

German Environment Agency

World Resources Forum 2023 // Rethinking Value – Resources for Planetary Wellbeing // Critical and strategic raw materials II // #valuechains // Geneva (CH) // 6.9.2023

Developing and using an environmental hazard radar for minerals and metals supply chains

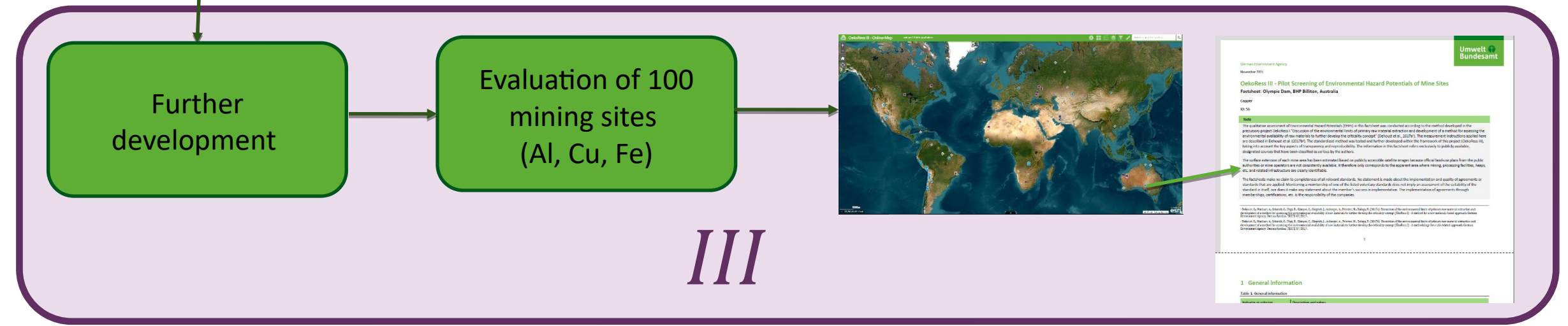
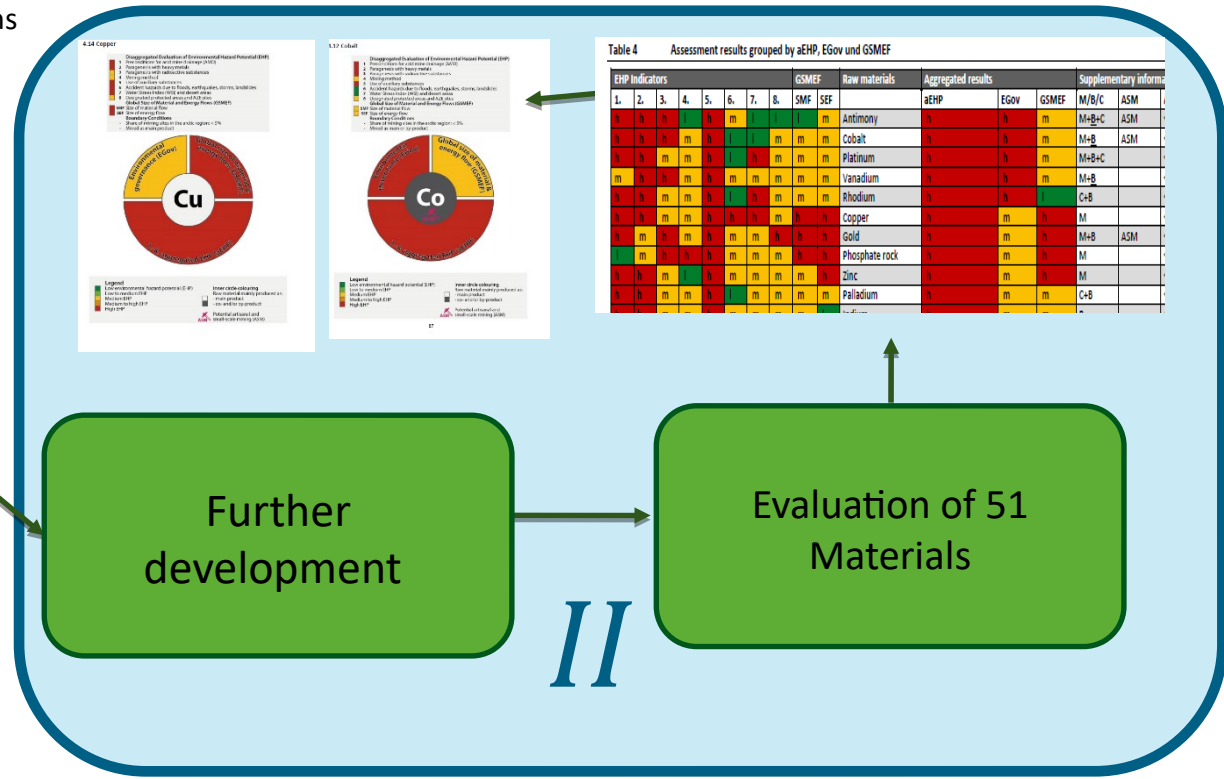
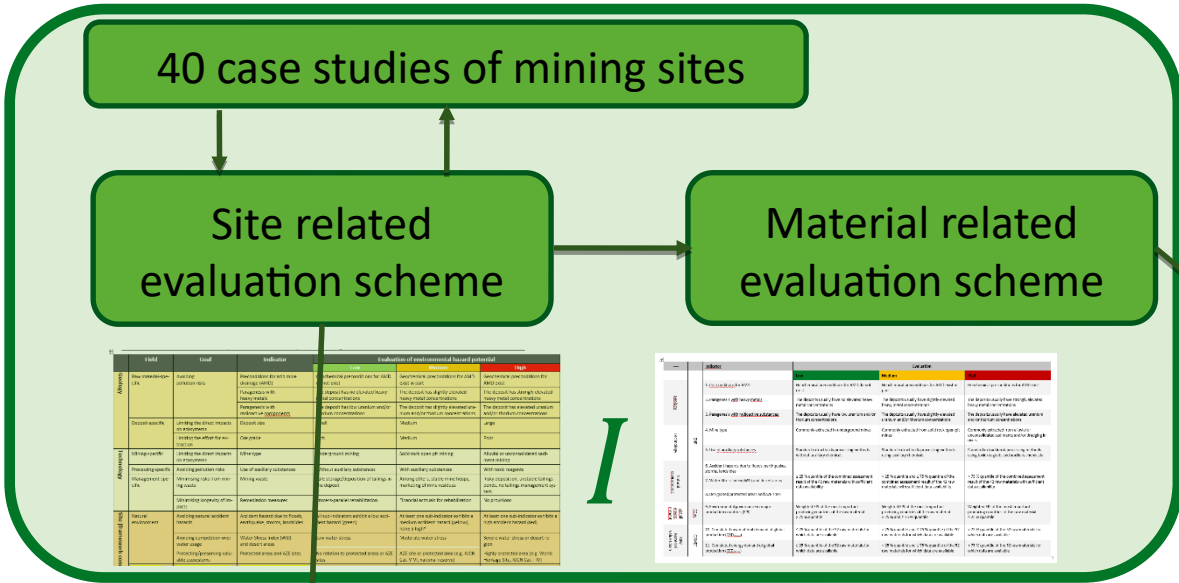
Synopsis and review of the OekoRess project trilogy

Jan Kosmol

Section III 2.2 „Resource Conservation, Material Cycles, Minerals and Metals Industry“

Christopher Demel (Projekt-Consult GmbH), Günter Dehoust (Öko-Institut e.V), Aissa Rechlin (Ecologic Institut gGmbH), Regine Vogt (ifeu - Institut für Energie- und Umweltforschung gGmbH)

Overview OekoRess I - III



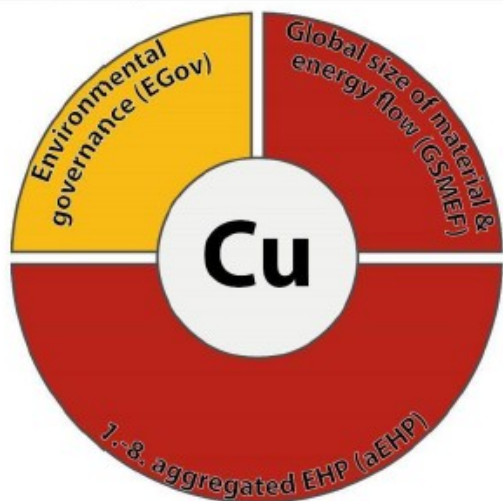
OekoRess I: Site related evaluation scheme

	Field	Goal	Indicator	Evaluation of environmental hazard potential		
				Low	Medium	High
Geology	Raw material-specific	Avoiding pollution risks	Preconditions for acid mine drainage (AMD)	Geochemical preconditions for AMD do not exist	Geochemical preconditions for AMD exist in part	Geochemical preconditions for AMD exist
			Paragenesis with heavy metals	The deposit has no elevated heavy metal concentrations	The deposit has slightly elevated heavy metal concentrations	The deposit has strongly elevated heavy metal concentrations
			Paragenesis with radioactive components	The deposit has low uranium and/or thorium concentrations	The deposit has slightly elevated uranium and/or thorium concentrations	The deposit has elevated uranium and/or thorium concentrations
	Deposit-specific	Limiting the direct impacts on ecosystems	Deposit size	Small	Medium	Large
			Ore grade	Rich	Medium	Poor
Technology	Mining-specific	Limiting the direct impacts on ecosystems	Mine type	Underground mining	Solid rock open pit mining	Alluvial or unconsolidated sediment mining
	Processing-specific	Avoiding pollution risks	Use of auxiliary substances	Without auxiliary substances	With auxiliary substances	With toxic reagents
	Management-specific	Minimising risks from mining waste	Mining waste	Safe storage/deposition of tailings in the deposit	Among others, stable mine heaps, marketing of mine residues	Risky deposition, unstable tailings ponds, no tailings management system
			Remediation measures	Process-parallel rehabilitation	Financial accruals for rehabilitation	No provisions
Site (framework cor	Natural environment	Avoiding natural accident hazards	Accident hazard due to floods, earthquake, storms, landslides	All sub-indicators exhibit a low accident hazard (green)	At least one sub-indicator exhibits a medium accident hazard (yellow), none a high*	At least one sub-indicator exhibits a high accident hazard (red)
		Avoiding competition over water usage	Water Stress Index (WSI) and desert areas	Low water stress	Moderate water stress	Severe water stress or desert region
		Protecting/preserving valuable ecosystems	Protected areas and AZE sites	No relation to protected areas or AZE sites	AZE site or protected area (e.g. IUCN Cat. V-VI, national reserve)	Highly protected area (e.g. World Heritage Site, IUCN Cat. I-IV)

OekoRes II: Material profile examples

4.14 Copper

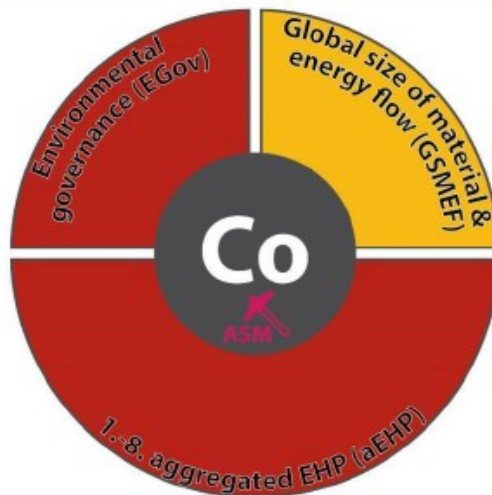
- Disaggregated Evaluation of Environmental Hazard Potential (EHP)**
- 1 Preconditions for acid mine drainage (AMD)
 - 2 Paragenesis with heavy metals
 - 3 Paragenesis with radioactive substances
 - 4 Mining method
 - 5 Use of auxiliary substances
 - 6 Accident hazards due to floods, earthquakes, storms, landslides
 - 7 Water Stress Index (WSI) and desert areas
 - 8 Designated protected areas and AZE sites
- Global Size of Material and Energy Flows (GSMEF)**
- SMF Size of material flow
 - SEF Size of energy flow
- Boundary Conditions**
- Share of mining sites in the arctic region: < 5%
 - Mined as main product



- Legend**
- Low environmental hazard potential (EHP)
 - Low to medium EHP
 - Medium EHP
 - Medium to high EHP
 - High EHP
- Inner circle colouring**
Raw material mainly produced as:
- main product
 - co- and/or by-product
- Potential artisanal and small-scale mining (ASM)

4.12 Cobalt

- Disaggregated Evaluation of Environmental Hazard Potential (EHP)**
- 1 Preconditions for acid mine drainage (AMD)
 - 2 Paragenesis with heavy metals
 - 3 Paragenesis with radioactive substances
 - 4 Mining method
 - 5 Use of auxiliary substances
 - 6 Accident hazards due to floods, earthquakes, storms, landslides
 - 7 Water Stress Index (WSI) and desert areas
 - 8 Designated protected areas and AZE sites
- Global Size of Material and Energy Flows (GSMEF)**
- SMF Size of material flow
 - SEF Size of energy flow
- Boundary Conditions**
- Share of mining sites in the arctic region: < 5%
 - Mined as main or by-product



- Legend**
- Low environmental hazard potential (EHP)
 - Low to medium EHP
 - Medium EHP
 - Medium to high EHP
 - High EHP
- Inner circle colouring**
Raw material mainly produced as:
- main product
 - co- and/or by-product
- Potential artisanal and small-scale mining (ASM)

4.29 Lithium

- Disaggregated Evaluation of Environmental Hazard Potential (EHP)**
- 1 Preconditions for acid mine drainage (AMD)
 - 2 Paragenesis with heavy metals
 - 3 Paragenesis with radioactive substances
 - 4 Mining method
 - 5 Use of auxiliary substances
 - 6 Accident hazards due to floods, earthquakes, storms, landslides
 - 7 Water Stress Index (WSI) and desert areas
 - 8 Designated protected areas and AZE sites
- Global Size of Material and Energy Flows (GSMEF)**
- SMF Size of material flow
 - SEF Size of energy flow
- Boundary Conditions**
- Share of mining sites in the arctic region: 0%
 - Mined as main product

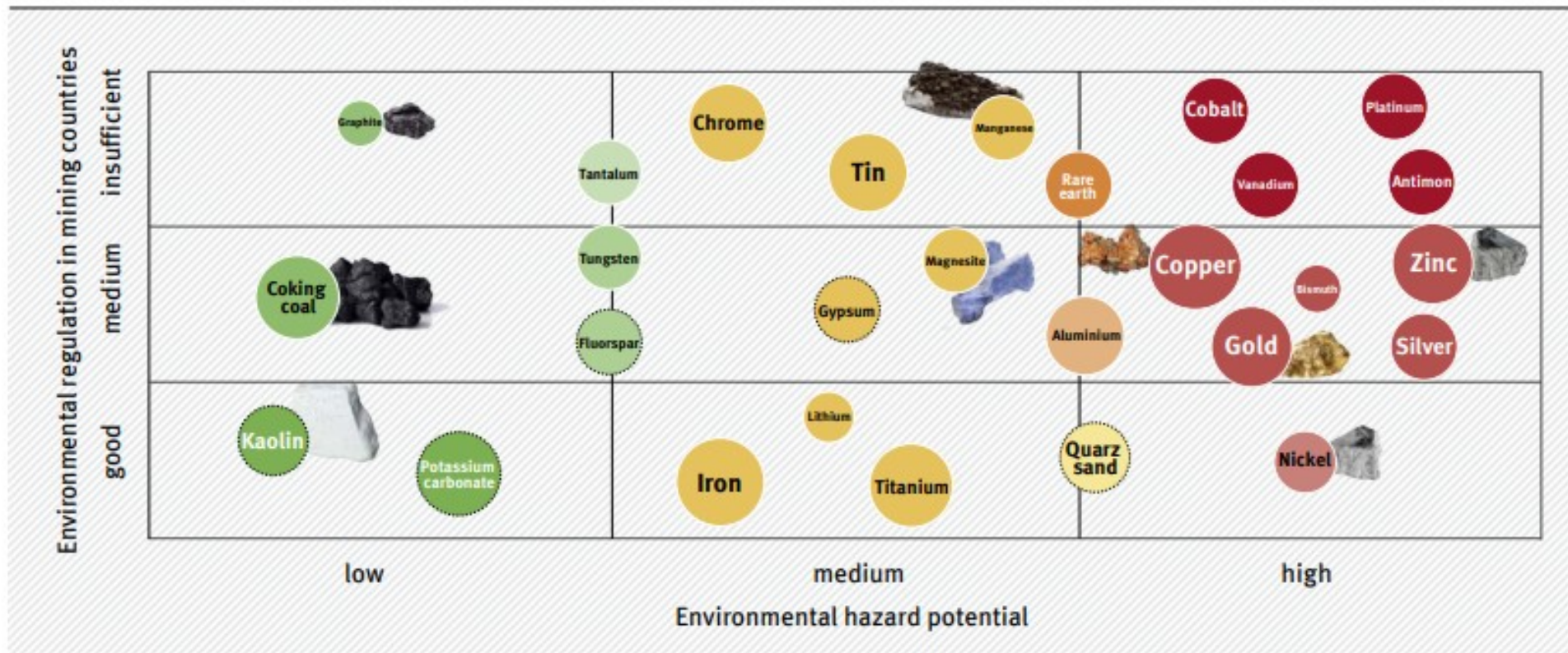


- Legend**
- Low environmental hazard potential (EHP)
 - Low to medium EHP
 - Medium EHP
 - Medium to high EHP
 - High EHP
- Inner circle colouring**
Raw material mainly produced as:
- main product
 - co- and/or by-product
- Potential artisanal and small-scale mining (ASM)

OekoRess II: Material evaluation results



Environmental hazard potentials (EHP) and environmental regulation in mining countries, by raw material



The size is proportional to global material and energy flows associated with the raw material (three-stage scale). Raw materials with a black outline show relevant extraction quantities also in Germany.

Limitations of the OekoRess approach:

Screening tool (radar) to identify issues that require more detailed analyses.

Scope: mining & ore processing, smelting & refining excluded.

Potential adverse effects can be prevented and mitigated by good practice.

Complementary to other approaches of environmental assessment (e.g. LCA, EIA)

Does not allow substitution recommendations - full product lifecycle LCA

OekoRess III: Interactive map



Features of the map:

Welcome: purpose, project, assumptions, limitations, data, terms.

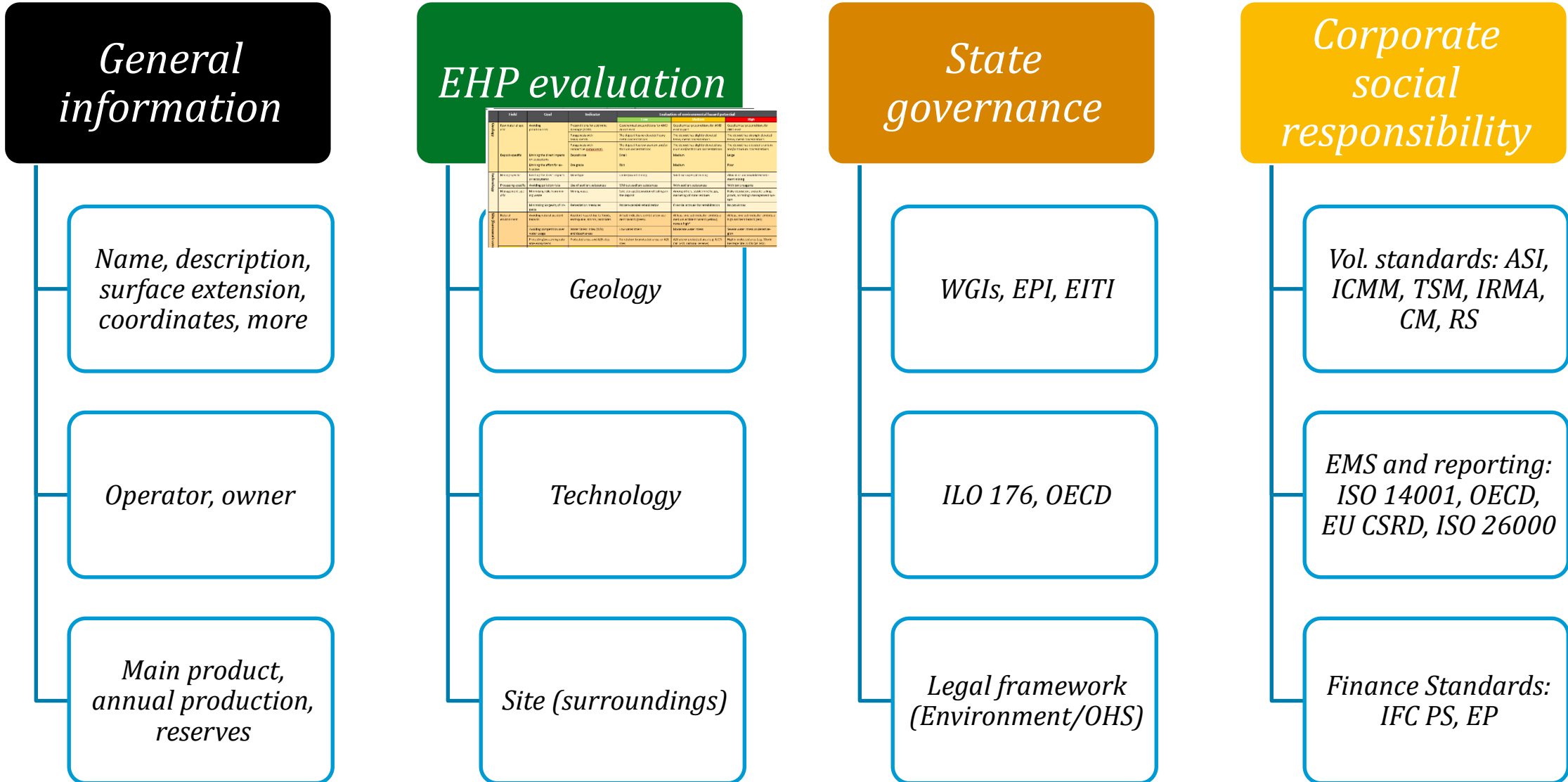
Tools: zoom, move, scale, coordinates, base maps, legend, measure, search.

Click on site symbol: List w/ evaluation results + metadata, link to detailed factsheet.

Layers: show results for selected indicators: e.g. paragenesis w/ heavy metals

Filter map for specific criteria: e.g. copper mines in areas of high water stress

OekoRes III: 100 Factsheets // Content



Using the two radar systems

Material related evaluation (II): identify priority materials and issues for

- supply chain due diligence (RBC) or
- circular economy policies
- **Users: Downstream industry (OEMs), policy makers**

Site related evaluation (III): identify priority issues at site level

- **Users: Industry, finance, civil society, communities, regulatory authorities with limited human or financial resources**
 - Initial evaluation to prioritize further investigations
 - "reading guide" for EIAs in permitting processes.



Thank you. Questions?

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[https://
www.umweltbundesamt.de/
publikationen/eroerterung-
oekologischer-grenzen-der](https://www.umweltbundesamt.de/publikationen/eroerterung-oekologischer-grenzen-der)

II



[https://
www.umweltbundesamt.de/
publikationen/
environmental-criticality-of-
raw-materials](https://www.umweltbundesamt.de/publikationen/environmental-criticality-of-raw-materials)

III

Interactive Map



[https://www.umweltbundesamt.de/publikationen/pilo
t-screening-of-the-environmental-hazard](https://www.umweltbundesamt.de/publikationen/pilot-screening-of-the-environmental-hazard)