NF Wire Forum

Resource availability for societal change – copper´s case

Aurubis Metals for Progress

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Agenda

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- What are resources used for?
- Challenges of today and tomorrow
- Resource availability – The case of copper
- Summary

Resource

- Definition
- Usage

Resource: Definition and usage

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Definition of Resource In ISO 22301, clause 7.1 defines a resource as "anything required for the operation of a business process or activity." This broad definition includes people, money, facilities, materials, information, and other assets.

Mankind life is based on:

- Natural resources (abiotic and biotic resources (incl. energy resources))
- Land
- Water
- Wind
- …

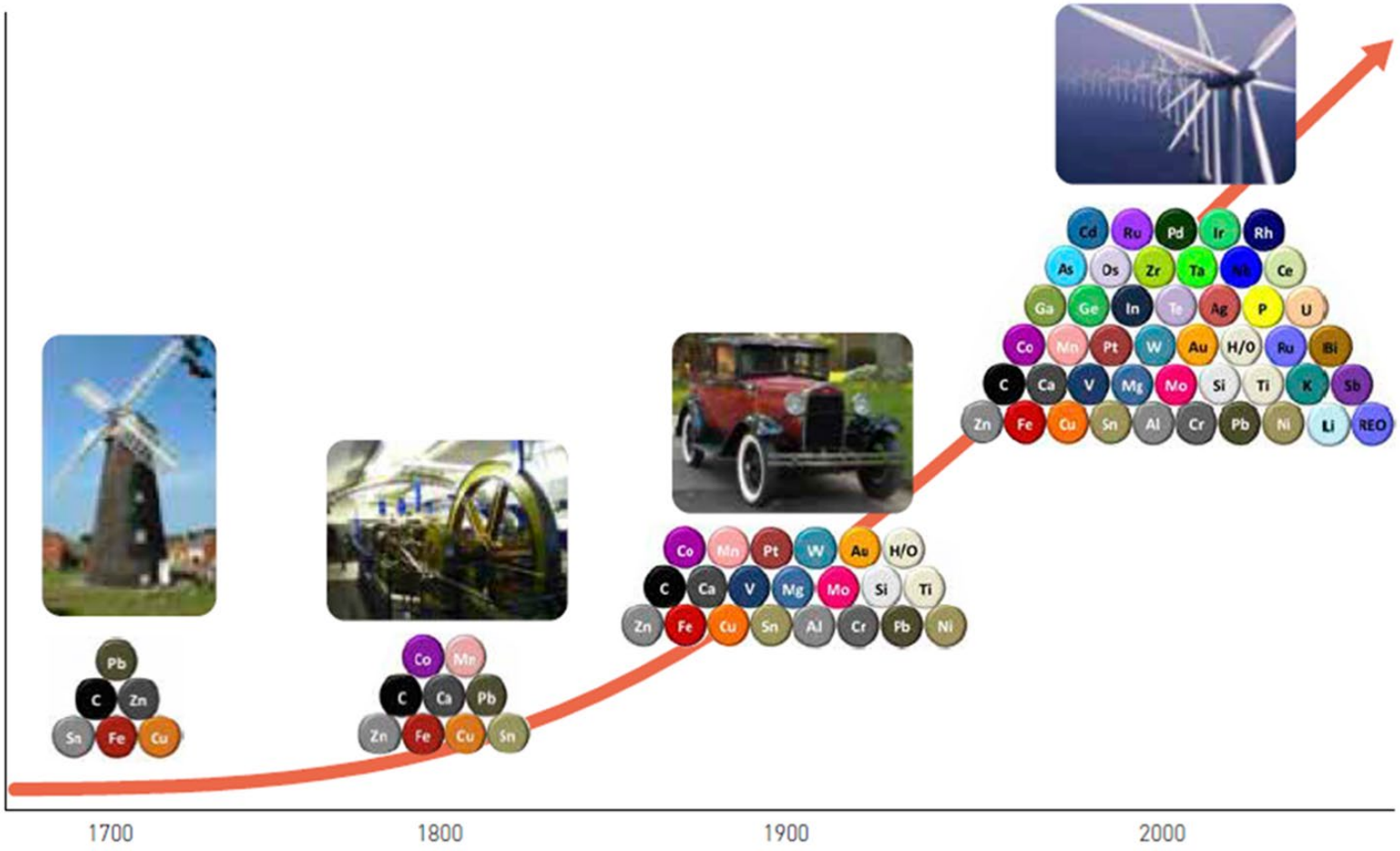
The use of natural resources is growing steadily. In 2050 the world population is supposed to attain 10 billion inhabitants. This will require 140 billion t of minerals, ores, fossile resources, etc.., if we keep consuming as usual.(UNEP 2011).

© www.umweltbundesamt.de, Elemente einer erfolgreichen Ressourcenschonungspolitik

Resource usage

Increase of product and material variability

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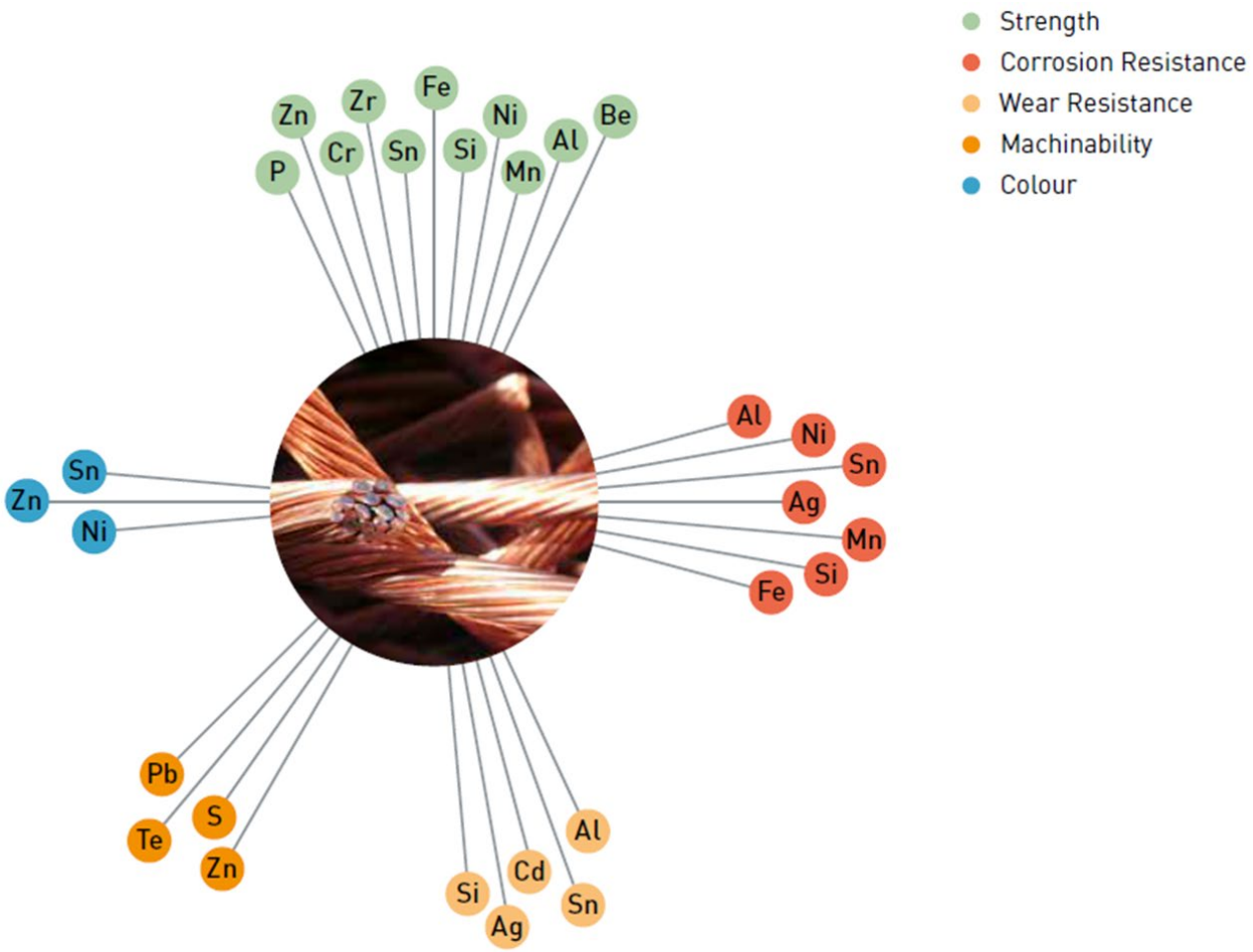








Resource usage



Variety is necessary for material design!

Challenges
of today and tomorrow

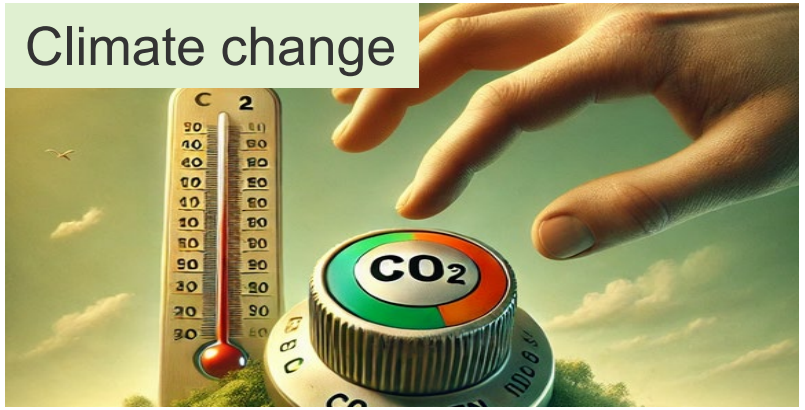
Challenges of today and tomorrow

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Digitalisation



Climate change



Electrification



Energy transformation

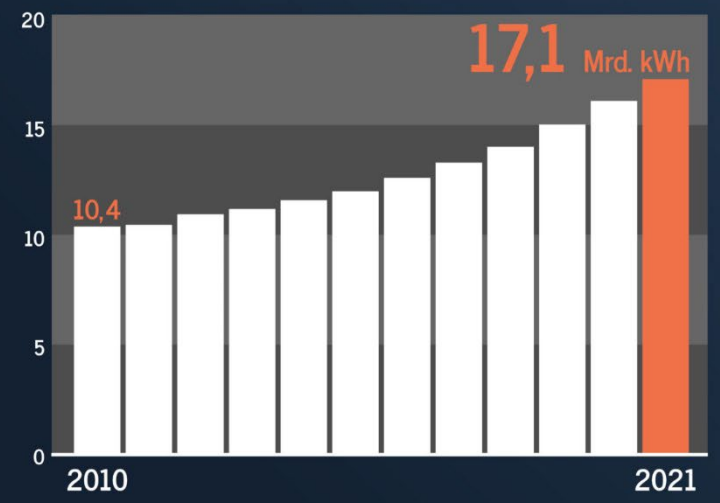


Diverse trans-formations are running in parallel interact to each other!

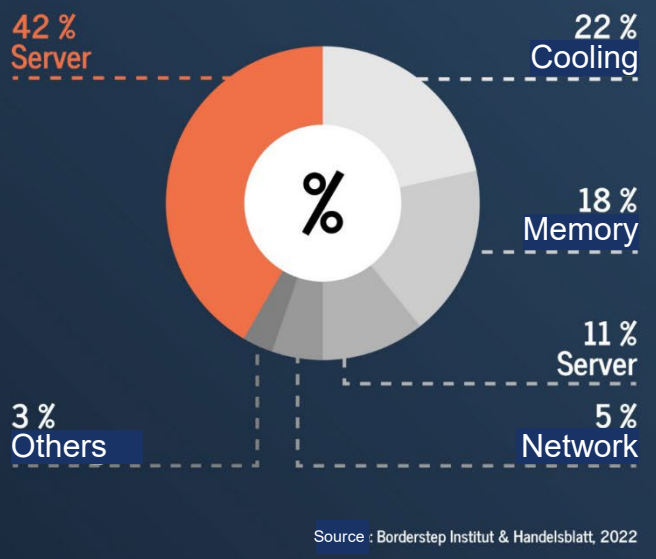
Challenges of today and tomorrow

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Rise of the energy consumption of server in Germany in Mrd kWh



Share of different components from 2021 consumption



Rise of digitalisation is driving the energy consumption!

© www.digital-chiefs.de, Ressourcen und Einsparpotenziale in Rechenzentren

Challenges of today and tomorrow

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Modern Mine: Electrified mine (transport and other processes)

(1505) 5 Mines You Can Work At In Northern Europe - YouTube



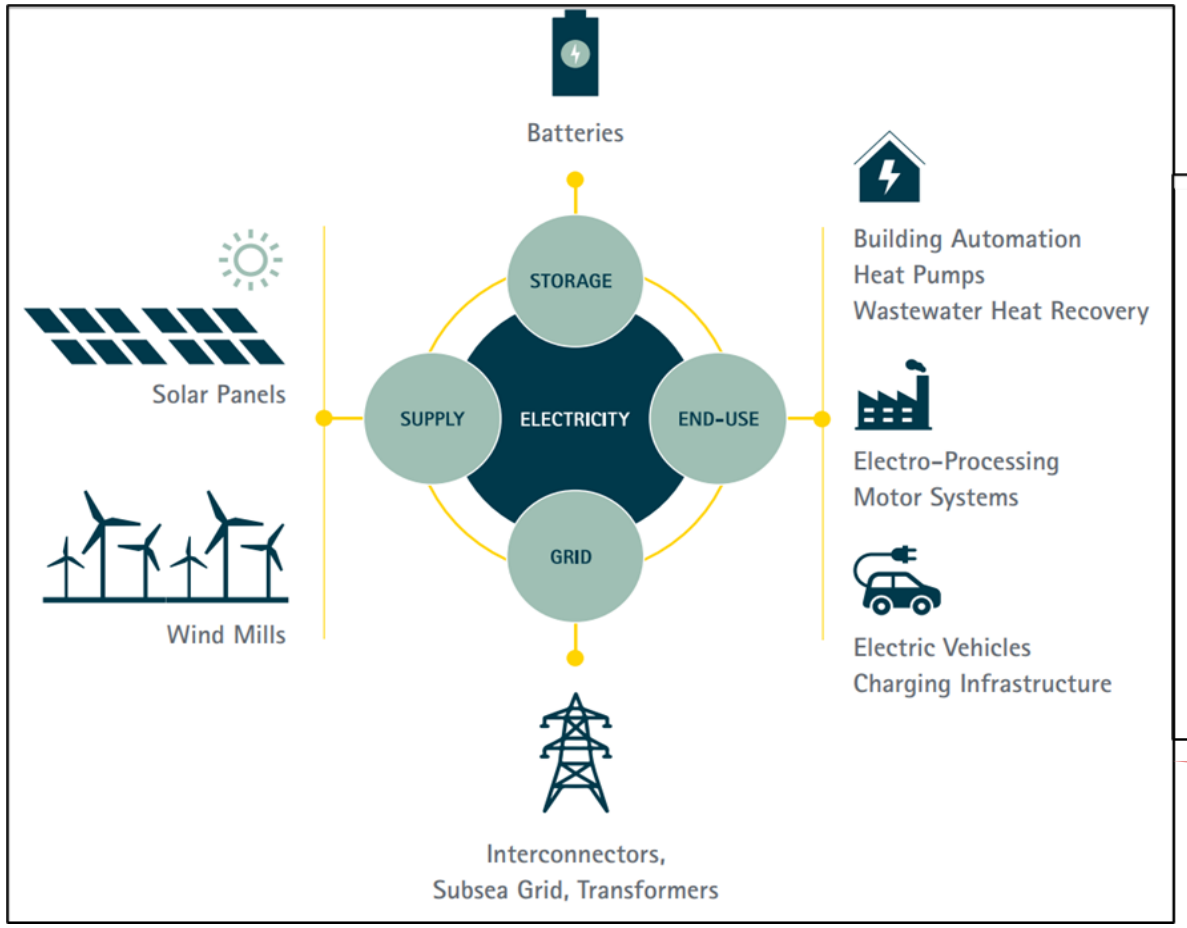


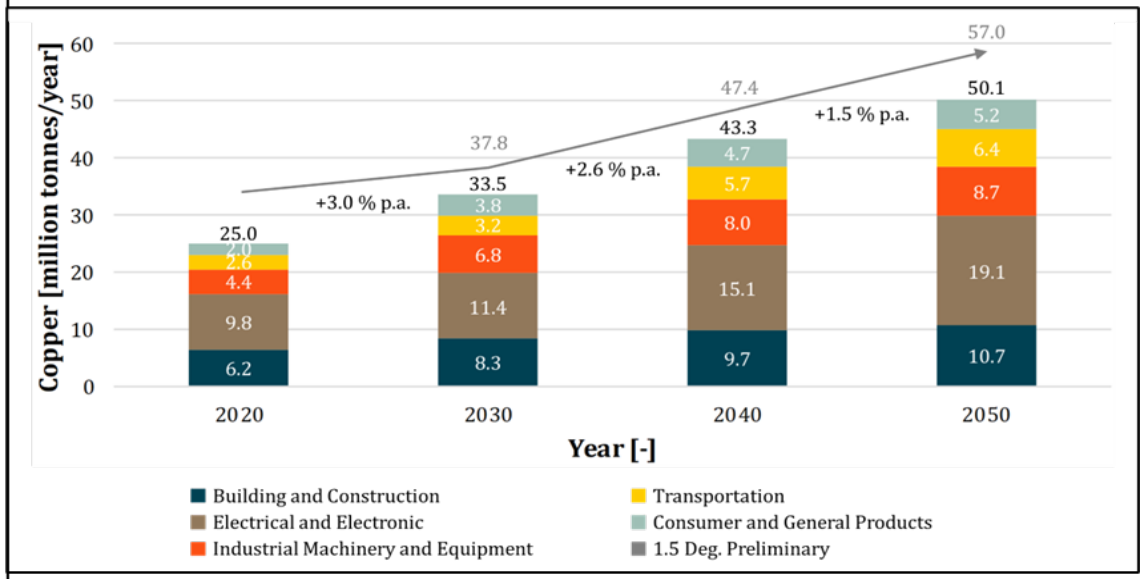


The electrification of the production is evolving at the mine level.

Challenges of today and tomorrow

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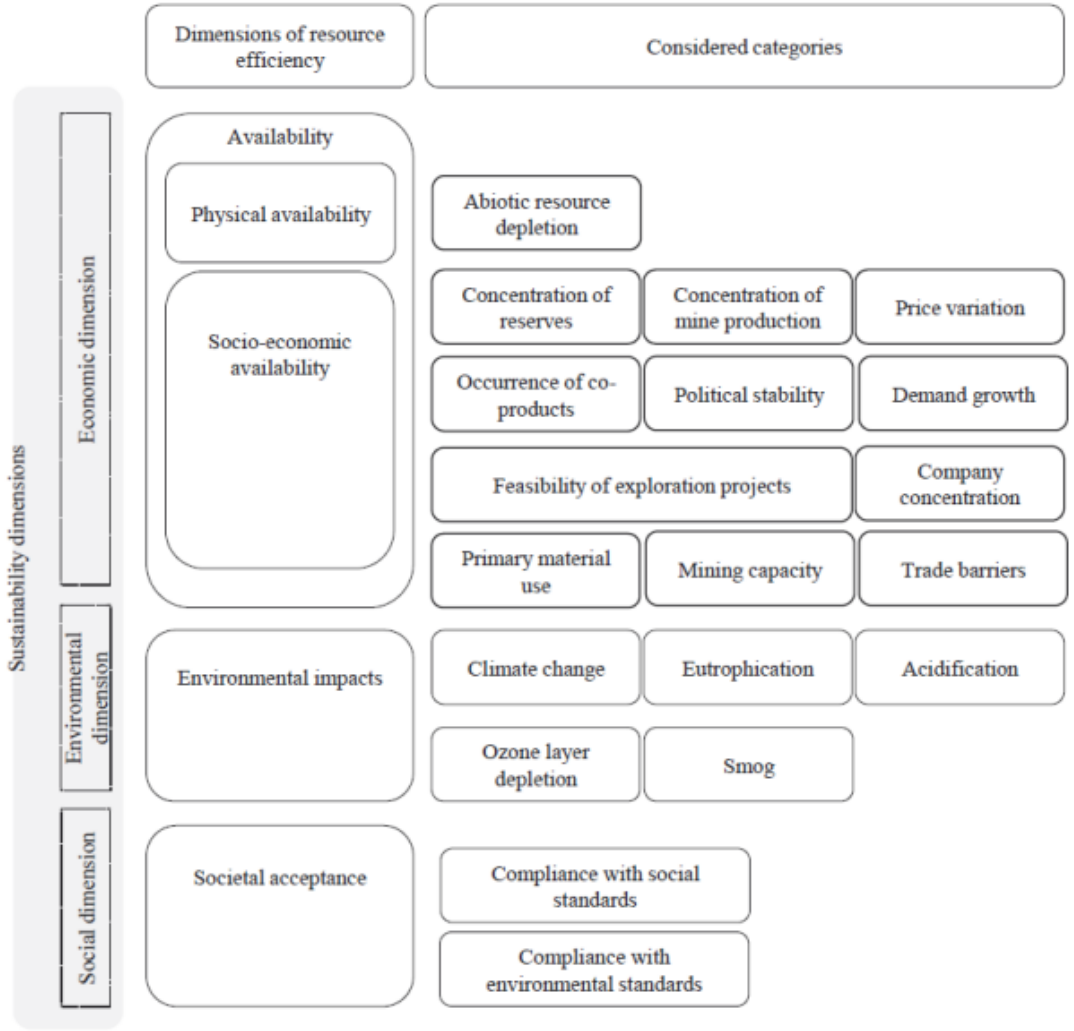
Transformation in society will require more copper!

Resource availability – the copper case

Resource availability – The copper case

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Criteria for assessing the availability

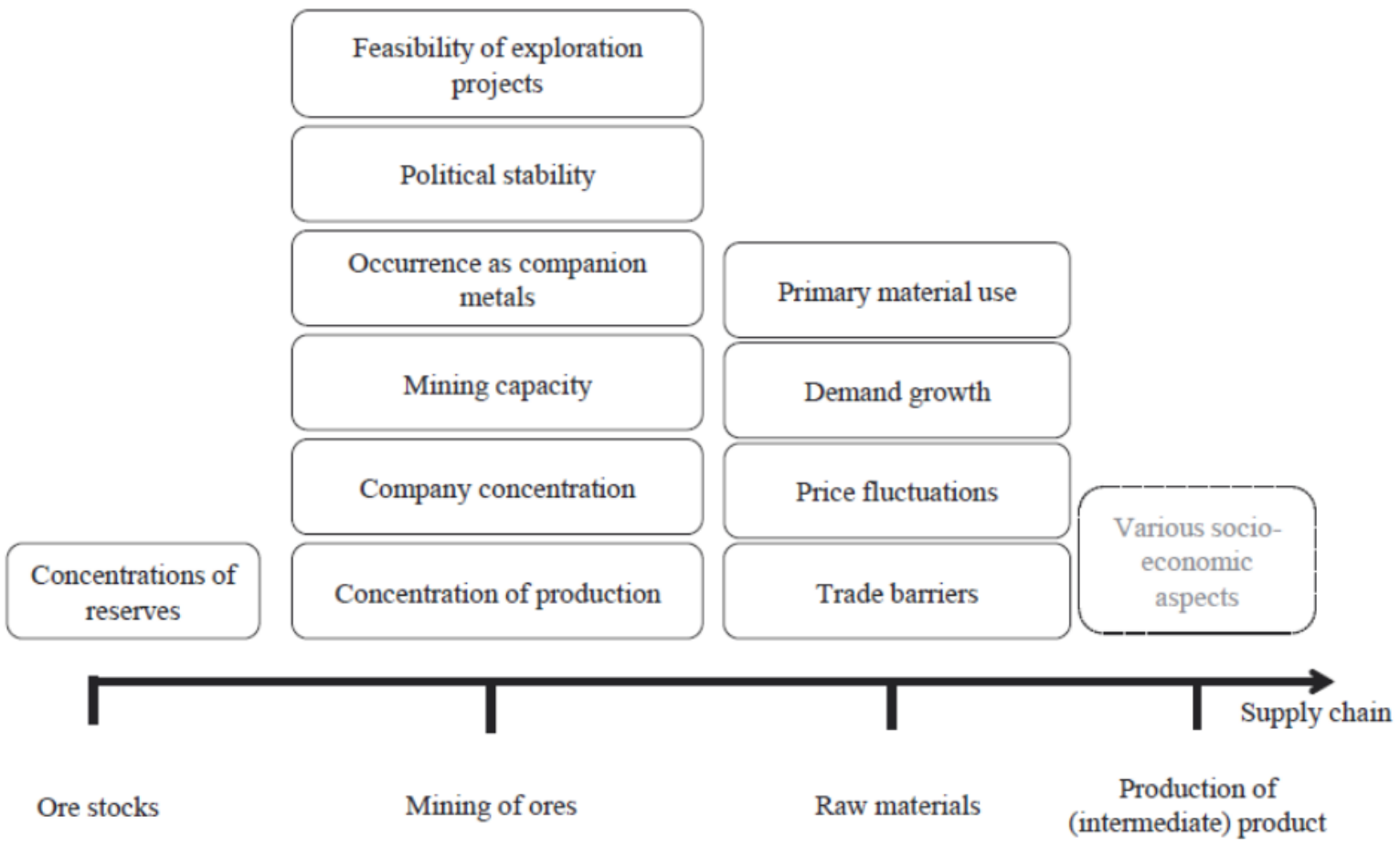


Resource availability is not just limited to physical aspects!

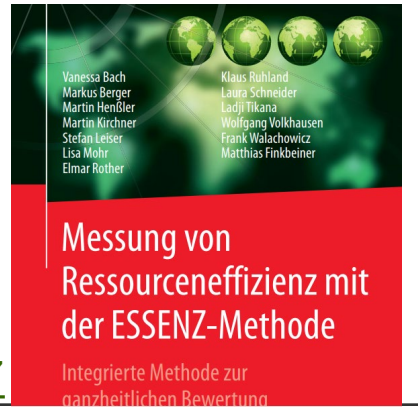
Resource availability – The copper case

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Criteria for assessing the availability



The resource availability depends on many parameters



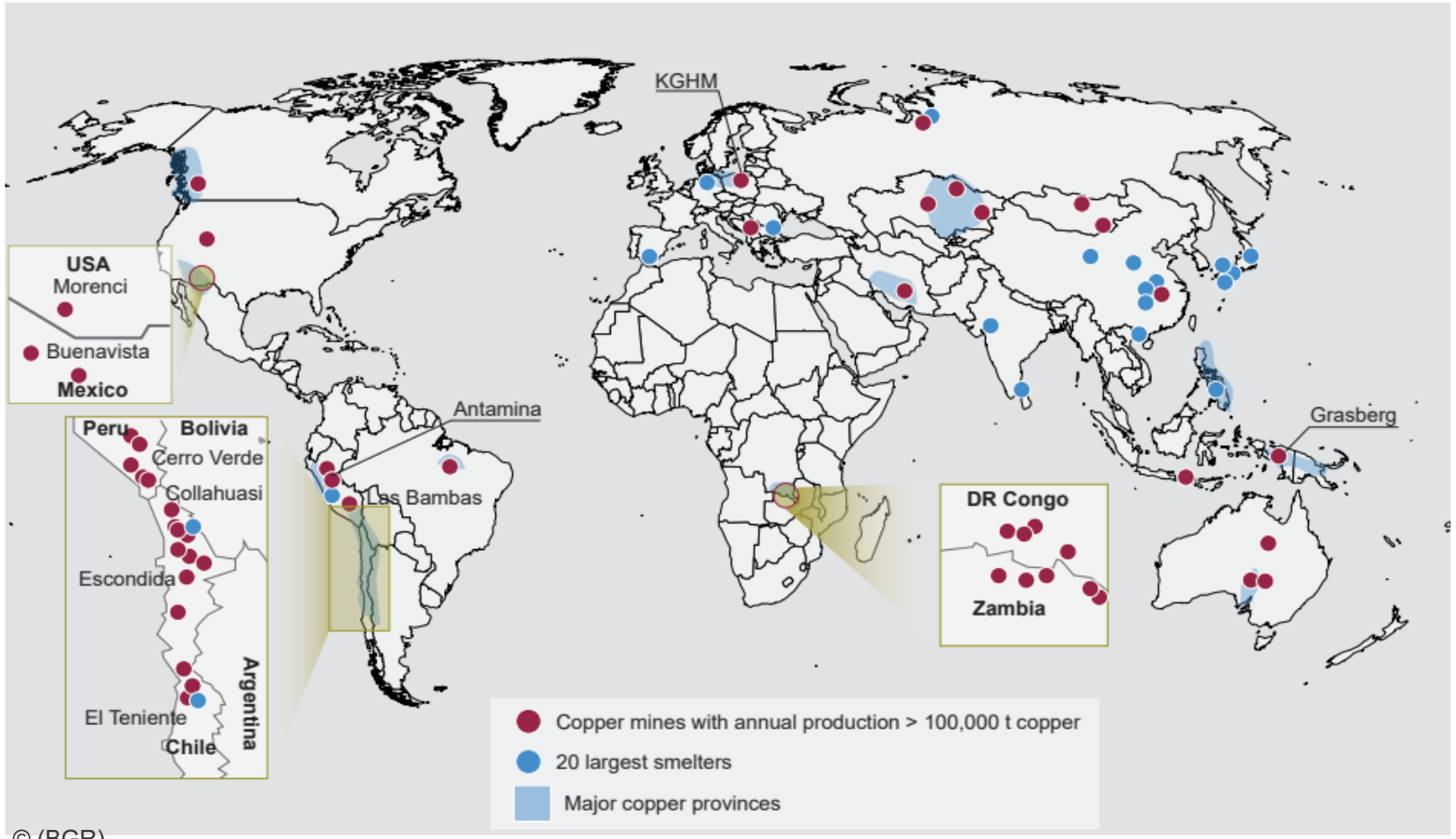
Bach, V., Berger, M., Henßler, M., Kirchner, M., Leiser, S., Mohr, L., … Finkbeiner, M. (2016). Integrated method to assess resource efficiency – ESSENZ. Journal of Cleaner Production, 137, 118–130.

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Availability of Copper Resources

Availability of Copper Resources

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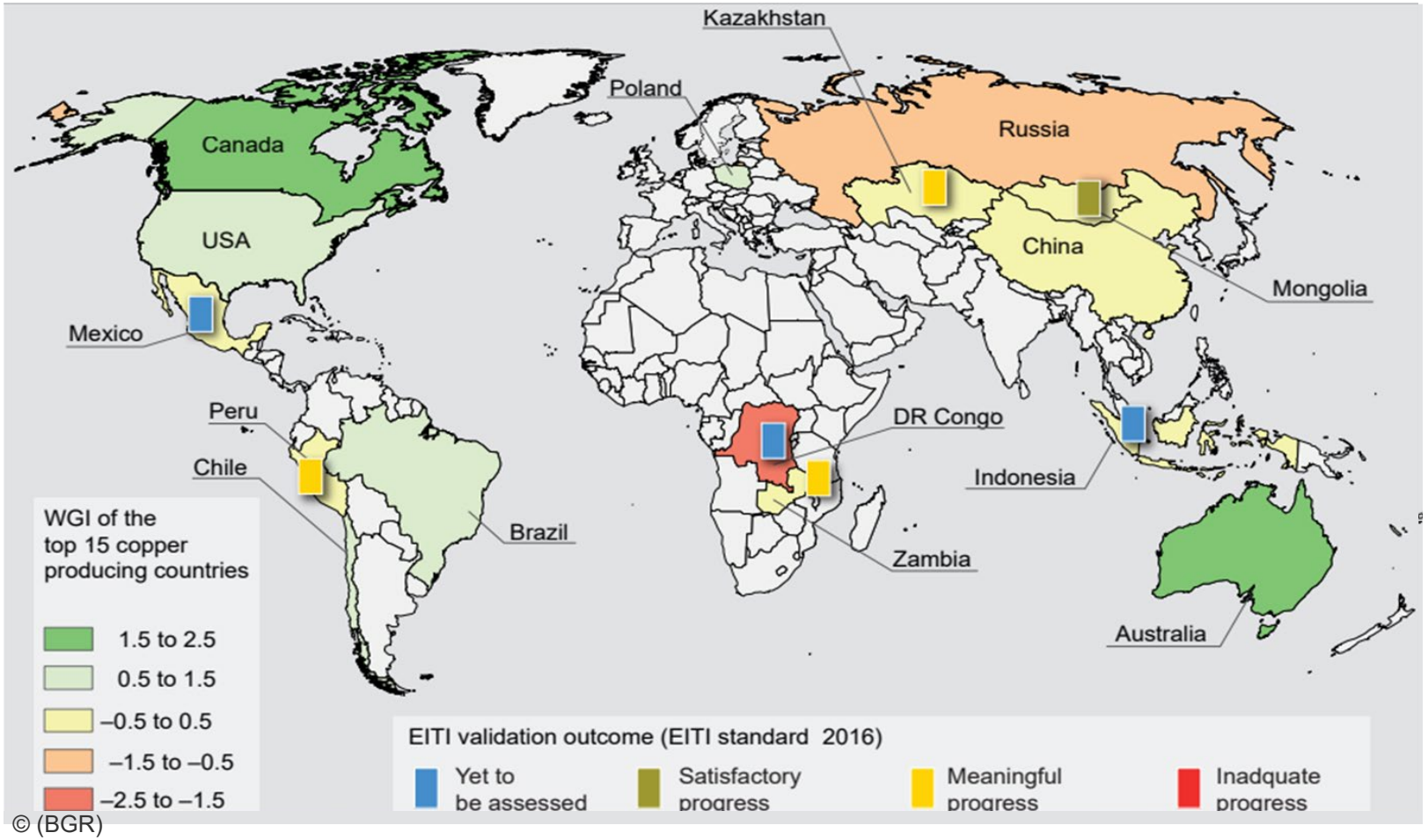


© (BGR)

The physical availability of copper is well distrbuted globally!

Availability of Copper Resources

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Diverse factors (politics and society) can influence the resource availability!

EITI: Extractive Industry Transparence Initiative
WGI: World Governance Indicator

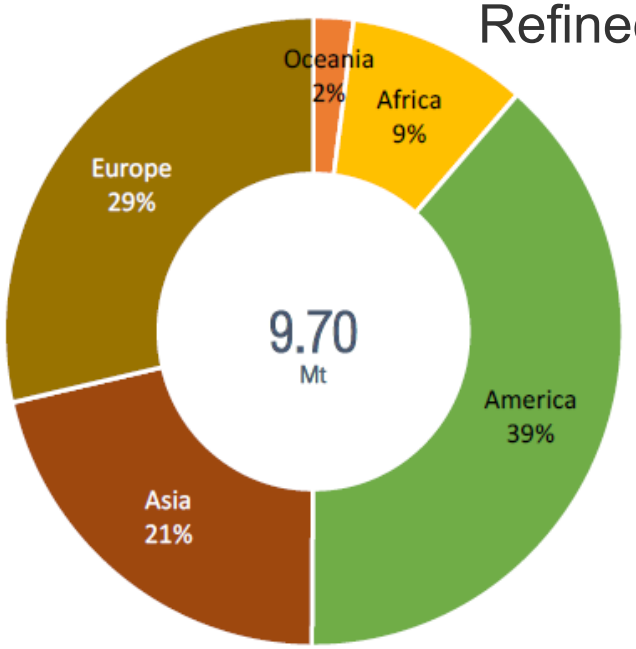
Availability of Copper Resources

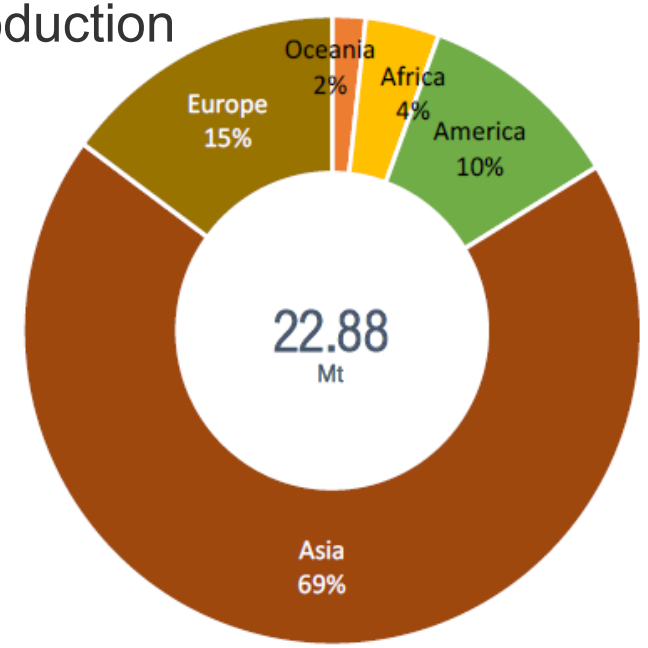
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1990

2023

Refined Copper production



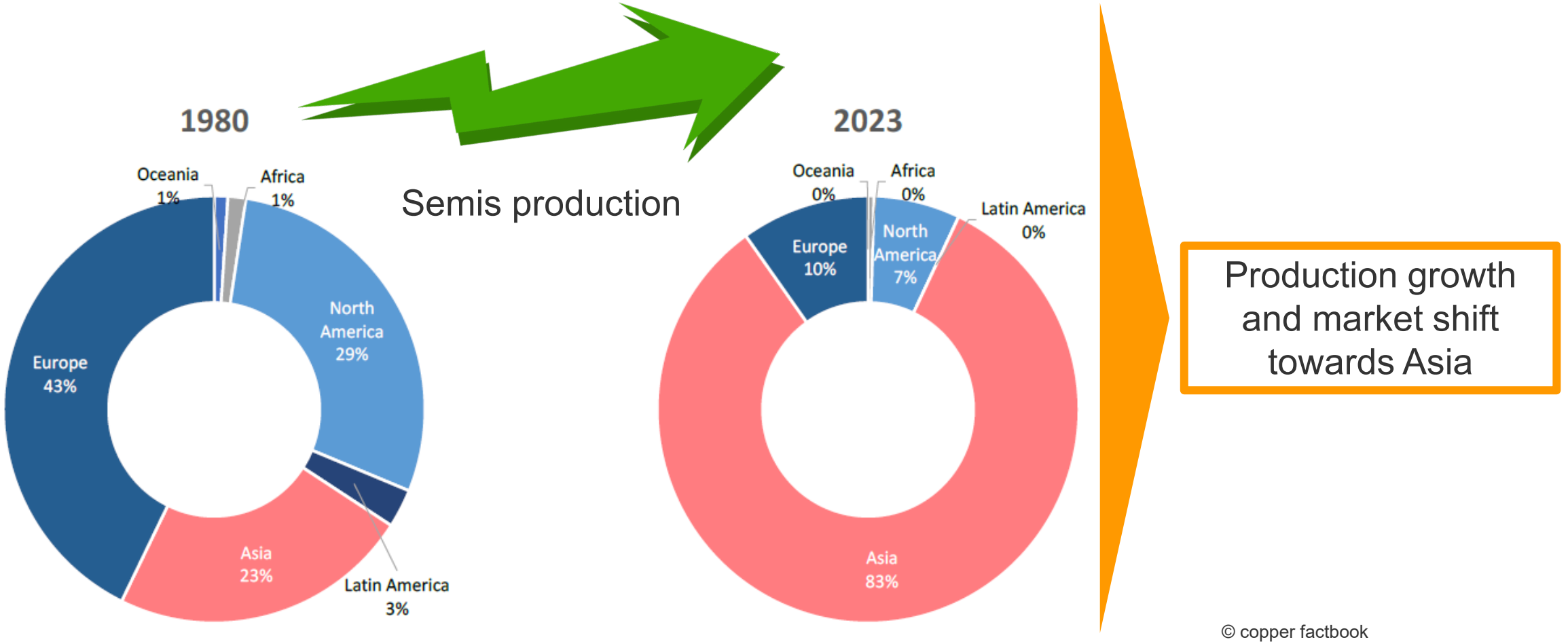


Production growth and market shift towards Asia

© copper factbook

Availability of Copper Resources

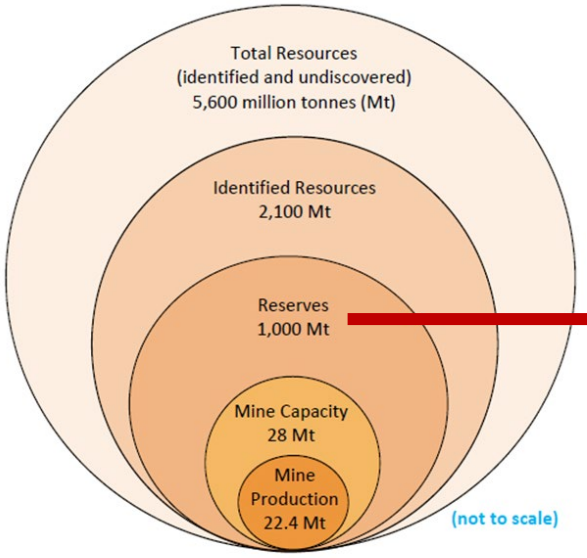
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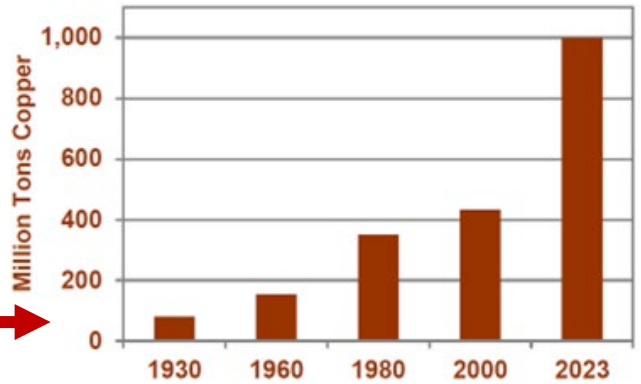
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Availability of Copper Resources

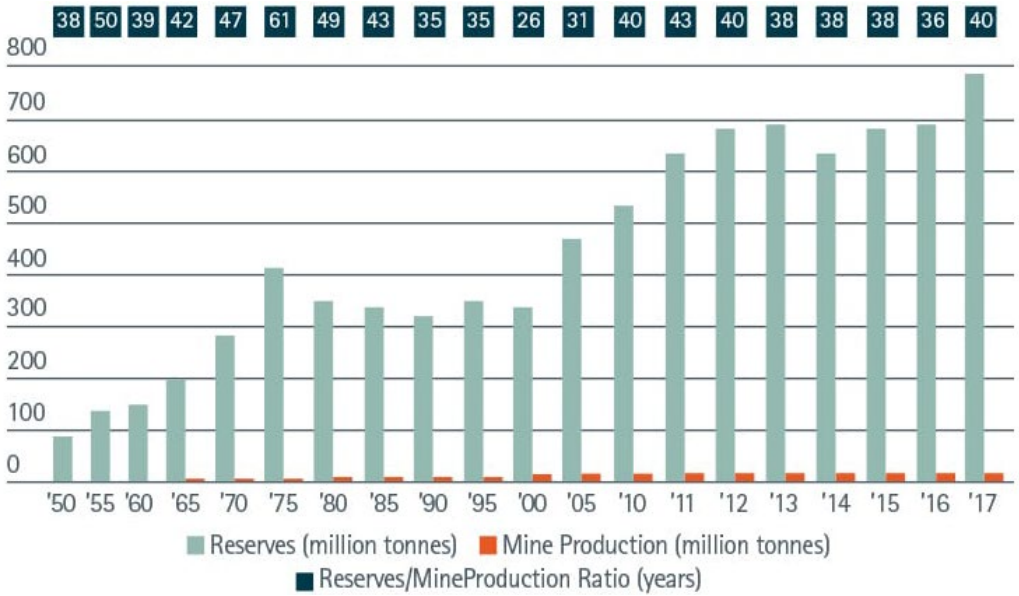
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1/ Source: USGS (resources/reserves data) and ICSG (capacity/production data)



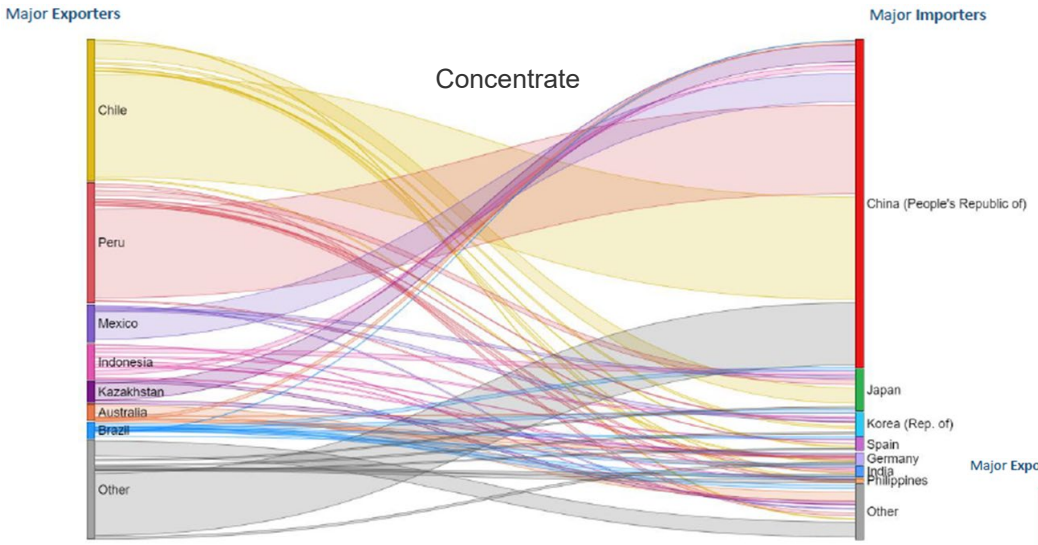
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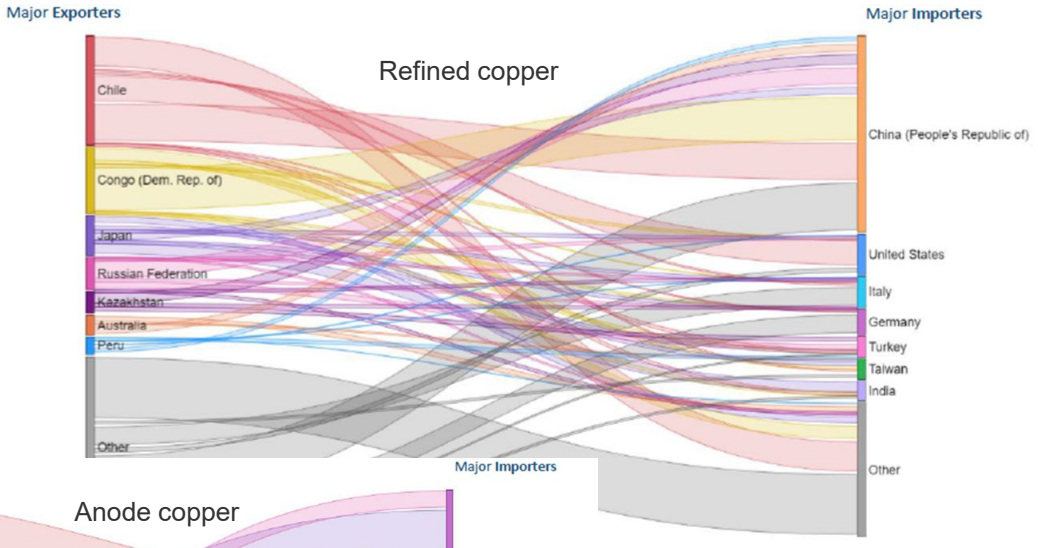


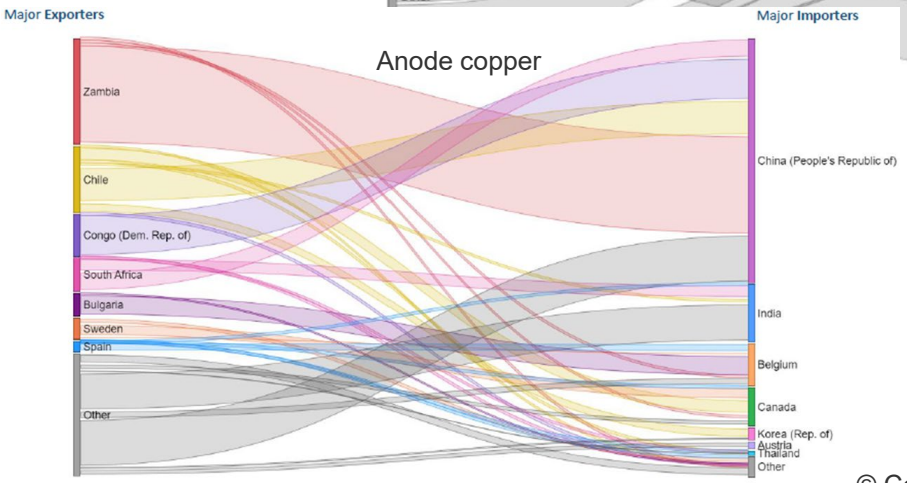
- The availability of copper resources is, as such, not critical!
- Nevertheless, copper is classified as a critical material worldwide (EU, USA, China, Japan, etc.) because of its key role in the societal transition towards digitalisation, decarbonisation and green energy transition!

Availability of Copper Resources

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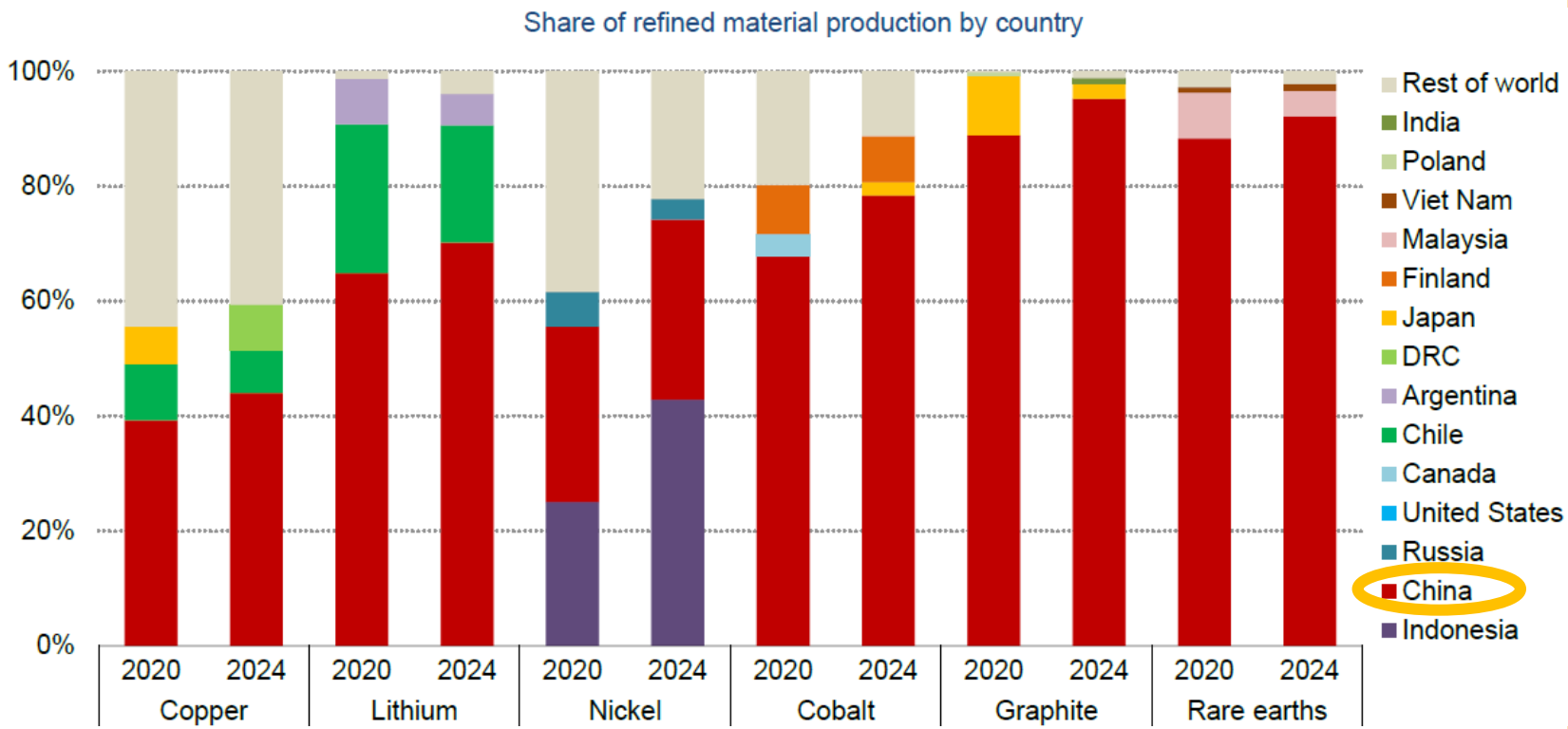


The main copper flows are going to Asia!

© Copper Factbook, 2023-2024

Availability of Copper Resources

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A deep dive into the resource field shows that China plays a dominant role in the production of commodities!

© IEA – Global Critical Minerals Outlook 2025

Summary

Summary

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- Although the demand for copper is growing, there is more copper available today than in humankind´s history.
- This fact added to copper´s ability to be endless recyclable means that it is not obvious, the society will run out of copper.
- The physical availability of copper can therefore be considered non-critical, as the metal remains relatively abundant.
- However, its distribution, accessibility and production are not equally shared across the globe.
- Despite this abundance, copper´s key role in the energy transition, digitalization and other strategic sectors has lead to its classification as critical (strategic) material worldwide.

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Thanks for your attention! 

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