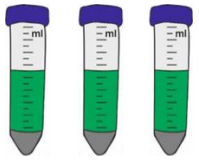
Characterization and revalorization of solid wastes/ Recovery of Critical Raw Materials from solid wastes



$FeS_2 + 3.5\ O_2 + H_2O \longrightarrow Fe^{2+} + 2SO_4^{2-} + 2H^+$

$(REY)CaSO_4 \cdot 2H_2O + 2H^+ \longrightarrow CaSO_4 \cdot 2H_2O + REY$

20, 40, 60ºC
2, 4, 6, 8h



1:2.5 1:5 1:10

25% py +75% PG
50% py +50% PG
75% py +25% PG

Método basado en economía circular

Valorización de residuos generados en la industria fertilizante como fuente de tierras raras e ytrio (VALOREY). Ref. RTI2018-101276-J-I00. Ministerio de Economía, Industria y Competitividad

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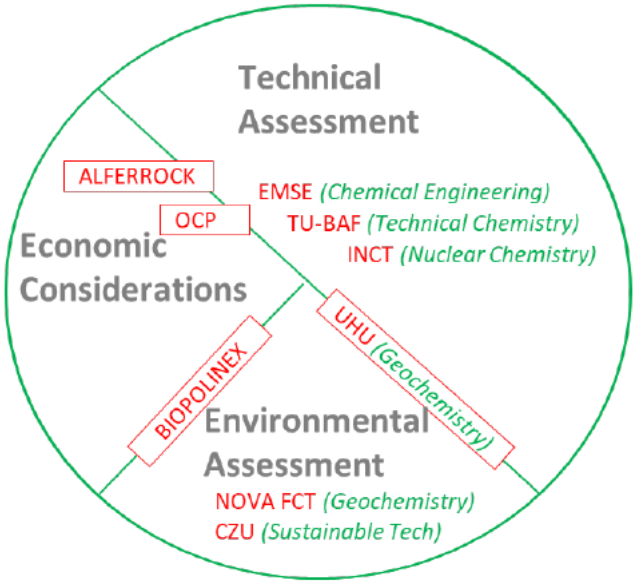

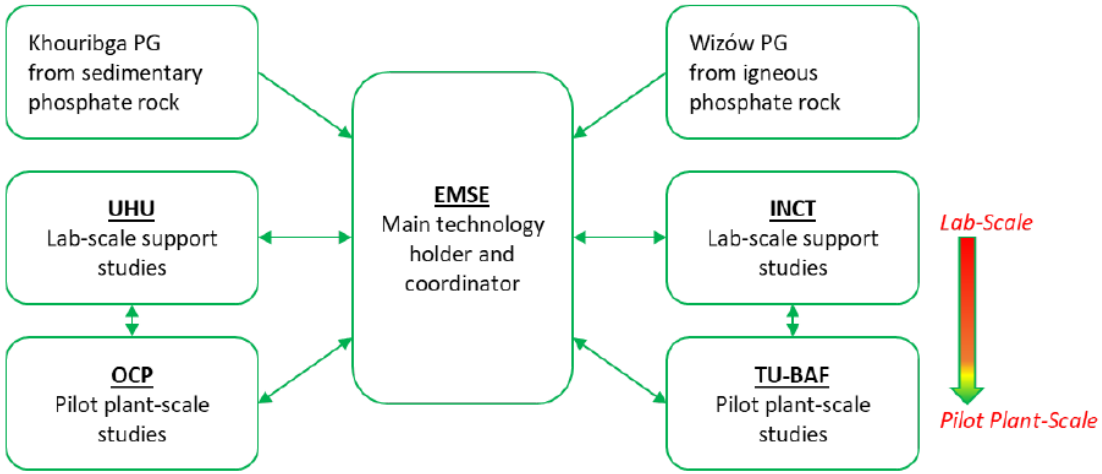

ERA-NET Cofund on Raw Materials (ERA-MIN 3)

Phosphogypsum Processing to Critical Raw Materials (PG2CRM)

Freiberg University of Mining and Technology, **Germany**
University for Continuing Education Krems, **Austria**
NOVA FCT, GeoBiotec - Geobiosciences, GeoTechnologies and GeoEngineering **Portugal**
Fraunhofer Institute for Ceramic Technologies and Systems IKTS, **Germany**
Mines Saint-Etienne, CNRS, **France**
Institute of Nuclear Chemistry and Technology, **Poland**
Sumy State University, **Ukraine**
Czech University of Life Sciences Prague, **Czech Republic**
NOVA FCT, LIBPhys, **Portugal**
Biopolinex Sp. **Poland**
Mines Saint-Etienne, CNRS, **France**
OCP SA, **Morocco**
Alferrock GmbH, **Germany**

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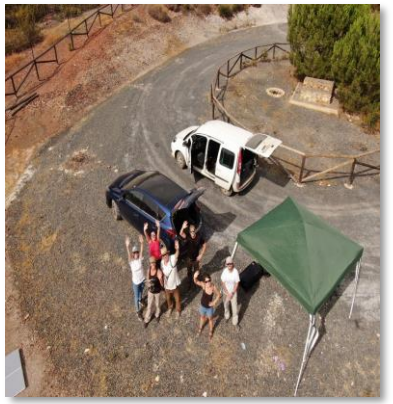
THANK YOU!
MUCHAS
GRACIAS

Thank you!



You can find me at:

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Lola Basallote
Tlf: 959219835
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Thank you!

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Website: eit-hei.eu

Twitter: @EIT_HEI

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