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Long-term low-price benchmarks for metals and their effects on exploration, mining and investment

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Die Bundesanstalt für Geowissenschaften und Rohstoffe ist eine technisch-wissenschaftliche Oberbehörde im Geschäftsbereich des Bundesministeriums für Wirtschaft und Energie (BMWi).



Source: Fotolia

The German Mineral Resources Agency (DERA) at BGR (German Geological Survey)

German Mineral Resources Agency at the Federal Institute for Geosciences and Natural Resources (BGR) · Formed 10/2010, opened in Berlin 8/2012

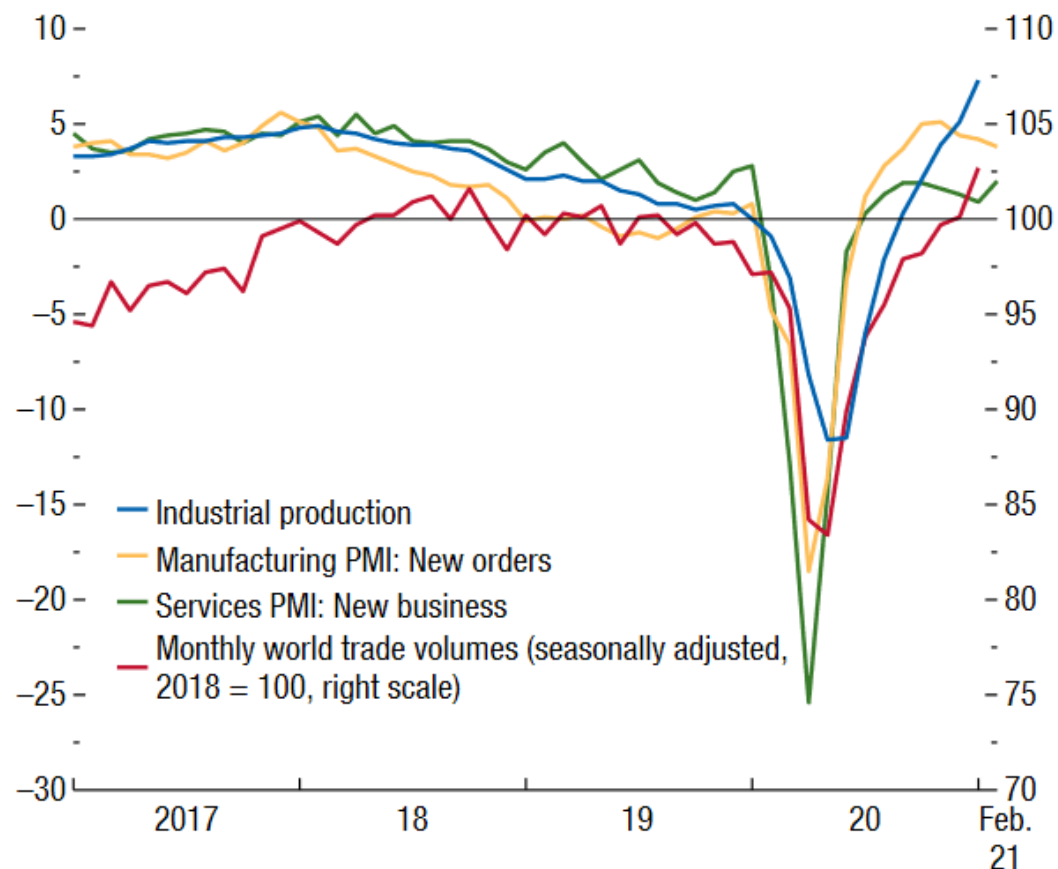


BGR-Office Berlin · Wilhelmstraße 25-30, Germany, www.deutsche-rohstoffagentur.de

Presentation outline

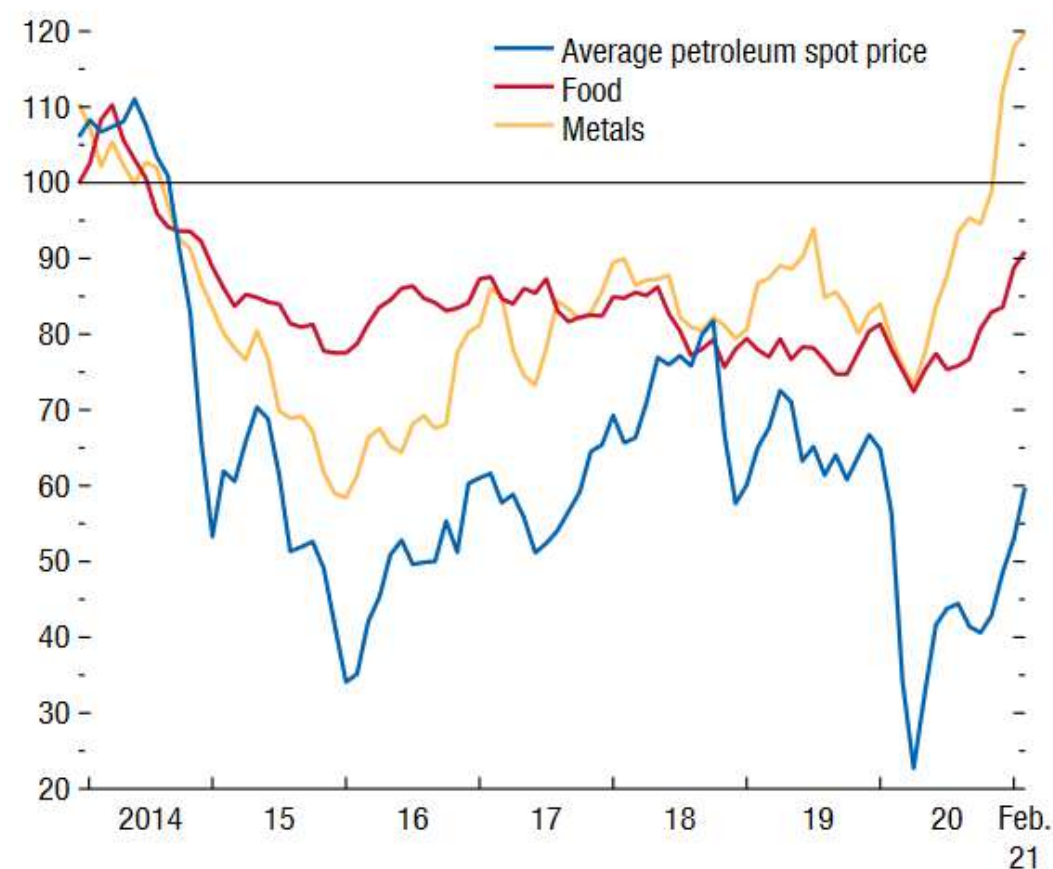
1. World economic outlook
2. Demand drivers
3. Current commodity prices
4. Supercycles and real prices
5. Long-term low-price benchmarks for 28 metals

World Economic Outlook 04/2021, Global Activity Indicators, IMF



Sources: CPB Netherlands Bureau for Economic Policy Analysis; Haver Analytics; Markit Economics; and IMF staff calculations.

Note: PMI = purchasing managers' index.



Sources: IMF Primary Commodity Price System; and IMF staff calculations.

World Economic Outlook 04/2021, IMF

	World	Advanced Economies	USA	Euro Zone	China	Developing Economies	Developing Countries
2020	-3.3	-4.7	-3.5	-6.6	2.3	-2.2	0.0
2021	6.0	5.1	6.4	4.4	8.4	6.7	4.3
2022	4.4	3.6	3.5	3.8	5.6	5.0	5.2

IMF, World Economic Outlook, April 2021

What drives raw materials demand in the long run?

- Industrialization
- Future technologies

Renewable energy, grids Cu, Al



Wind power REE



Solar power

- Thin film cells of amorphous and crystall. Silicon
- Galliumarsenide cells (GaAs)
- Cadmiumtelluride cells (CdTe)
- CIS cells (Cu-In-Diselenide; Cu-In-Ga-Diselenide)

E-mobility

Li, Co, Ni, Mn, Graphite



3D Printing
Lightweight construction
Al, Sc (ScAl alloy)



Digitalization
Cu, Ge, Ga, AS, Ag, Au, Ta



Smart Cities – 5G

Cu, Ge, Ga, As, Ag, Au, Ta



Industry 4.0 – Virtual Reality

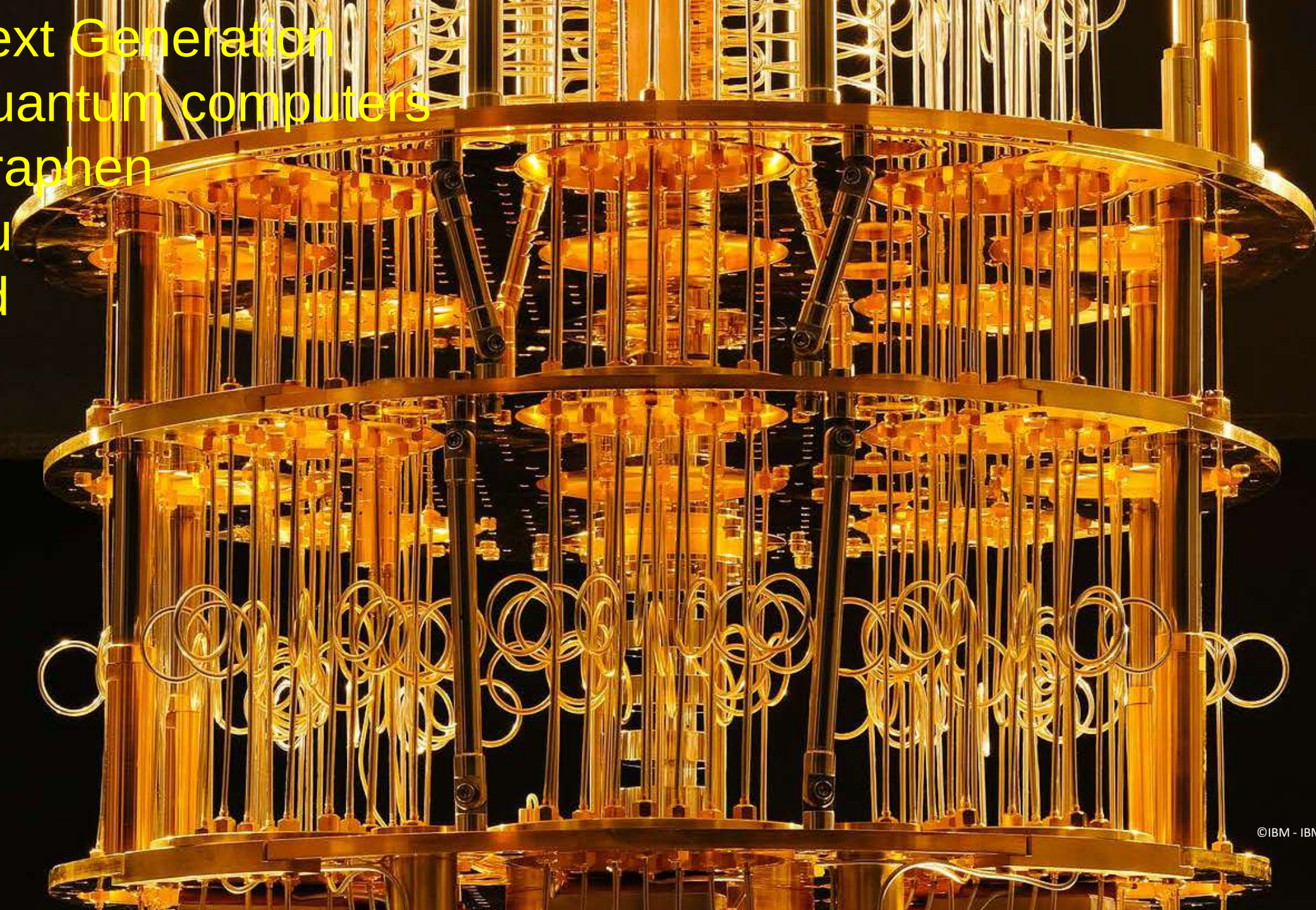
Cu, Ge, Ga, As, Ag, Au, Ta



Next Generation: Autonomous vehicles
Cu, Ge, Ga, As, Ag, Au, Ta



Next Generation
Quantum computers
Graphen
Cu
Pd

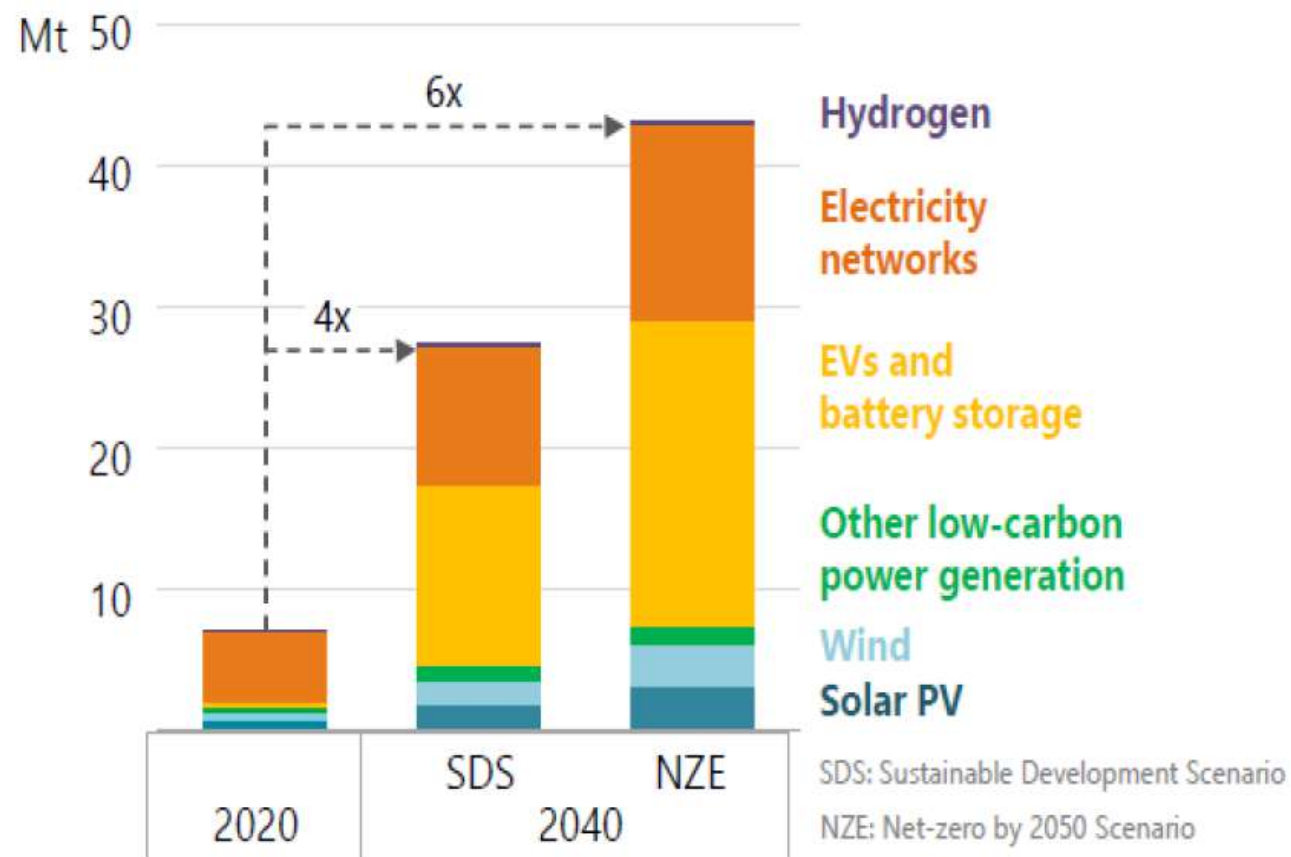


©IBM - IBM quantum computer.

Demand drivers: The Role of Critical Minerals in Clean Energy Transitions, IEA, 2021

Metals demand in 2020 and Scenarios for 2040

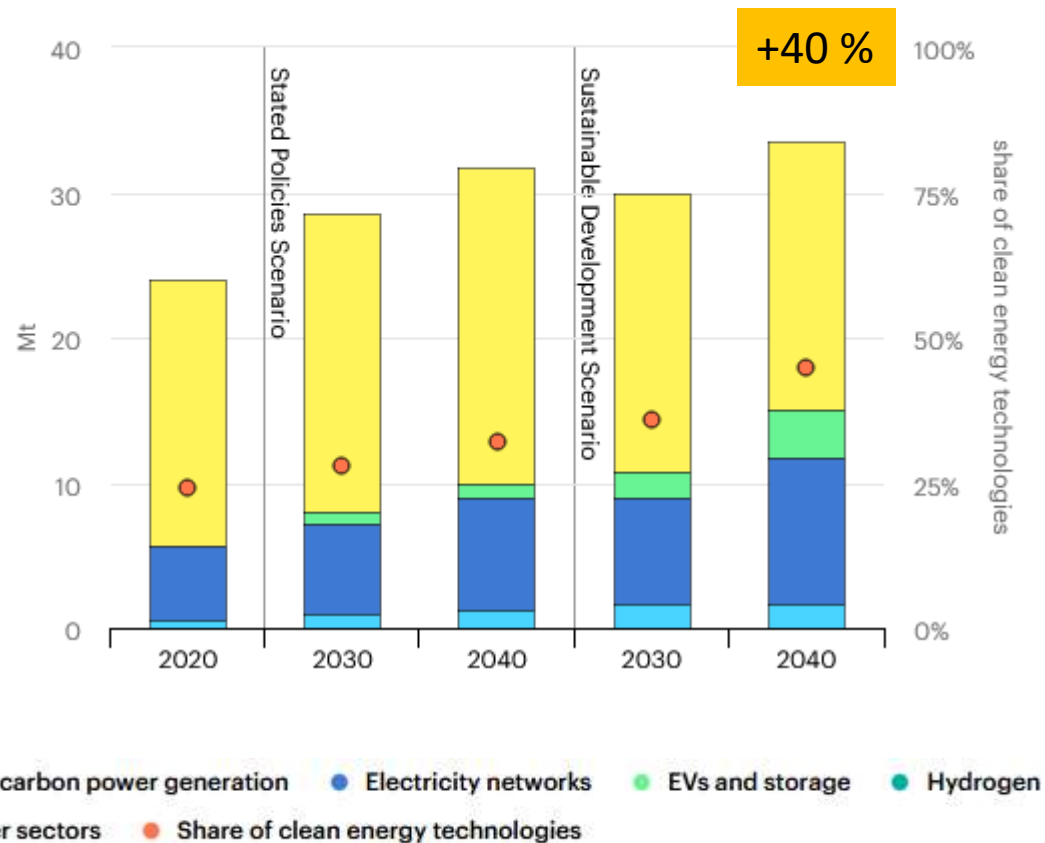
(Sustainable Development and Net Zero Scenarios)



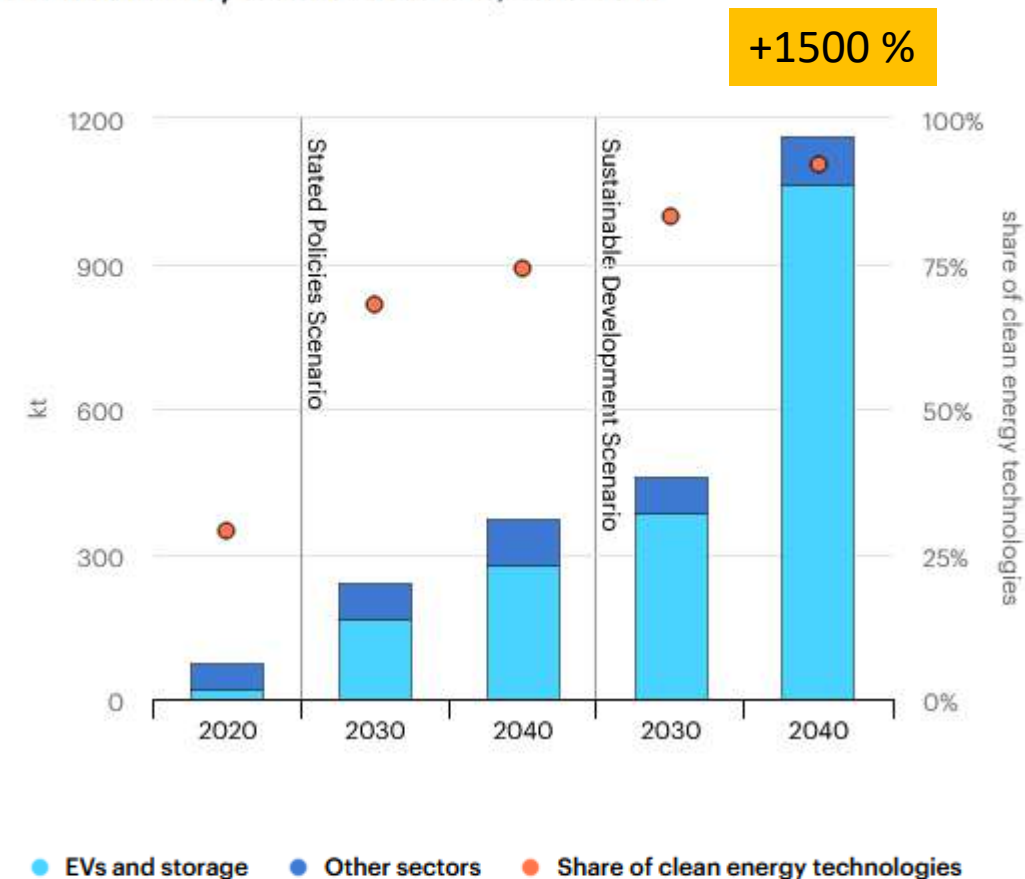
Source: International Energy Agency, 2021.

Demand drivers: The Role of Critical Minerals in Clean Energy Transitions, IEA, 2021

Total copper demand by sector and scenario, 2020-2040



Total lithium demand by sector and scenario, 2020-2040



Demand drivers: The Role of Critical Minerals in Clean Energy Transitions, IEA, 2021

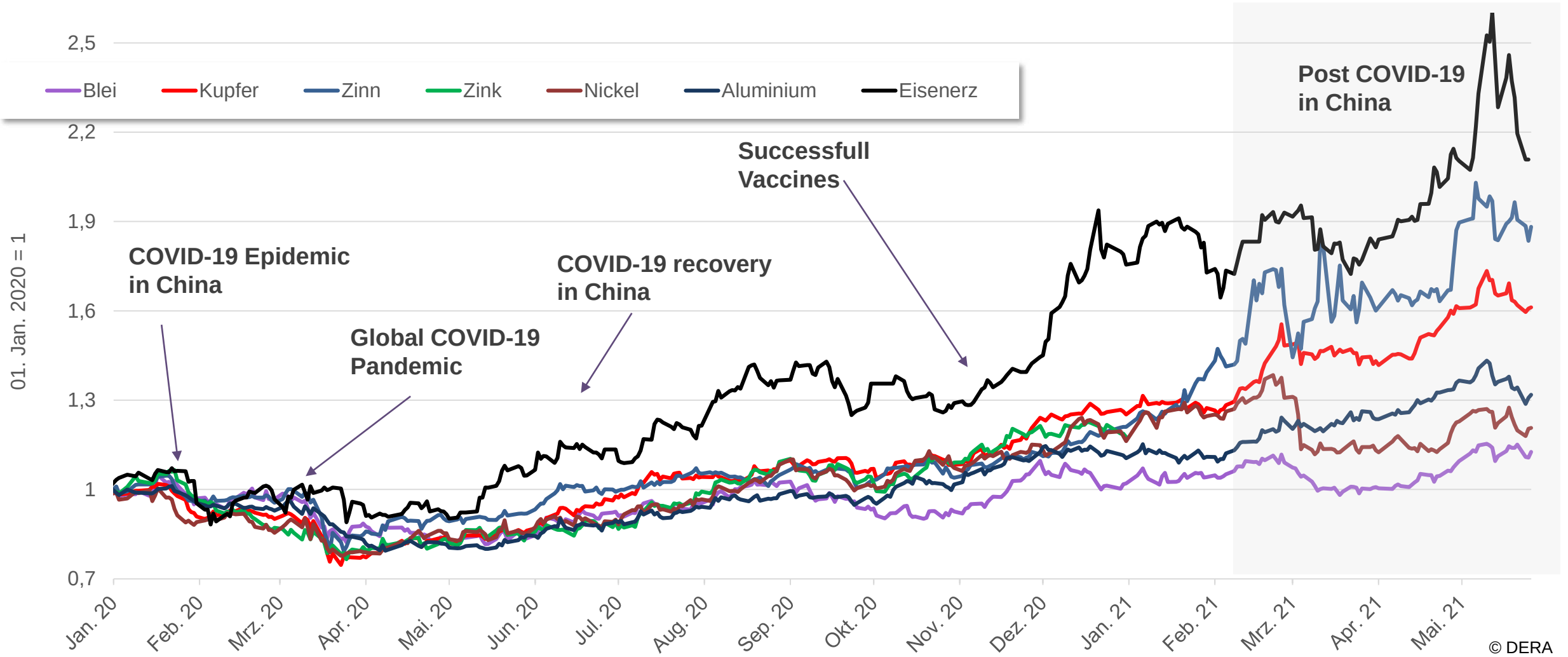
Critical mineral needs for clean energy technologies

	Copper	Cobalt	Nickel	Lithium	REEs	Chromium	Zinc	PGMs	Aluminium
Solar PV	●	●	●	●	●	●	●	●	●
Wind	●	●	●	●	●	●	●	●	●
Hydro	●	●	●	●	●	●	●	●	●
CSP	●	●	●	●	●	●	●	●	●
Bioenergy	●	●	●	●	●	●	●	●	●
Geothermal	●	●	●	●	●	●	●	●	●
Nuclear	●	●	●	●	●	●	●	●	●
Electricity networks	●	●	●	●	●	●	●	●	●
EVs and battery storage	●	●	●	●	●	●	●	●	●
Hydrogen	●	●	●	●	●	●	●	●	●

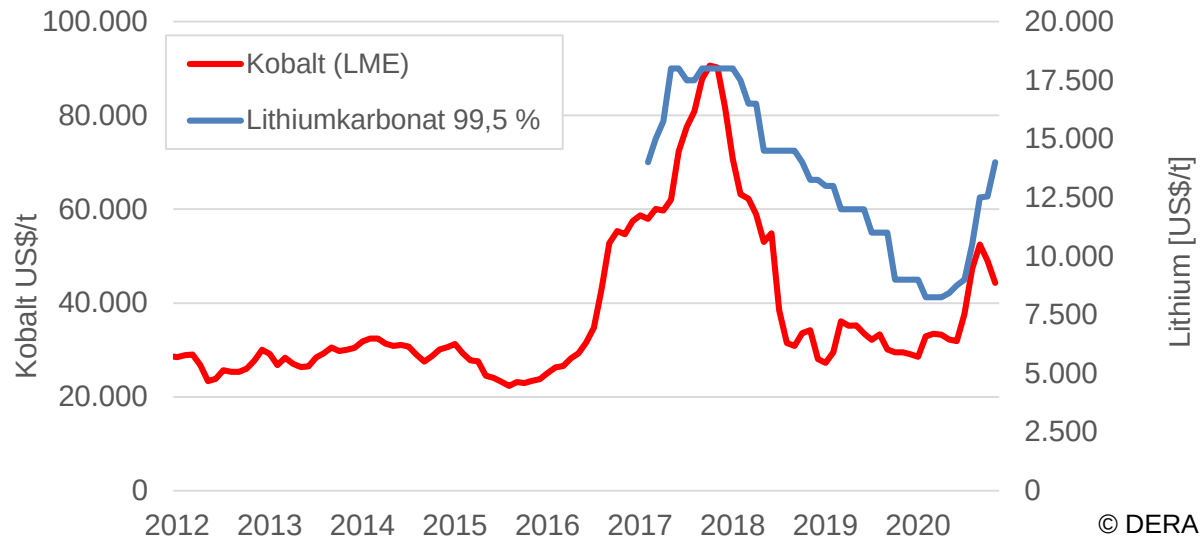
Relative importance of minerals for a particular clean energy technology:

High: ● Moderate: ● Low: ●

Current commodity prices: Relative price development for LME metals & iron ore since 01/2020



Current commodity prices: Lithium and cobalt

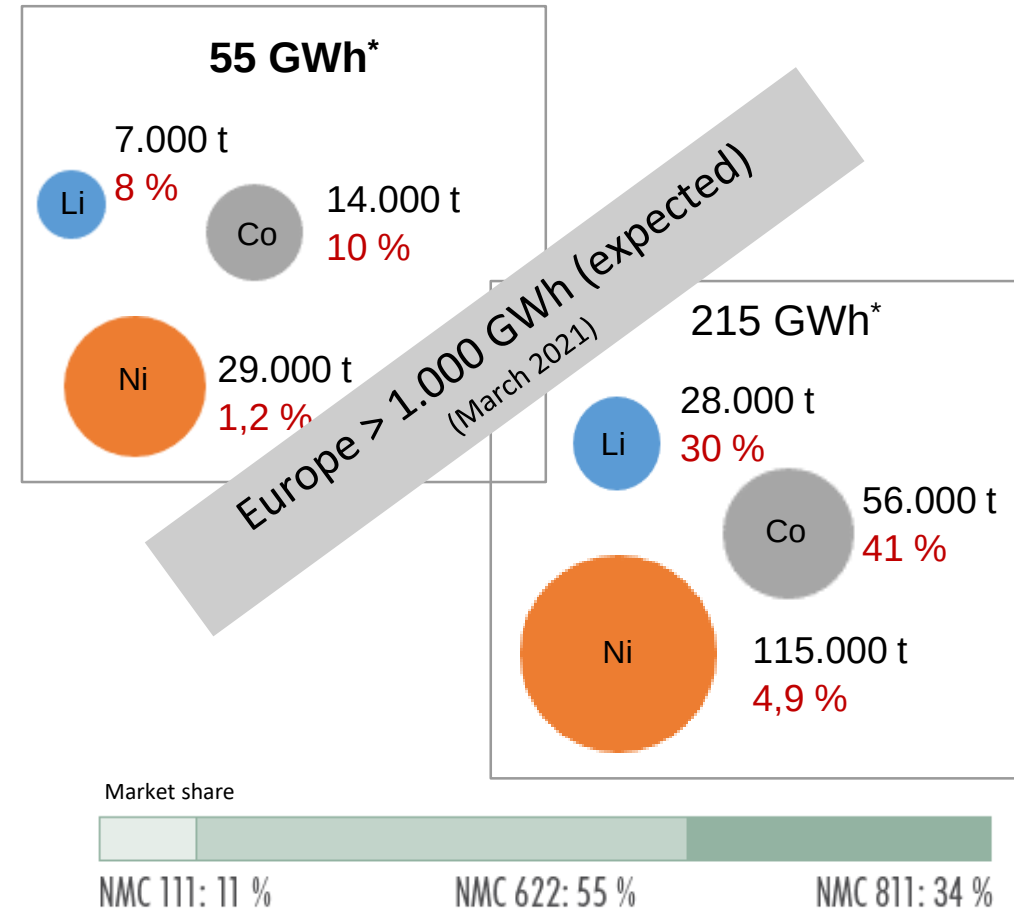


- Glencore reactivates largest Co-mine: Mutanda (~20.000 t Cobalt content, from 2022)
- Export ban of Cu/Co ores and concentrates from DR Congo (Kamoa/Kakula)

Raw materials demand in Germany

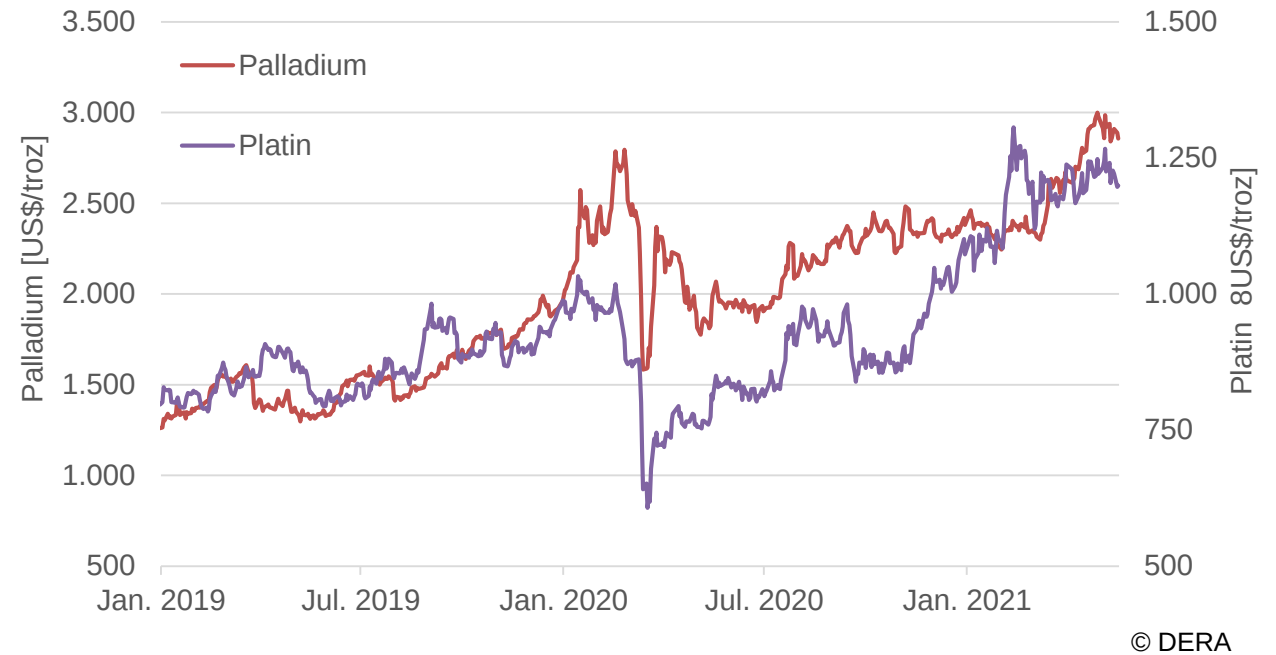
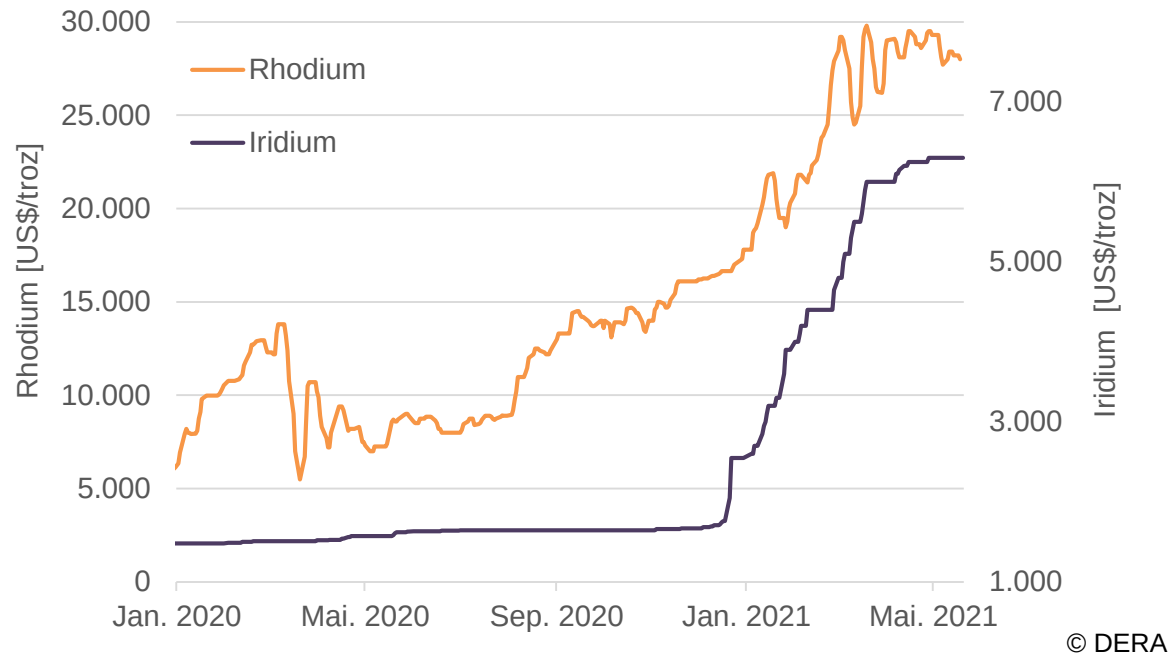
in % of the global production 2018

ohne Tesla



© DERA

Current commodity prices: PGEs



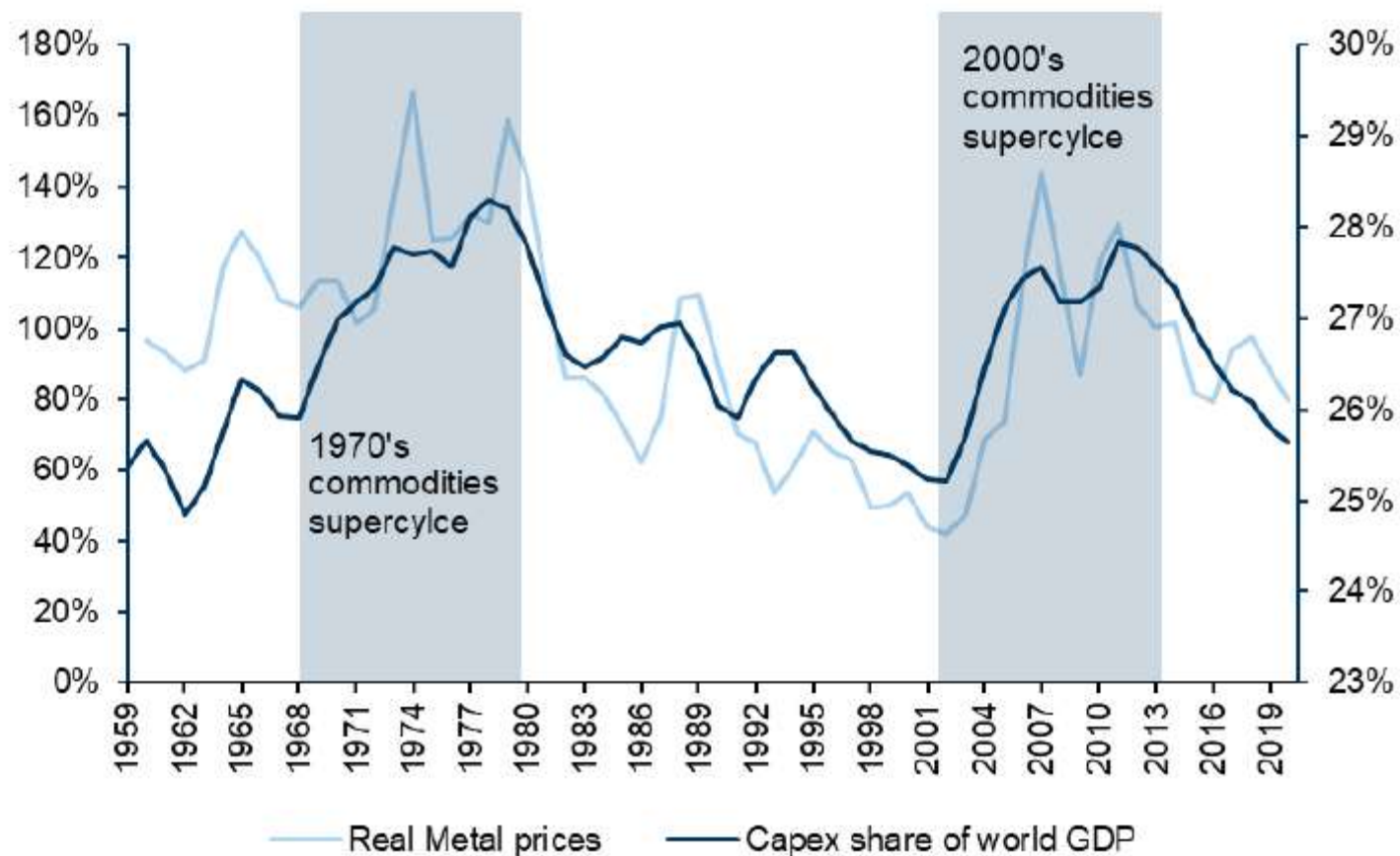
- Reduced supply of PGEs in 2020 through pandemic
- Technical problems at Norilsk and Anglo American lower supply
- Strong demand by the automotive industry (Pd und Rh), electronic industry (Iridium)

Deficit for Rhodium (-31.000 troz) und Palladium (-829.000 troz) expected

Supercycles and real prices: Goldman Sachs Global Investment Research, J. Currie 06/2021

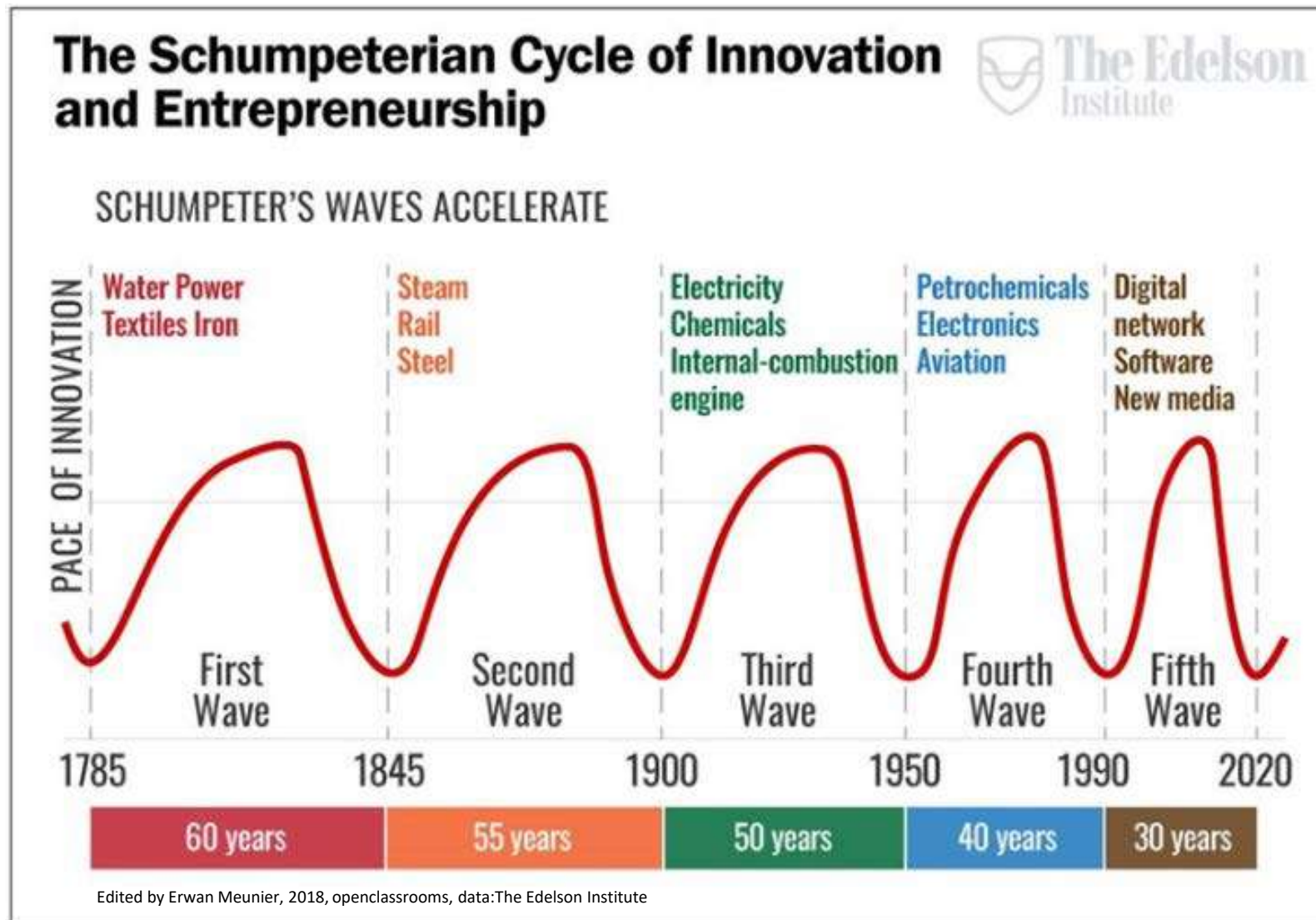
Metal prices reflect underlying demand dynamics better than oil prices

World Bank metals price index, real vs gross fixed capital formation as a % of global GDP.



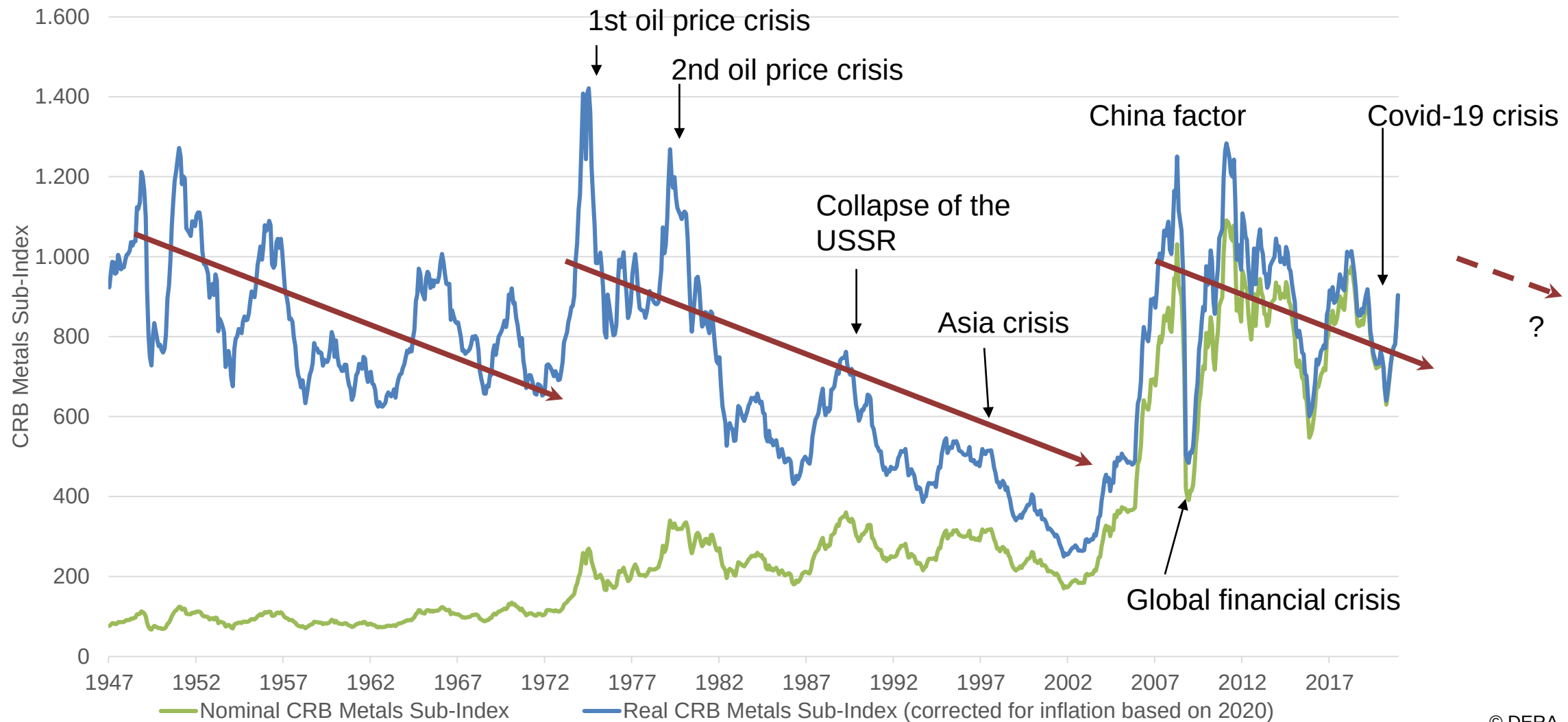
Source: Goldman Sachs Global Investment Research, Haver, World Bank

Supercycles and real prices: Technological innovation cycles

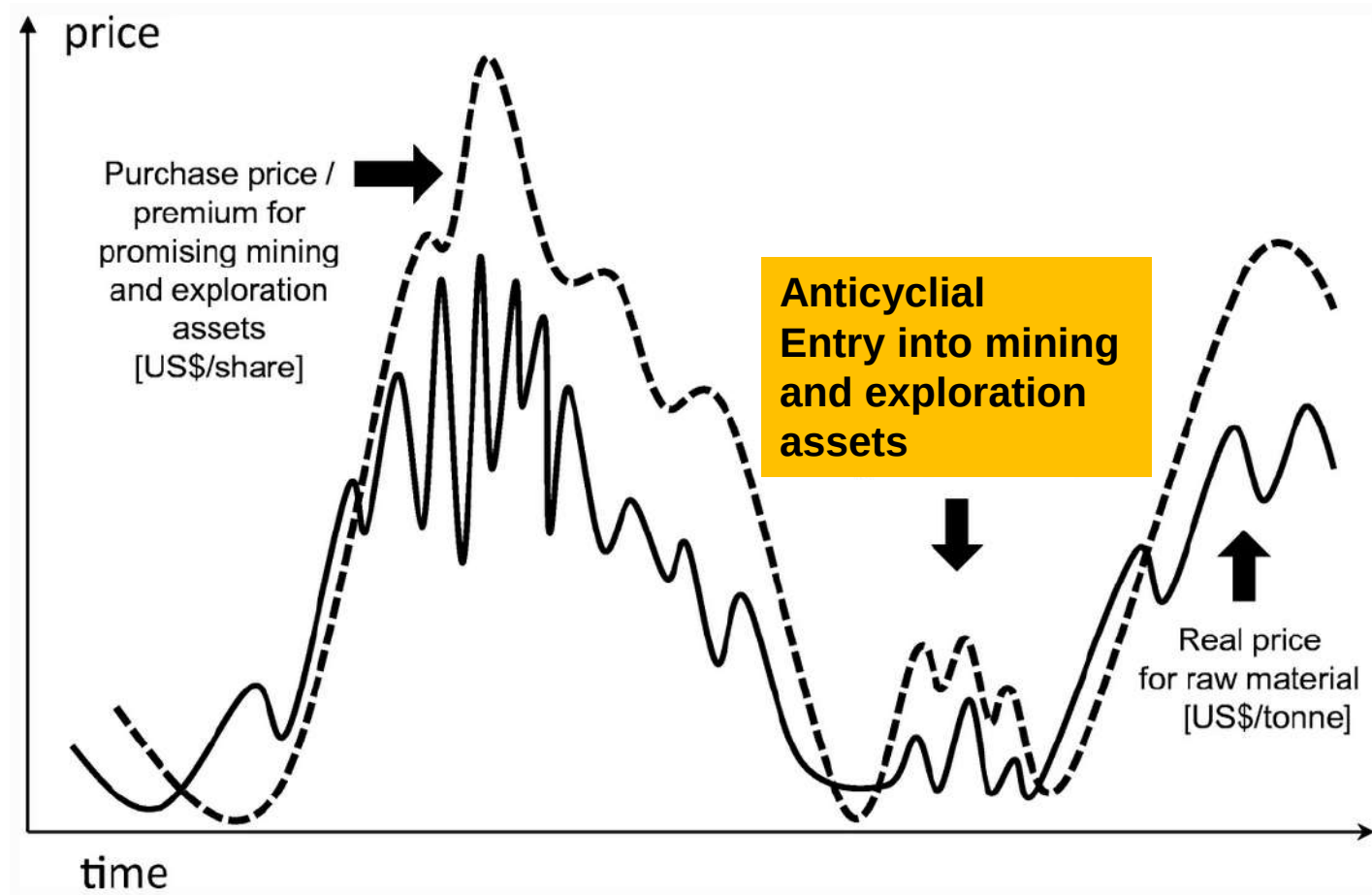


E-Mobility /
Green energy
transition

Supercycles and real prices: CRB-Metals Sub-Index (nominal/real, CPI, basis 12/2020)



Anticyclical investments in mining and exploration assets

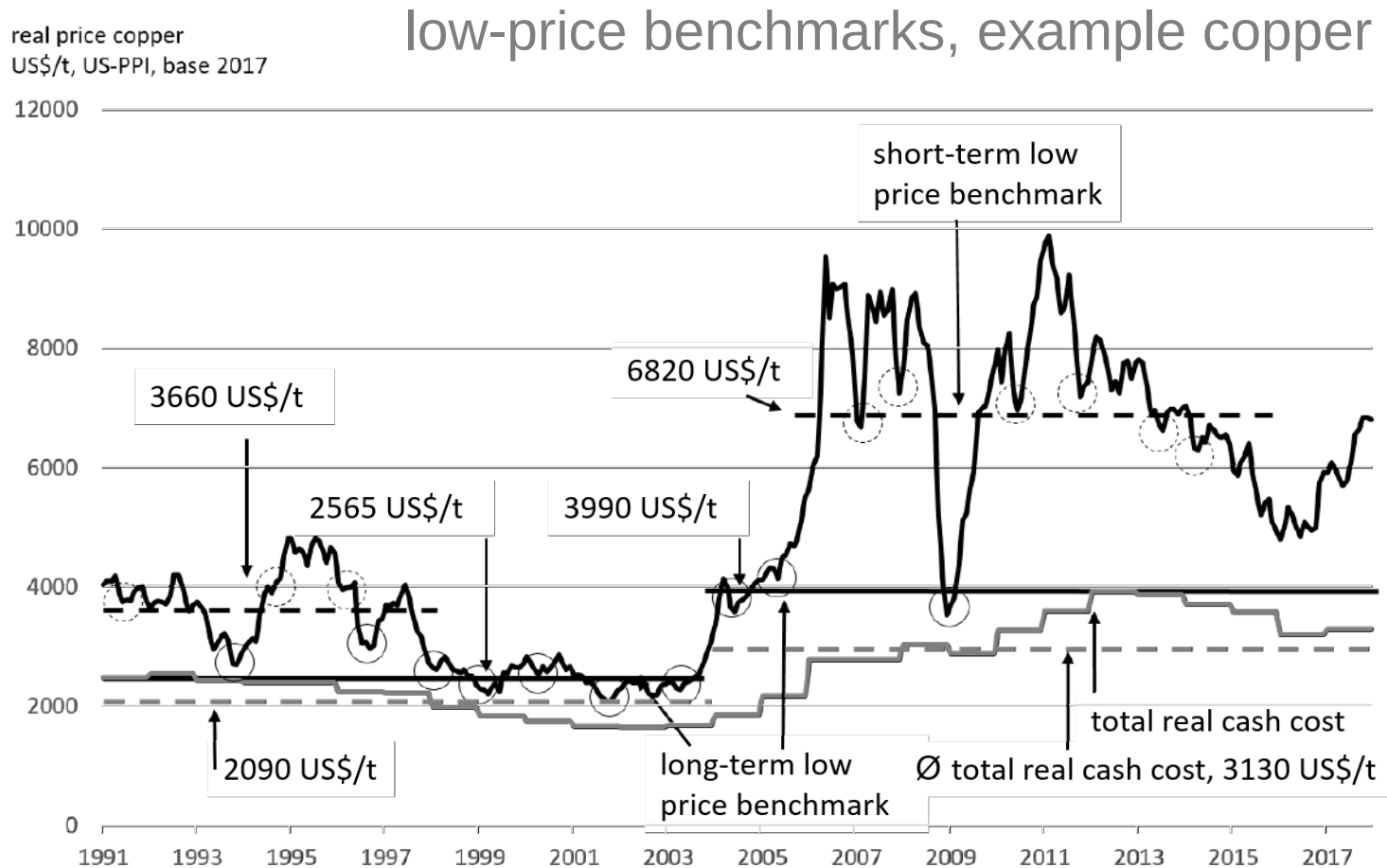


Buchholz P., Wellmer F.W., Bastian D., Liedtke M. (2019) Leaning against the wind: Low price benchmarks for acting anticyclically in the metal markets. Mineral Economics.

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Long term low-price benchmarks for 28 metals



real prices (deflated with PPI,
base 2017)

up to 100 years of price data

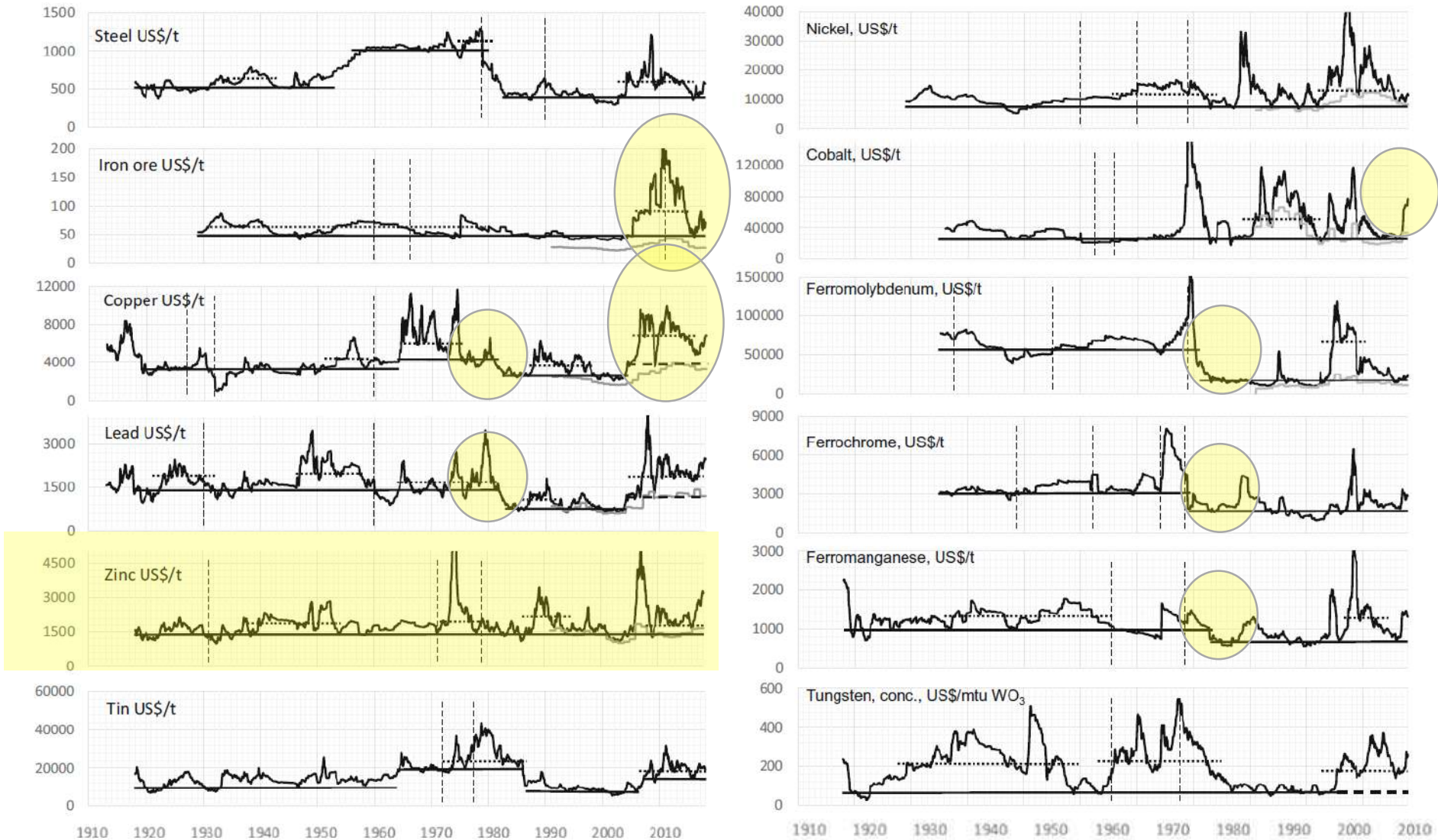
26 years real total cash costs for
11 metals

28 metals studied in total

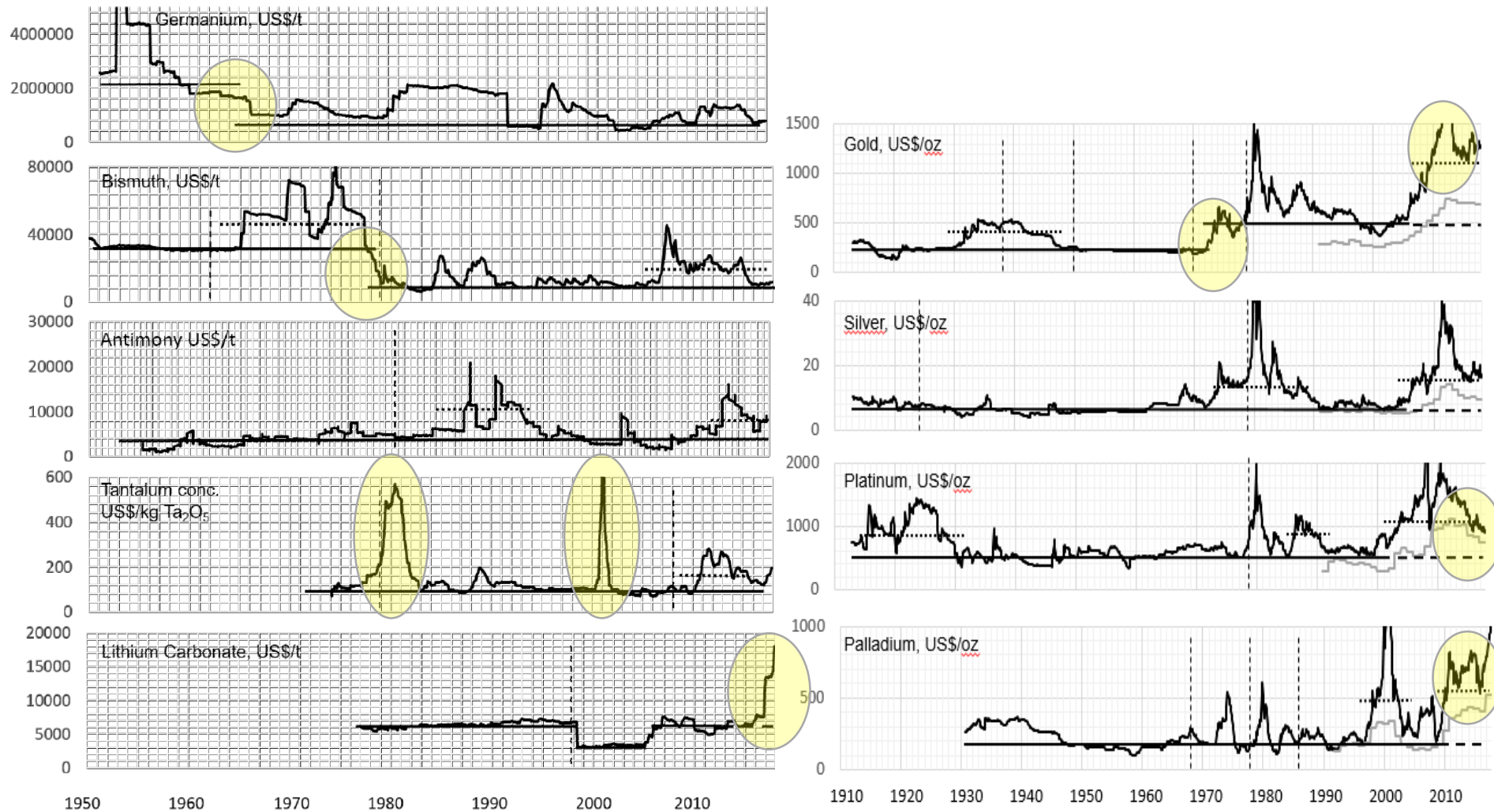
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Open source paper

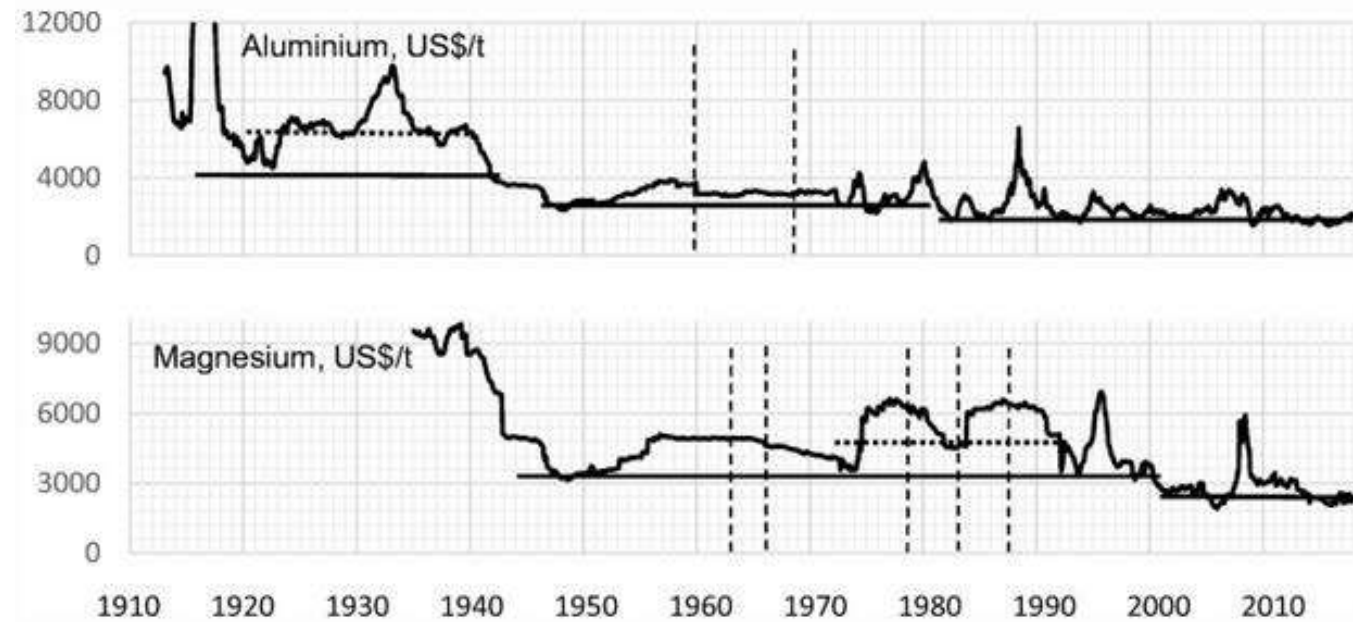
100 years low-price benchmarks – steel, iron ore, base metals



100 years low-price benchmarks – minor and precious metals



100 years low-price benchmarks – Aluminium and Magnesium



Buchholz P., Wellmer F.W., Bastian D., Liedtke M. (2019) Leaning against the wind: Low price benchmarks for acting anticyclically in the metal markets. Mineral Economics.

Take Aways

1. World economic outlook – **positive trend**
2. Demand drivers – **future technologies, especially E-mobility and green energy, are driving long term demand**
3. Current commodity prices – **still upward trend, but possibly overheated**
4. Supercycles and real prices – **Are we in the middle of the supercycle started 2002 or is it a start of a new supercycle?**
5. Long-term low-price benchmarks for 28 metals
 - Metal specific lower price bounds over long periods help investors and buyers to act anticyclically in between cycles, either to secure long-term offtake agreements or to farm into new mining assets at the right time (backward integration, longer term offtakes)
 - Beware of drastic price slumps and inflation
 - Asset financing by banks is often based on lower price assumptions than expected and on the „lower third rule“ of cash cost curves
 - While real prices for most metals have not increased in the past, this may not necessarily hold for the future when it is likely that more environmental and social costs will have to be internalized. The “social licence to operate” may become the most serious challenge for mining, smelting, and refining in the future



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Ndatenda zvikuru!



Source: Fotolia



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