

German Environment Agency

Umwelt 
Bundesamt

Mine tailings safety in the UNECE region and beyond:
Online seminar

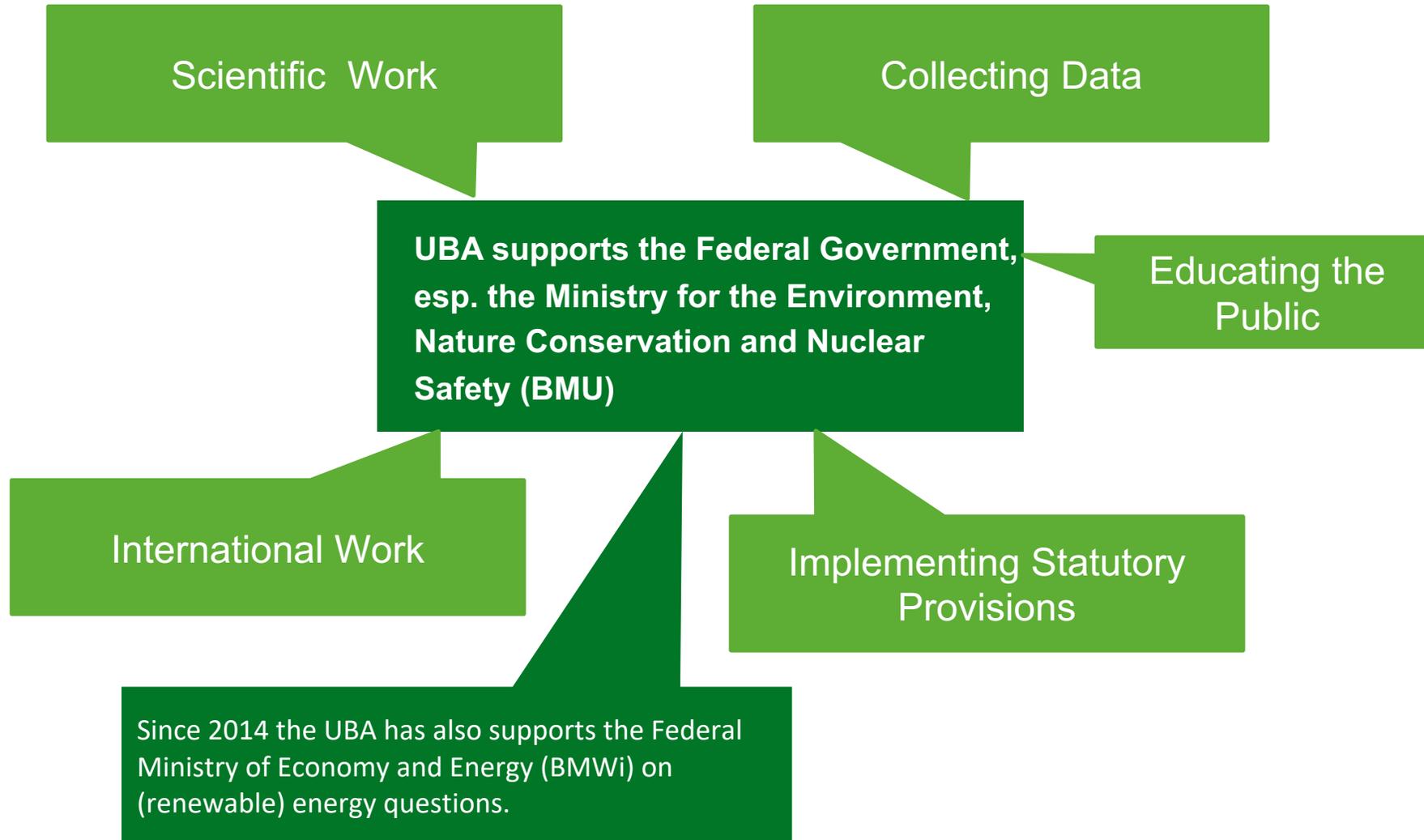
Projected trends and needs for Mineral Resources in the light of Sustainability Transformations

Jan Kosmol

Section III 2.2

Resource conservation, material cycles, minerals and metals industry

The German Environment Agency (UBA)



Established 1974 as independent authority

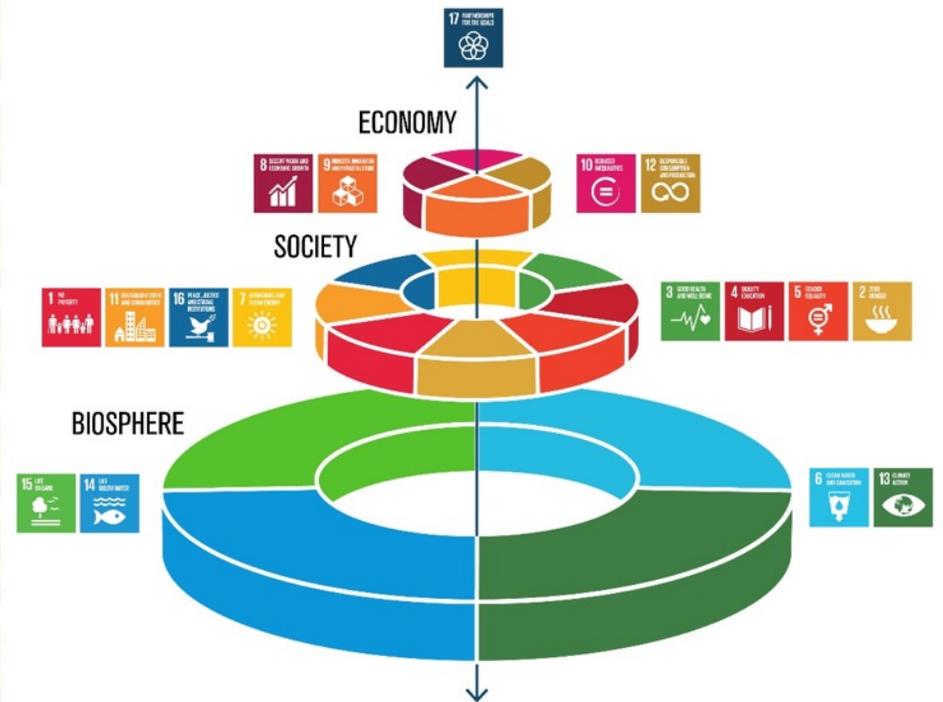
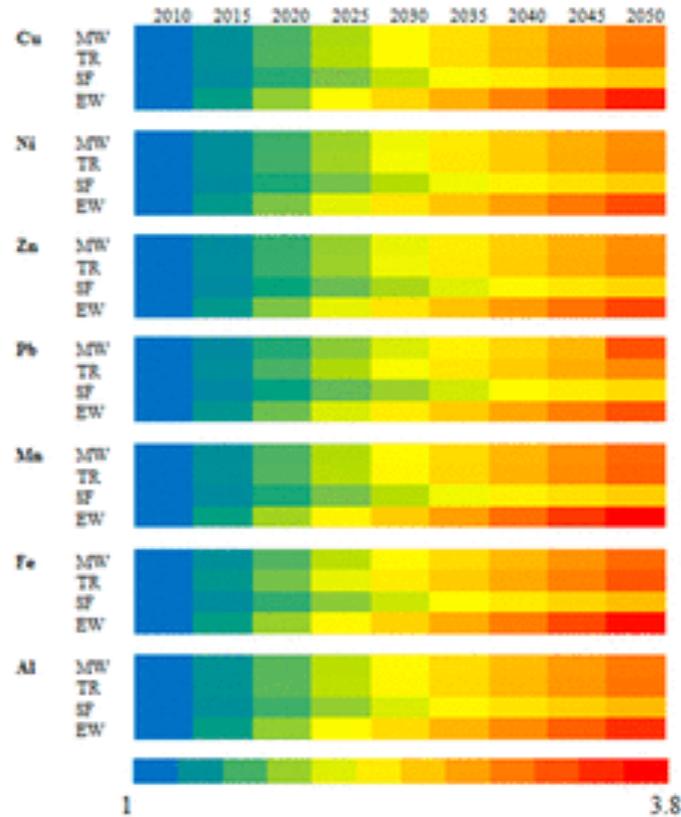
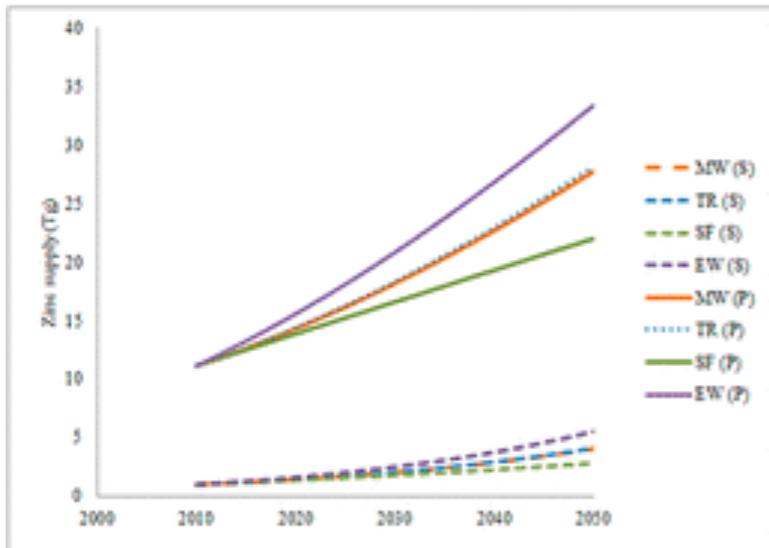
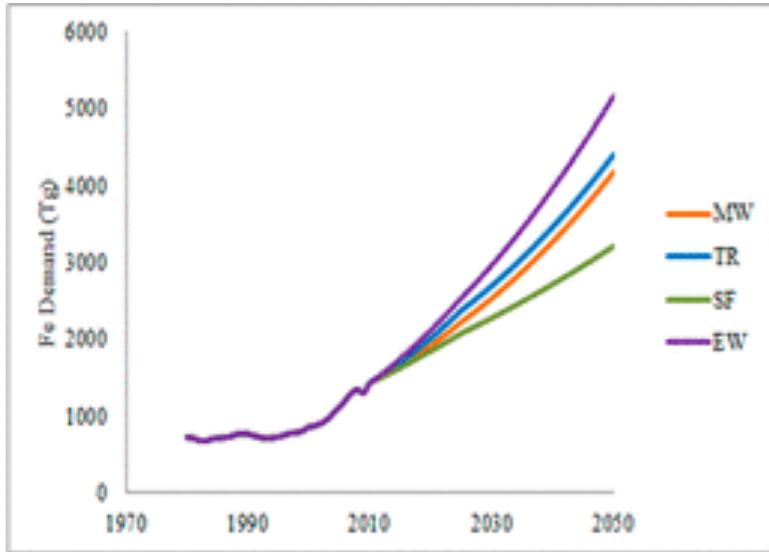
Largest Environmental Agency on Federal Level

~1,600 Employees,
~1000 in Dessau head office

Three main tasks by law:

1. Educating the public
2. Advising the Federal Government
3. Implementing statutory provisions

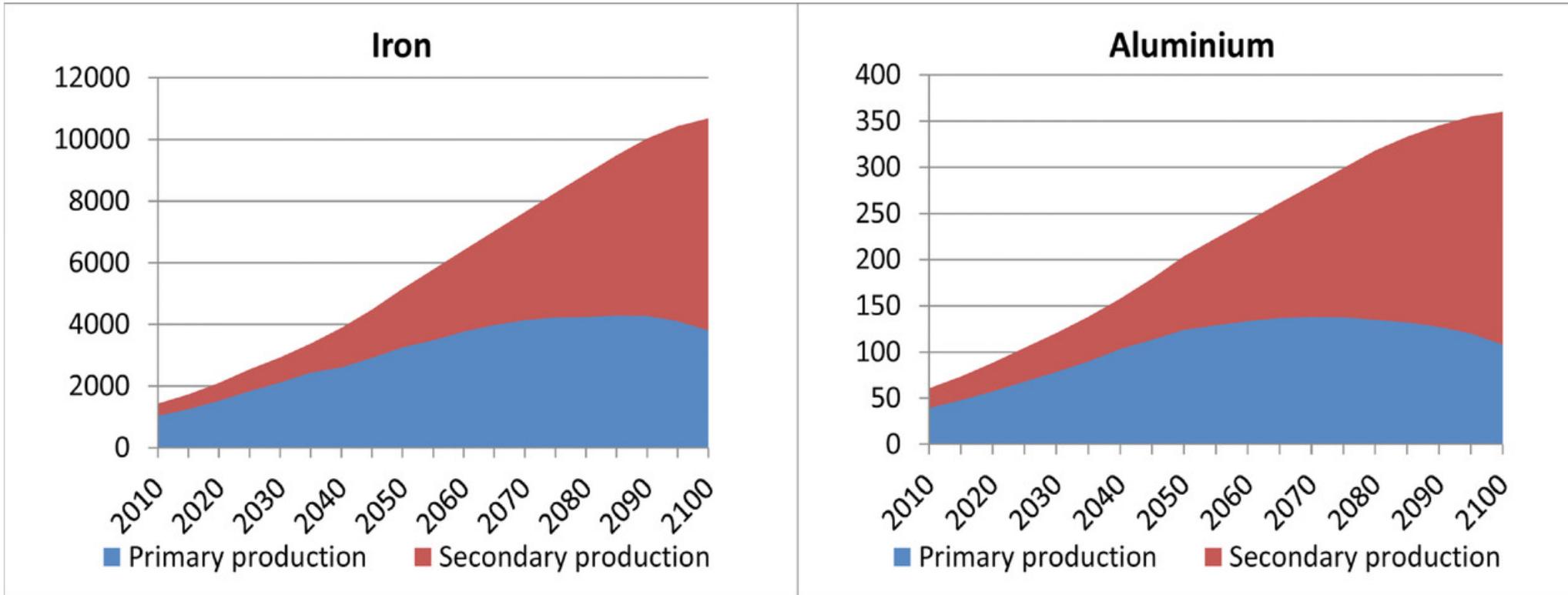
Sustainable Development requires more Minerals & Metals



Azote Images for Stockholm Resilience Centre, Stockholm University

Reprinted (adapted) with permission from (Elshkaki, Ayman; Graedel, T. E.; Ciacci, Luca; Reck, Barbara K. (2018): Resource Demand Scenarios for the Major Metals. ACS Publications. Collection. <https://doi.org/10.1021/acs.est.7b05154>). Copyright (2018) American Chemical Society.

Circular Economy is coming - Mining will remain



Van der Voet, E., Van Oers, L., Verboon, M. and Kuipers, K. (2019), Environmental Implications of Future Demand Scenarios for Metals: Methodology and Application to the Case of Seven Major Metals. *Journal of Industrial Ecology*, 23: 141-155. <https://doi.org/10.1111/jiec.12722> (CC BY 4.0)

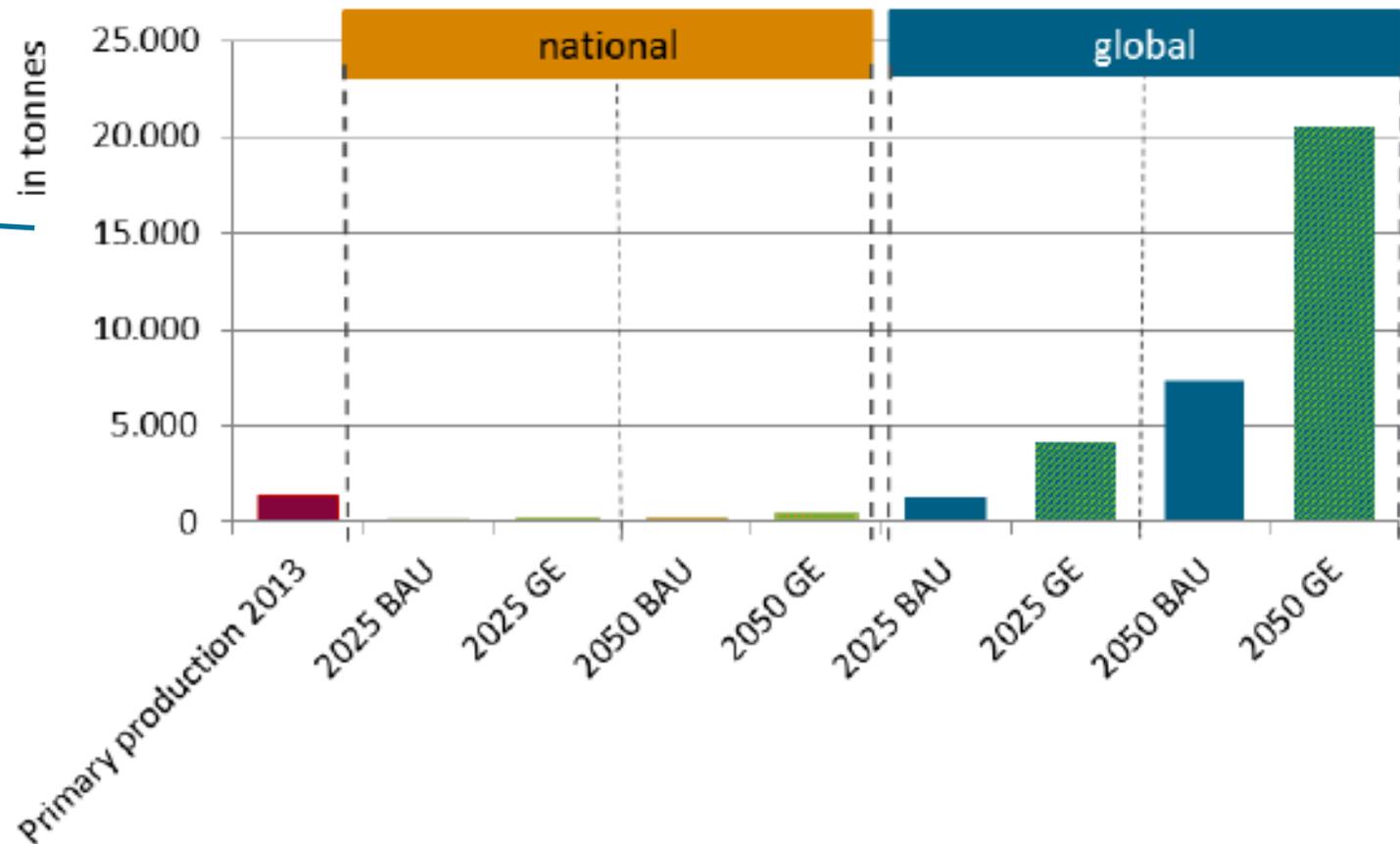
Bunge 2014

Projected Global Metal Demand for 40 Environmental Technologies

Raw materials requirement across all environmental technologies in the green economy scenario for 2025 in relation to global primary production in 2013

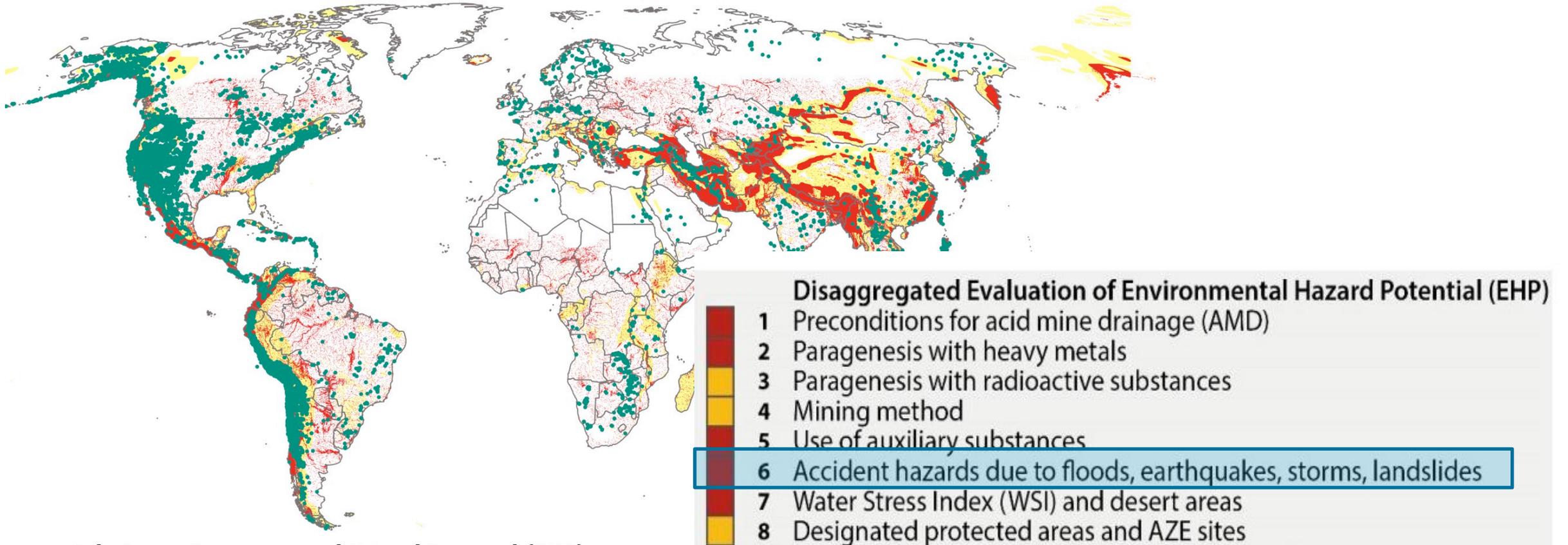
Raw material	Percentage
Palladium	423%
Ruthenium	409%
Rhodium	331%
Dysprosium	304%
Iridium	289%
Lithium	247%
Terbium	238%
Platinum	153%
Tin	82%
Neodymium	81%
Praseodymium	67%
Gallium	63%
Silver	58%
Indium	32%
Cerium	15.5%
Titanium as TiO ₂	12.5%
Magnesium	11.7%
Copper	11.2%

Absolute material requirements for dysprosium [in tonnes] compared with primary production 2013



Buchert et al. 2019: Substitution as a Strategy for Reducing the Criticality of Raw Materials for Environmental Technologies. Summary. UBA Texte 03/2019. German Environment Agency.

Accident hazards due to Floods, Earthquakes, Storms or Landslides Example Copper Mining

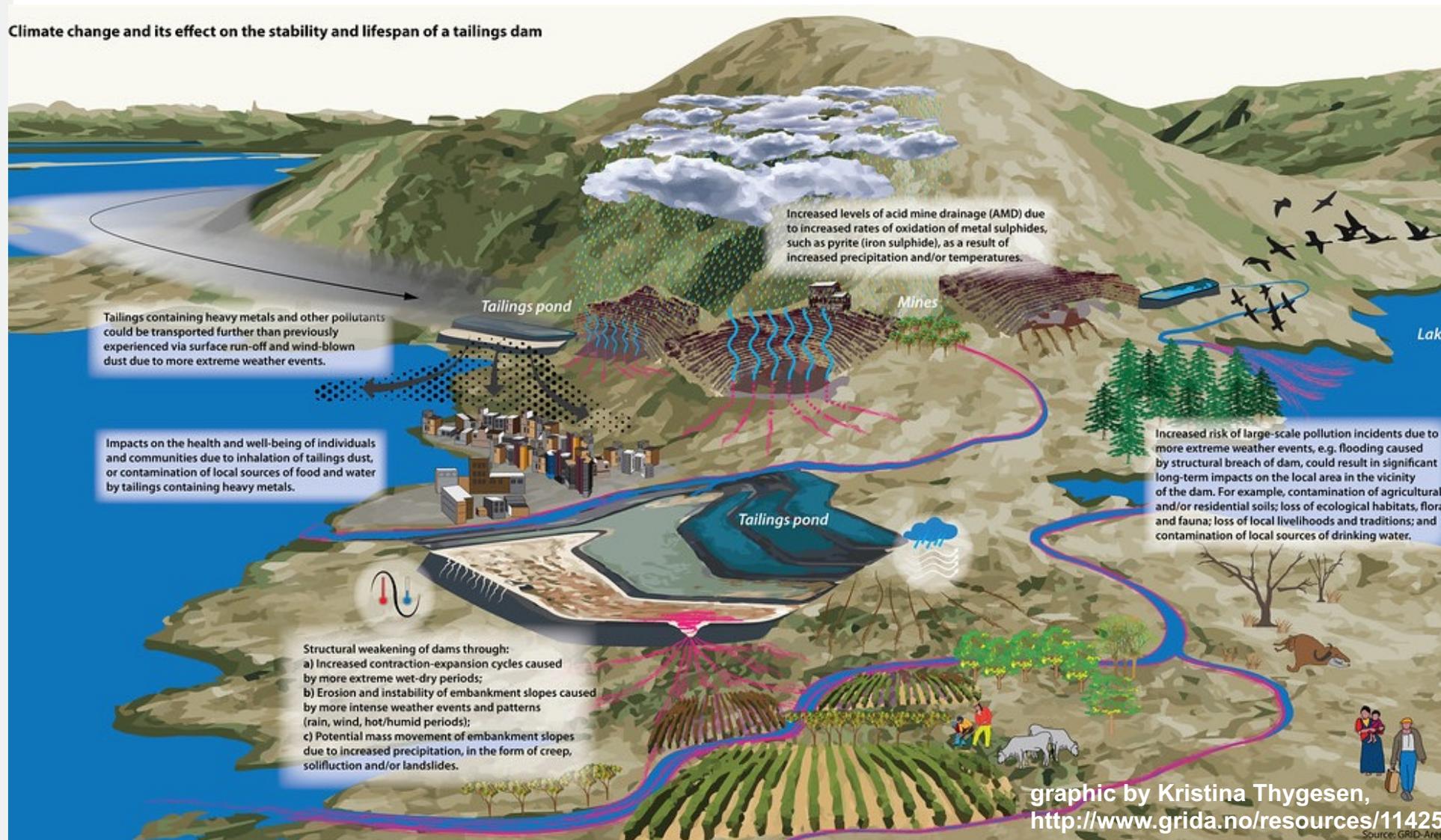


OekoRess – Environmental Hazard Potential (EHP)

Medium EHP High EHP

Dehoust et al. 2020: Environmental Criticality of Raw Materials. Summary. UBA Texte 80/2020. German Environment Agency.

Climate Change Impacts on Tailing Management Facilities



Slow onset:

Structural weakening

- Changing patterns (rain, wind, temperature, humidity)
- Permafrost degradation

Sudden onset:

Extreme weather events (rain, wind)

- increase contaminant transportation (run-off/dust)
- increase risk of dam failure

Rüttinger et al. 2020: Impacts of climate change on mining, related environmental risks and raw material supply. UBA Texte 106/2020. German Environment Agency.

Thank you for your attention

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www.umweltbundesamt.de/rawmaterialsconference

www.umweltbundesamt.de/en/topics/waste-resources

www.umweltbundesamt.de/en/topics/economics-consumption