

# Critical raw materials and the energy transition

*4TU Energy Community Meeting*

Benjamin Sprecher 03/04/2025



# Executive Order on Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries

— ECONOMY & JOBS | Issued on: September 30, 2020



I therefore determine that our Nation's undue reliance on critical minerals, in processed or unprocessed form, from foreign adversaries constitutes an unusual and extraordinary threat, which has its source in substantial part outside the United States, to the national security, foreign policy, and economy of the United States. I hereby declare a national emergency to deal with that threat.

# Trump to Expand Critical Mineral Output Using Wartime Powers



Government support offers to help boost domestic production to satisfy the needs of the Defense Department and private industry. *Photographer: Matthew Staver/Bloomberg*

By [Ari Natter](#) and [Joe Deaux](#)

March 20, 2025 at 9:14 PM GMT+1

## Bloomberg

President Donald Trump is invoking emergency powers to boost the ability of the US to produce critical minerals – and potentially coal – as part of a broad effort to ramp up the development of domestic natural resources and make the country less reliant on foreign imports.

An executive order signed by the president Thursday taps the Defense Production Act as part of an effort to provide financing, loans and other investment support to domestically process critical minerals and rare earth elements, according to a White House official. The US International Development Finance Corporation, working with the Department of Defense, will provide financing for new mineral production projects.



# We explored the Dutch energy system of 2050 in terms of material demand



## The Netherlands and the EU in numbers

NL – EU



0,8% - 16% GDP



0,5% - 11% ENERGY

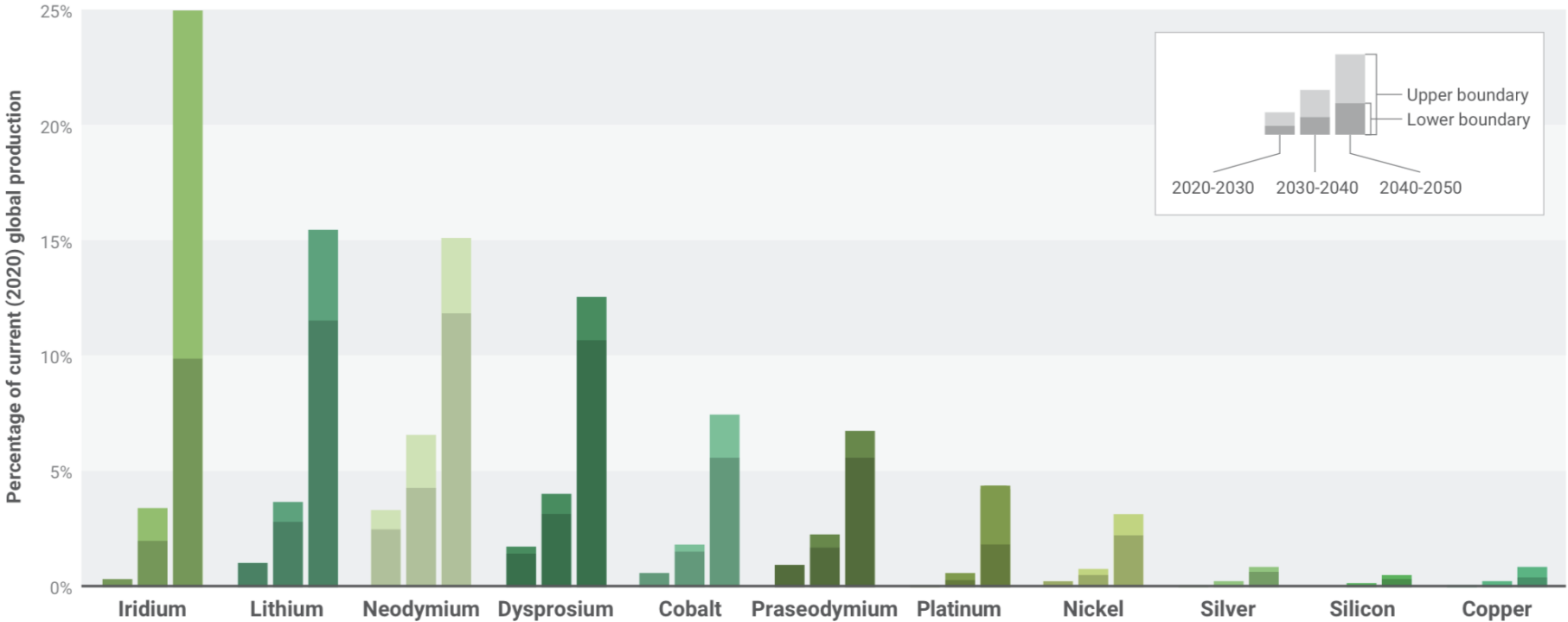


0,2% - 9,8% POPULATION



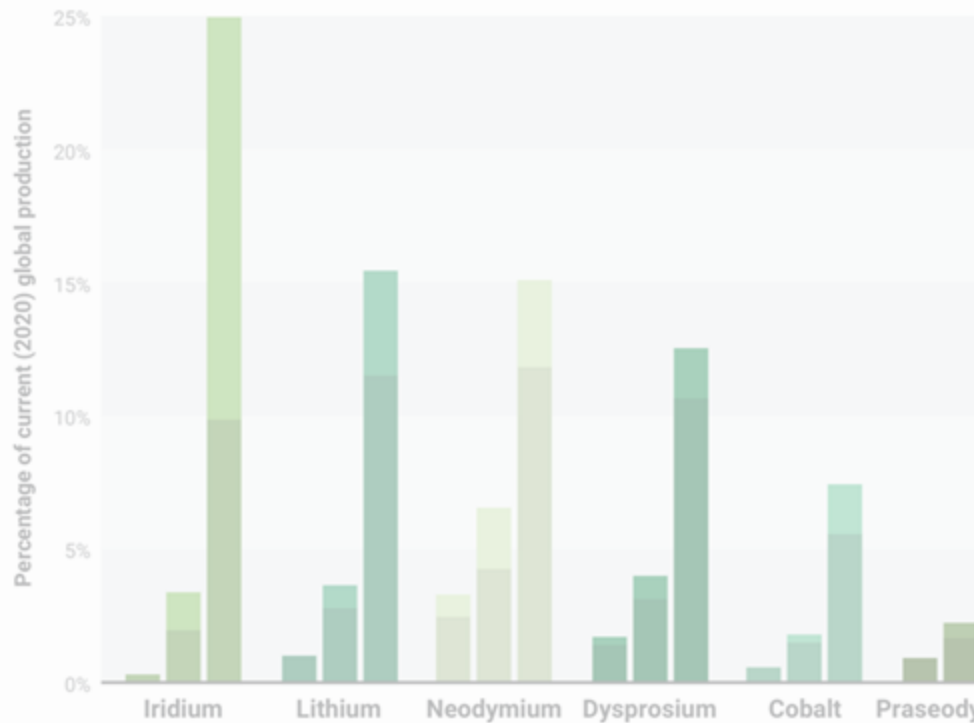
# The Netherlands will require a significant share of global production

## Average annual demand for 10 critical metals

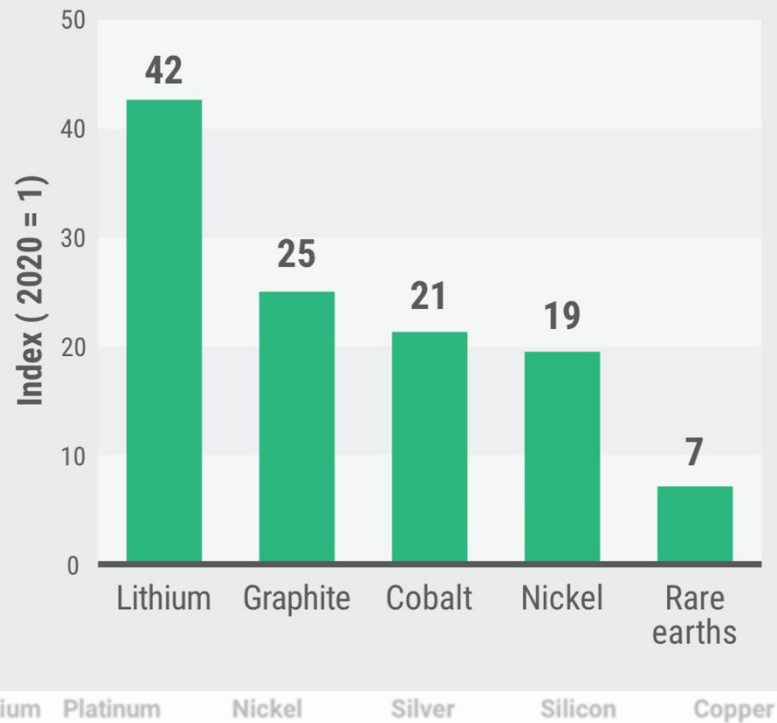


# The global energy transition will require a significant increase of production

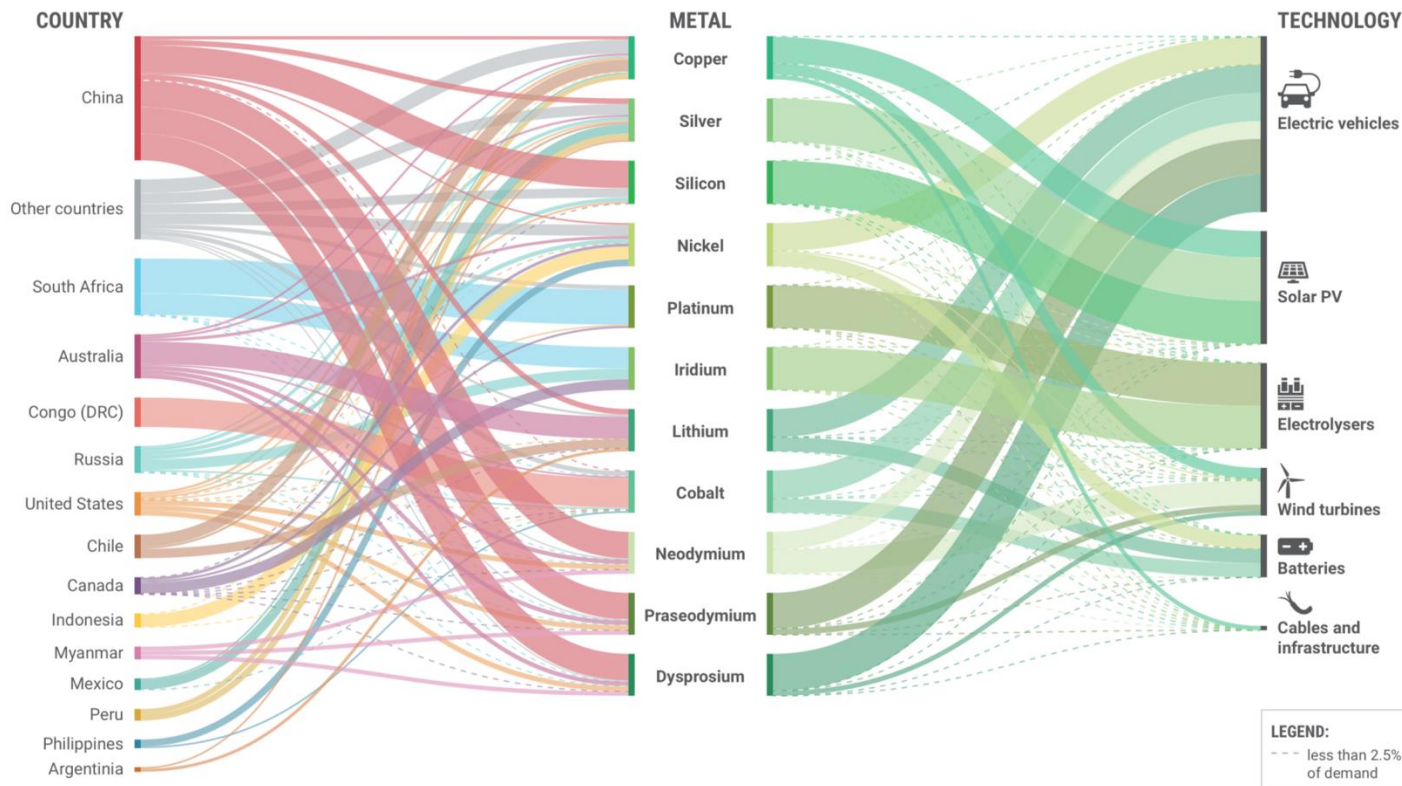
*Average annual demand for 10 critical metals*



**Growth of selected minerals in the SDS, 2040 relative to 2020**

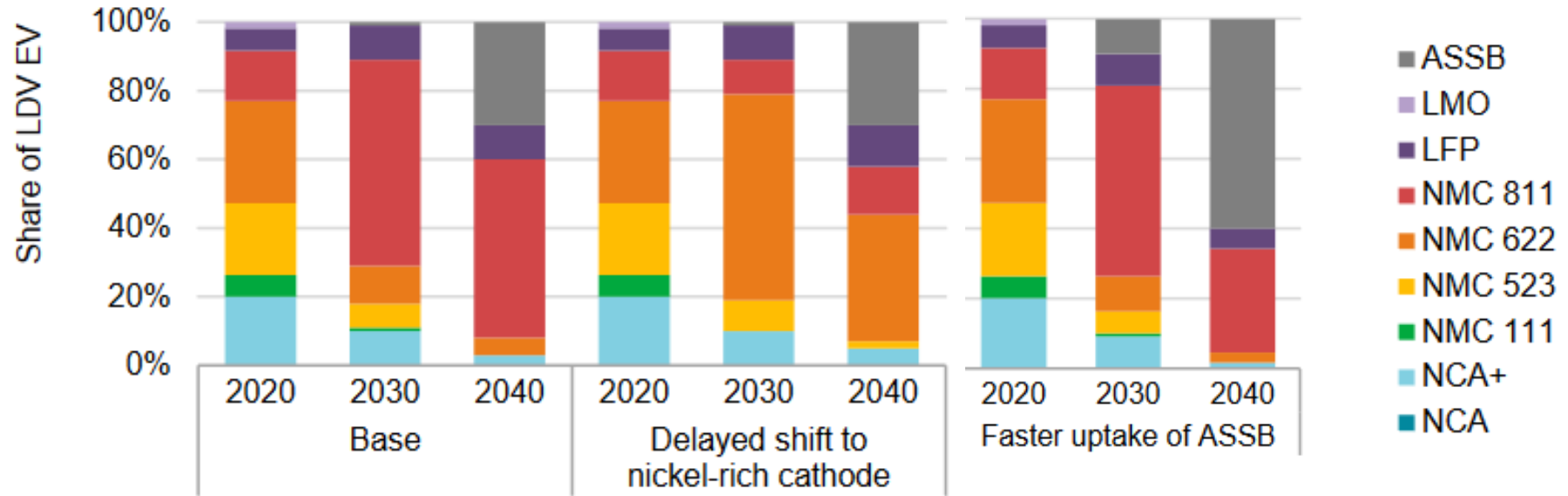


# Critical raw materials are sourced from a diverse set of countries





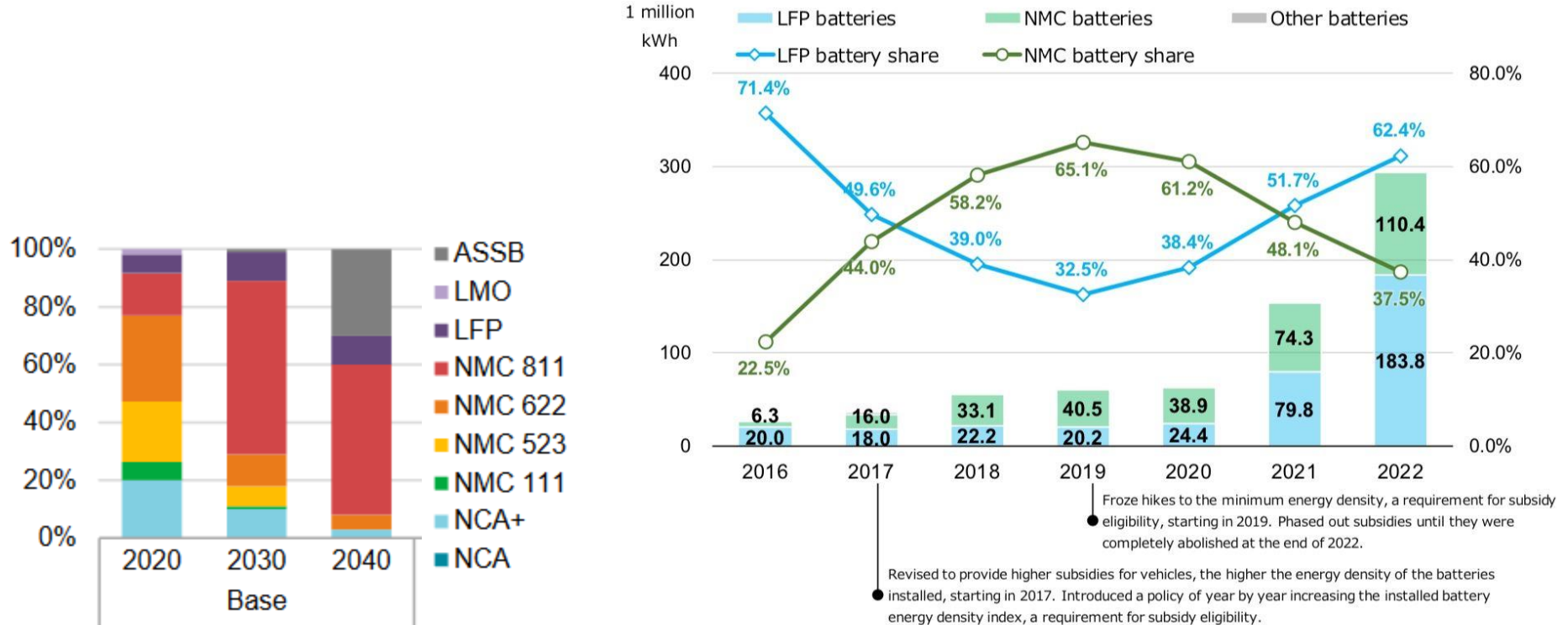
## Technology is very much in flux



IEA. All rights reserved.

# Technology is very much in flux

**Figure 2: Trends in volume of LFP and NMC batteries installed in EVs in China (2016 to 2022)**

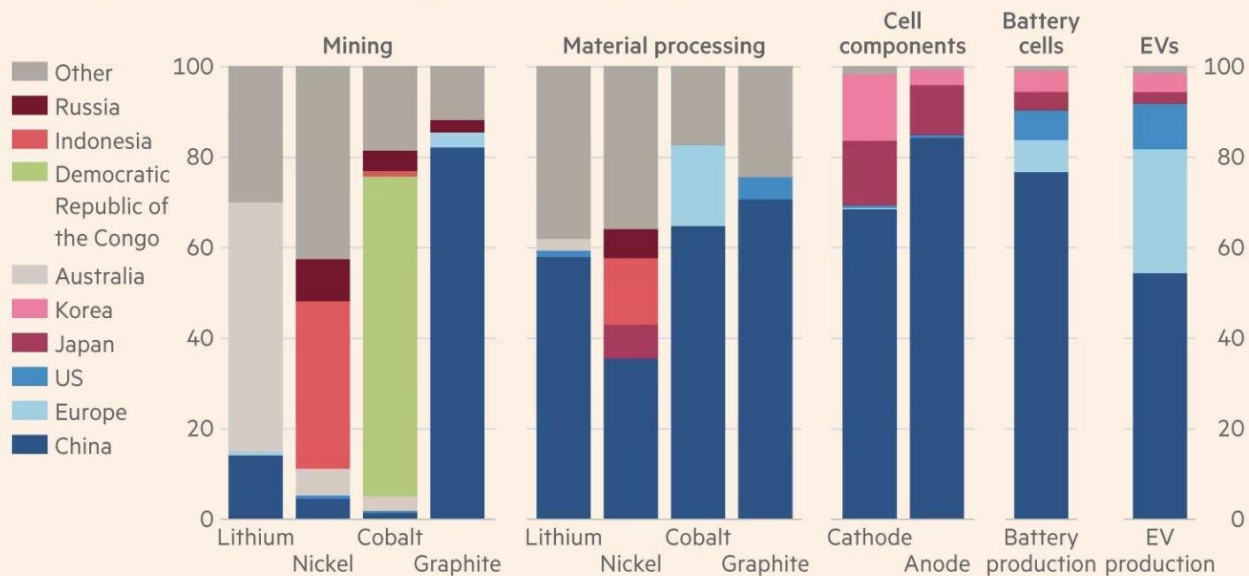


Source: Compiled by MGSSI based on materials released by the China Automotive Power Battery Industry Innovation Alliance and the Chinese government

# Mining is all over the world but processing is not so diverse

## China dominates the entire downstream EV battery supply chain

Geographical distribution\* of the global EV battery supply chain (%)



\* Refers to the country where the production occurs

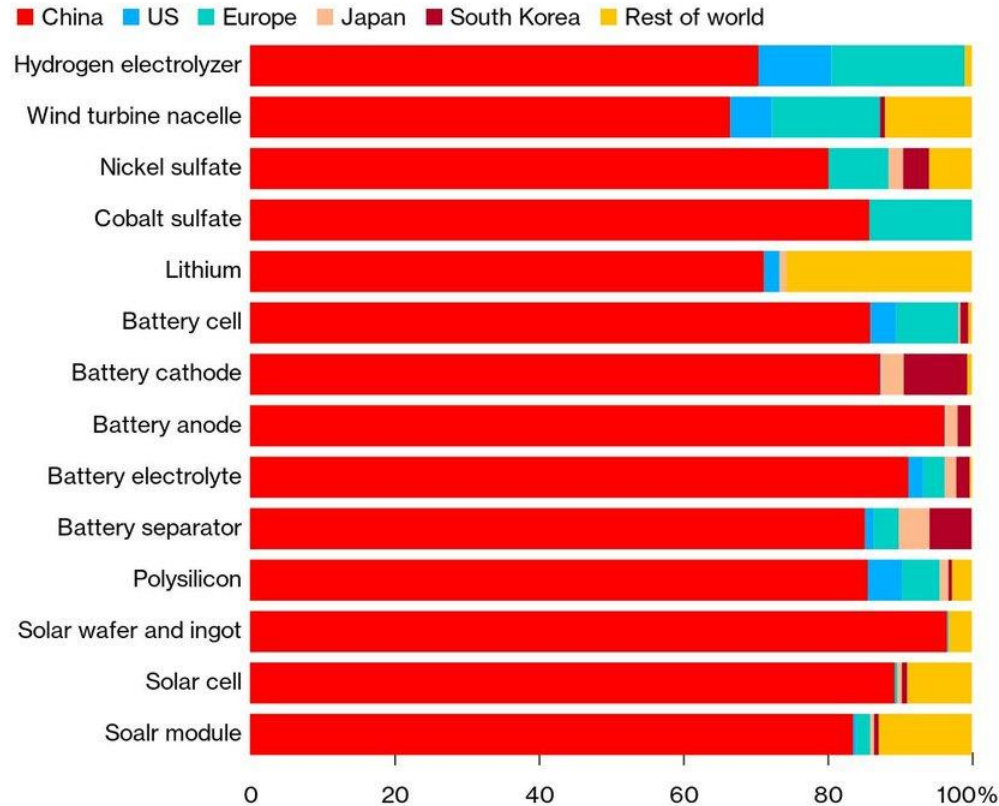
Mining is based on production data. Material processing is based on refining production capacity data. Cell component production is based on cathode and anode material production capacity data. Battery cell production is based on battery cell production capacity data. EV production is based on EV production data

Source: IEA

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## China Extends Dominance of Clean-Tech Supply Chains

Its share of global manufacturing capacity is now above 80% in 11 clean-tech segments

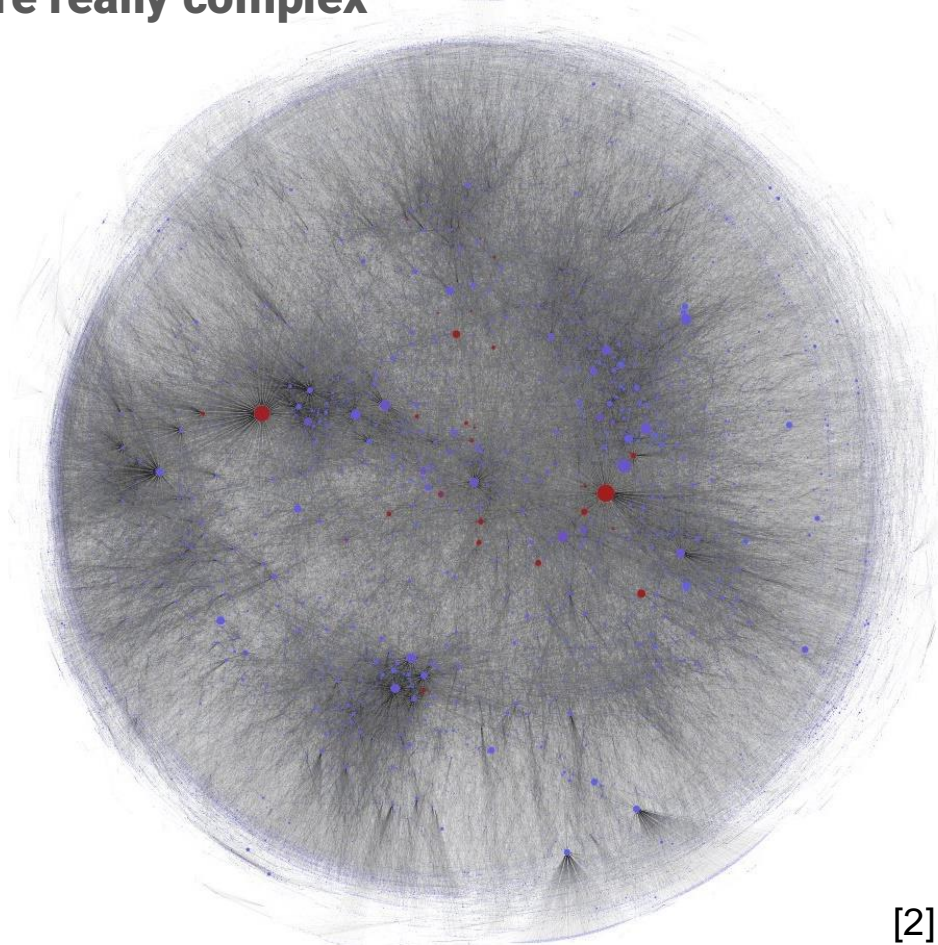
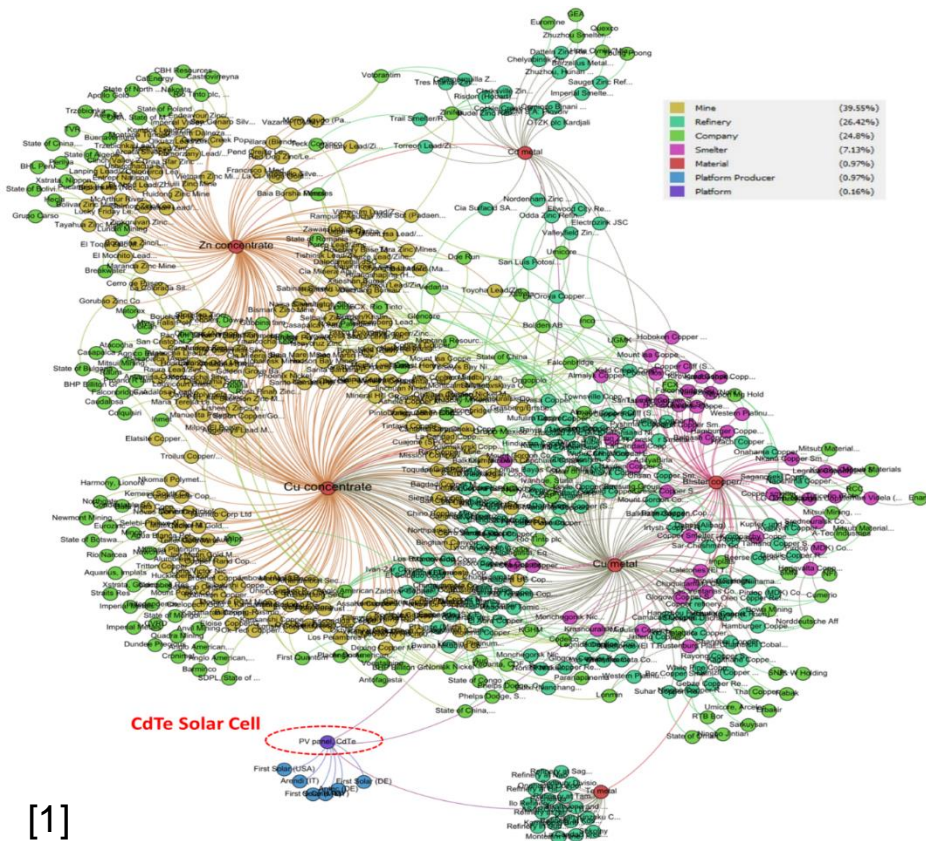


Source: BloombergNEF

Note: Capacity is by physical facility location, not manufacturer headquarters.

Lithium refers to lithium hydroxide and carbonate.

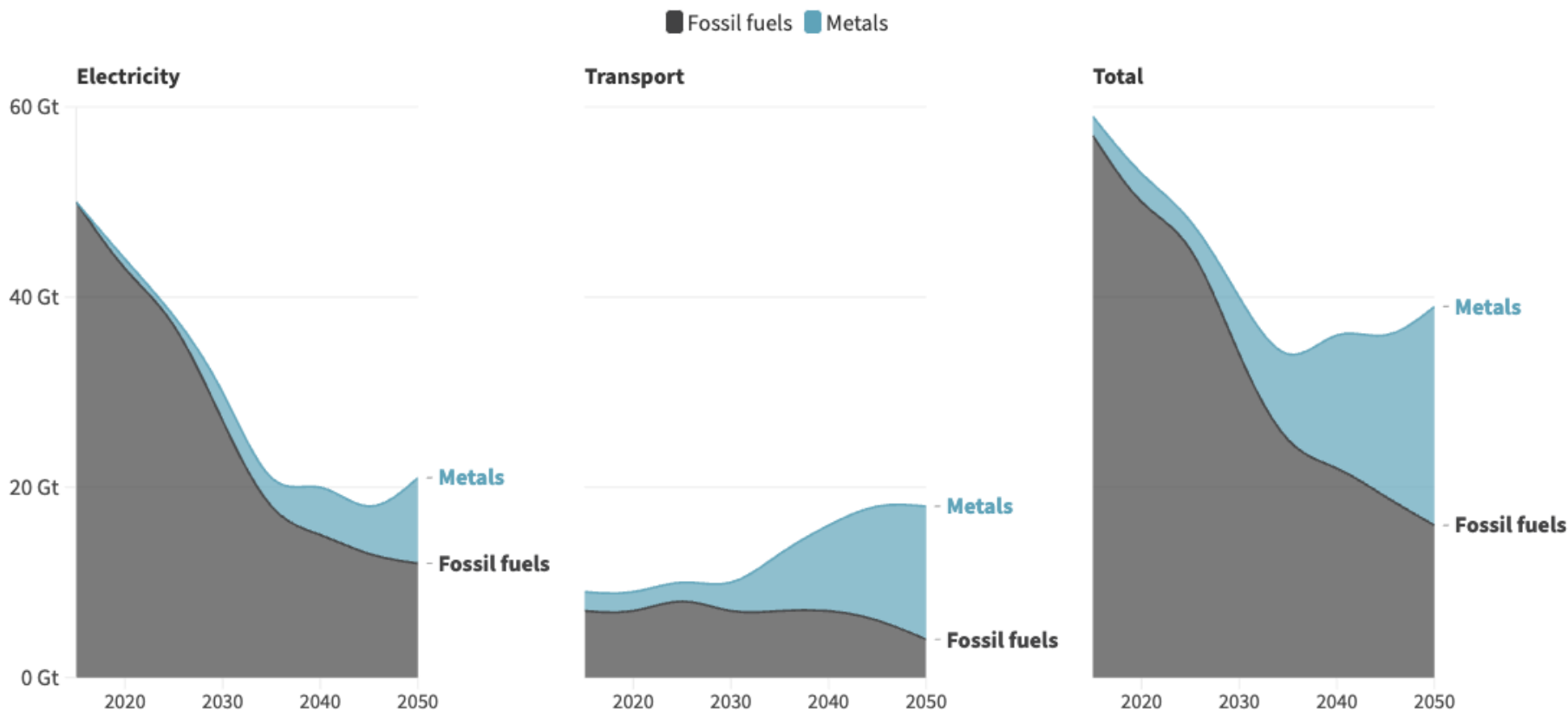
# Supply chains are really complex





# Total material requirements for the energy transition

Based on an International Energy Agency's (IEA) scenario to keep global temperature rise to 1.75°C by 2100. Total material requirements includes the minerals and metals used for energy production, plus all waste rock that needs to be moved to extract them.



Source: Watari et al. (2021). Sustainable energy transitions require enhanced resource governance.

**An eye towards  
solutions**



# Four mitigation strategies



**Rethink** less energy use and system redesign



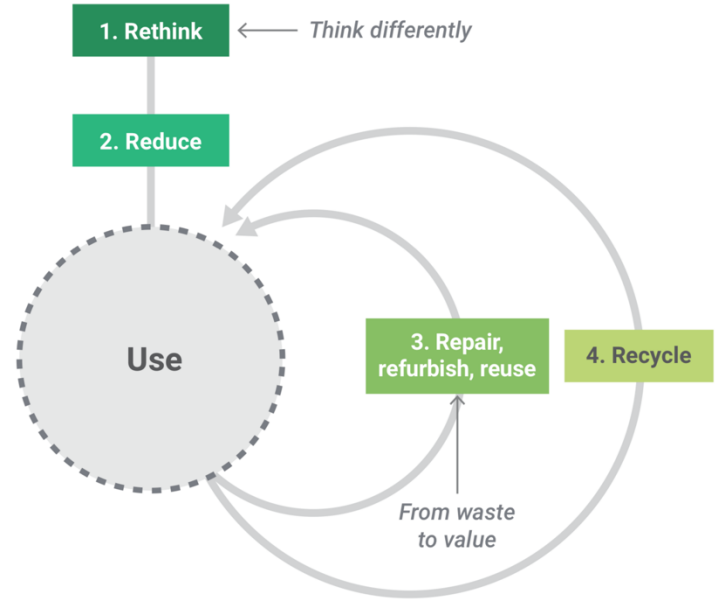
**Reduce** material efficiency and substitution



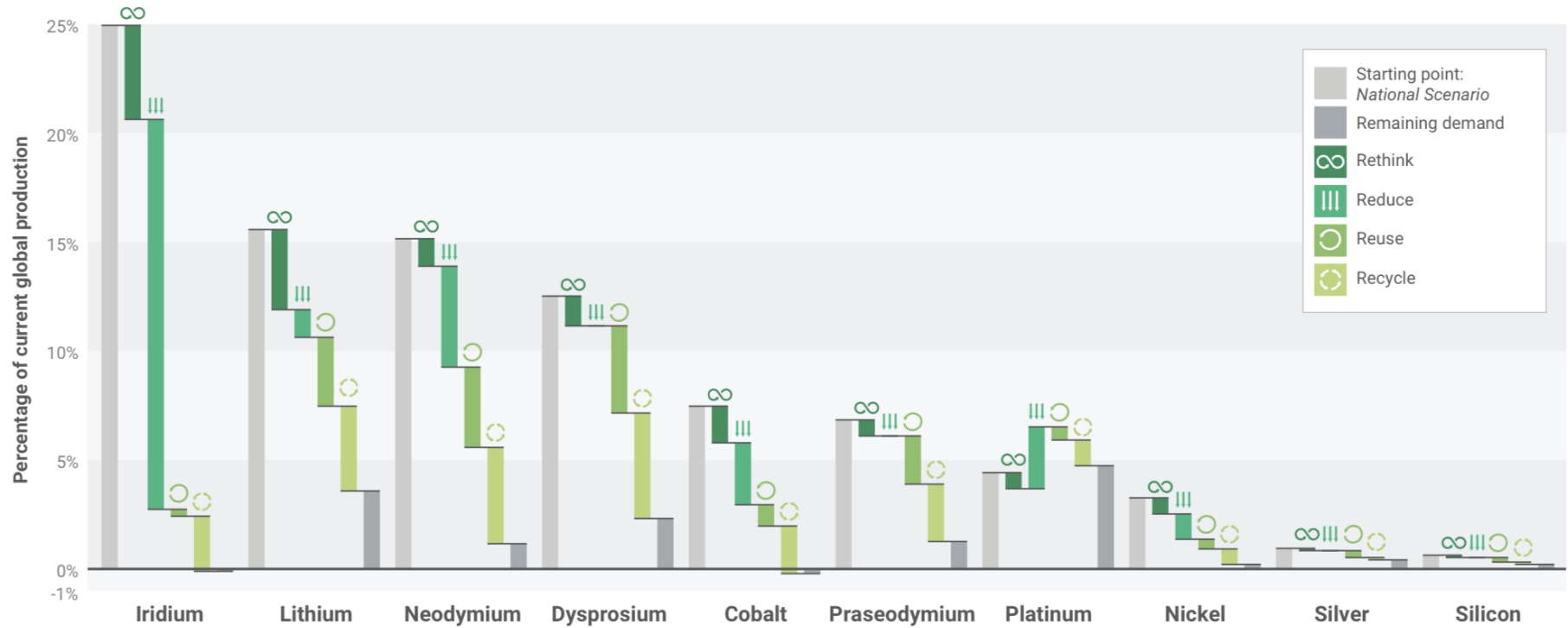
**Repair** increase lifespan



**Recycle** recovery of materials



# Potential impact of mitigation strategies



## Four recommendations



**1**  
**Monitoring,  
transparency &  
knowledge  
development**



**2**  
**All mitigation  
strategies  
simultaneously**



**3**  
**Competent,  
coherent and long  
term vision &  
strategy**



**4**  
**Better laws and  
regulations, better  
implementation**



# Book recommendations

'The definitive, eye-opening story of the most powerful and secretive traders in the world.' *Bradley Hope, co-author of Billion Dollar Whale*

## THE WORLD FOR SALE

Money, Power and the Traders  
Who Barter the Earth's Resources



JAVIER BLAS & JACK FARCHY

New Studies in Archaeology

## The Collapse of Complex Societies

JOSEPH A. TANTER



MARIANA MAZZUCATO  
ROSIE COLLINGTON

## THE BIG CON

HOW THE  
CONSULTING INDUSTRY  
Weakens our Businesses,  
Infantilizes our Governments  
AND  
Warps our Economies

allen lane

Thank you for your attention

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## References

- [1] Nuss, P., Graedel, T. E., Alonso, E., & Carroll, A. (2016). Mapping supply chain risk by network analysis of product platforms. *Sustainable Materials and Technologies*, 10, 14-22.
- [2] <https://phys.org/news/2022-05-country-entire-economy-predictand-forthe.html>
- [3] IEA 2022 The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions

<https://trumpwhitehouse.archives.gov/presidential-actions/executive-order-addressing-threat-domestic-supply-chain-reliance-critical-minerals-foreign-adversaries/>

*Het energiesysteem van de toekomst:*

<https://www.tennet.eu/nl/bedrijf/publicaties/ii3050/>

*Towards a circular energy transition (2021)*

<https://www.metabolic.nl/projects/circular-strategies-for-mitigating-surgings-critical-metal-demand/>

Price graphs: Bloomberg & The Rare Earth Observer September 2022 newsletter