Supply chain challenges in the mining and semiconductor industries

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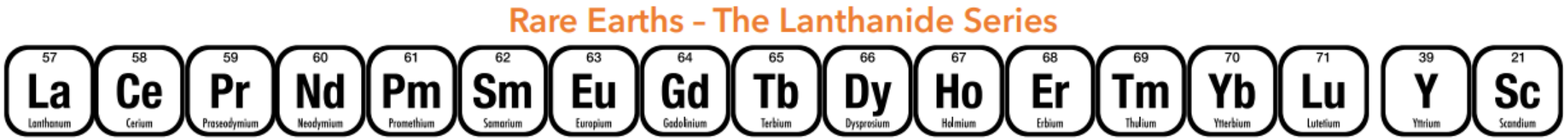
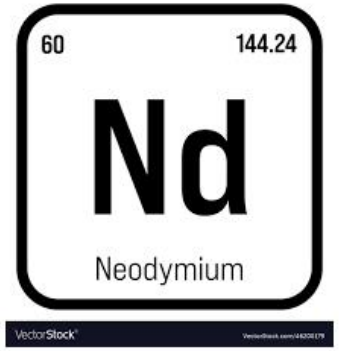
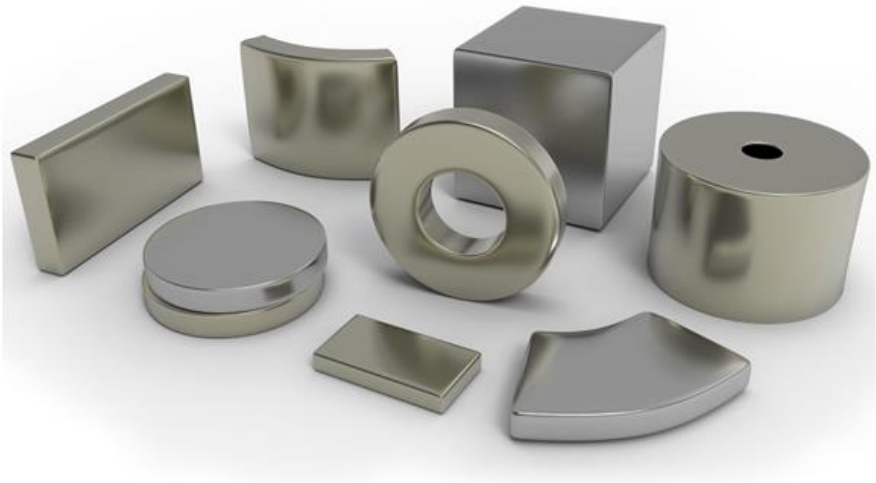
Supply chain at risk: the case of Rare Earths







Sources: Google image, MP Materials

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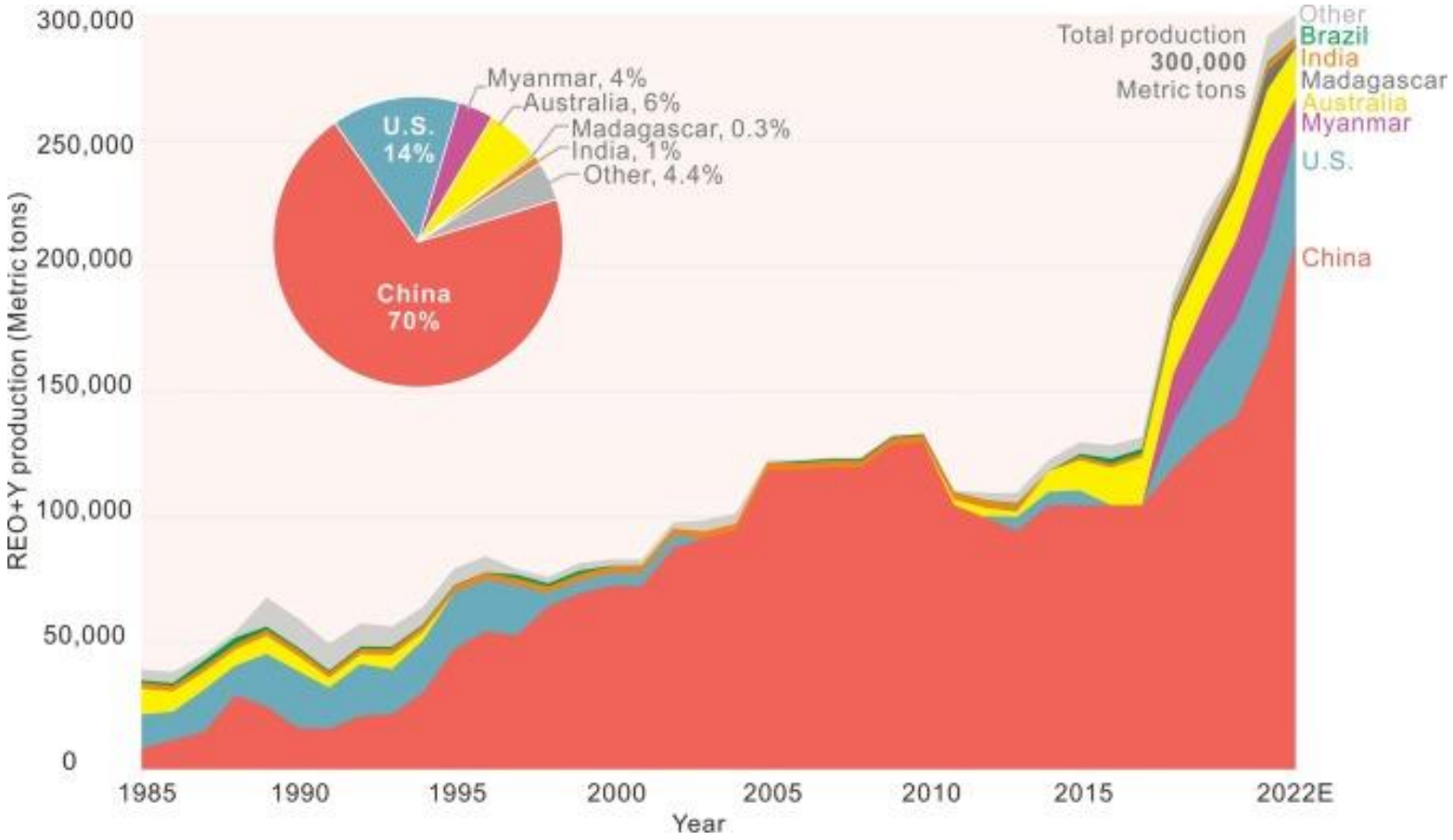
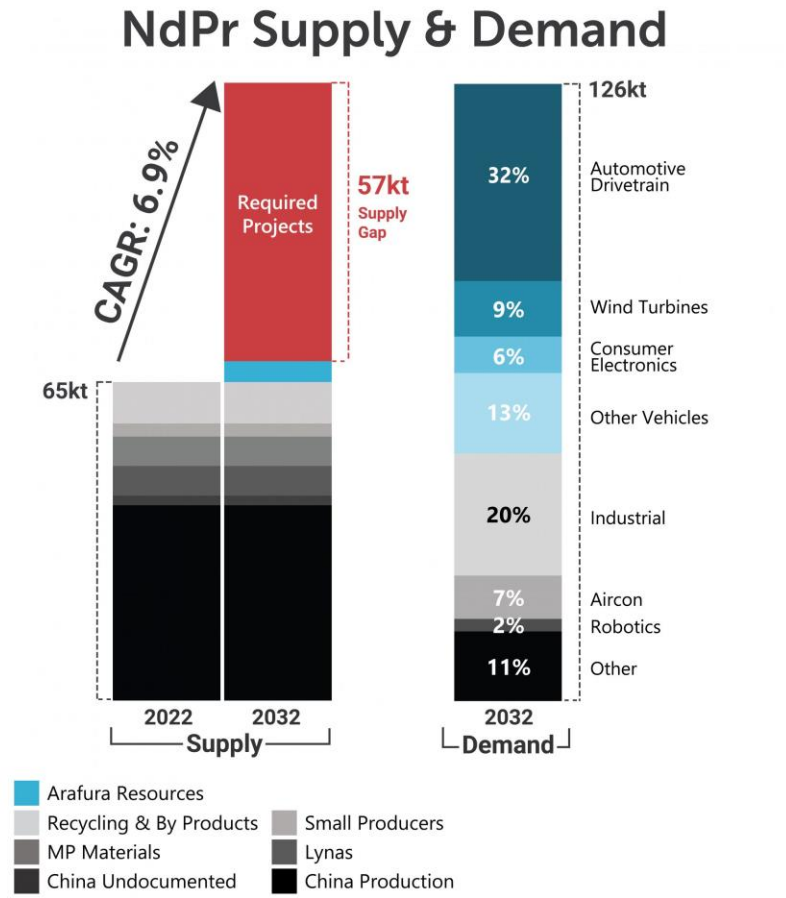
Supply of Rare Earth elements dominated by China. Demand is coming from critical sectors.





Source: Arafura internal Supply Demand forecast referencing Wood Mackenzie – Rare Earths Market Study, July 2022; General Administration of Customs of China via Baiinfo January 2023, Roskill 2021. Supply is primary supply, including monazite and excludes secondary source of NdPr supply from waste magnet production.

Sources: sciencedirect.com and Arafura using Wood Mackenzie data

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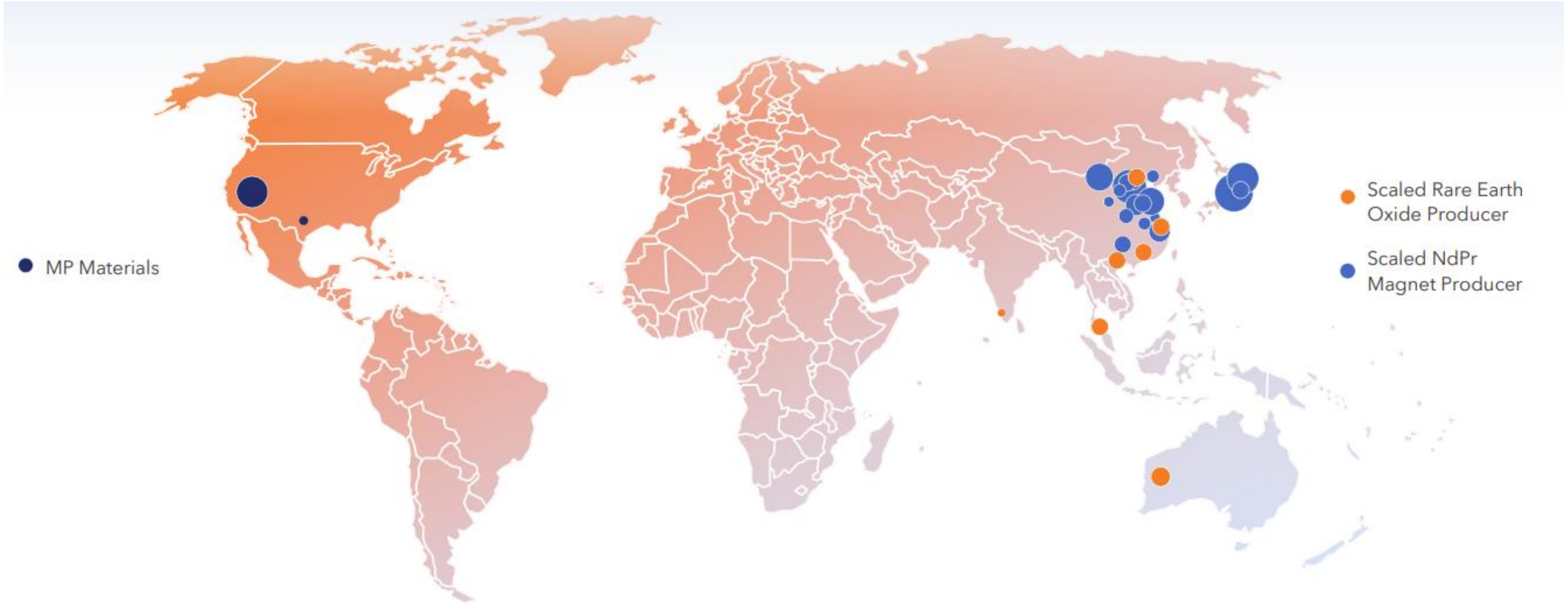
The supply chain of NdPr



Sources: MP Materials

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Environmental risks

The **Bayan Obo mine** in north-east China contains 70 per cent of the world's known rare earth element reserves. By 2005, it was responsible for 45 per cent of global production and now accounts for around 50 per cent.

Geopolitical risks

REUTERS®

China bans export of rare earths processing tech over national security

By **Siyi Liu** and **Dominique Patton**

December 22, 2023 7:46 AM GMT+1 · Updated 3 months ago

China has cut its export quotas for rare earths by 35 per cent in the first round of permits for 2011, threatening to extend a global shortage of the minerals needed for smart phones, hybrid cars and guided missiles.Oct 6, 2011

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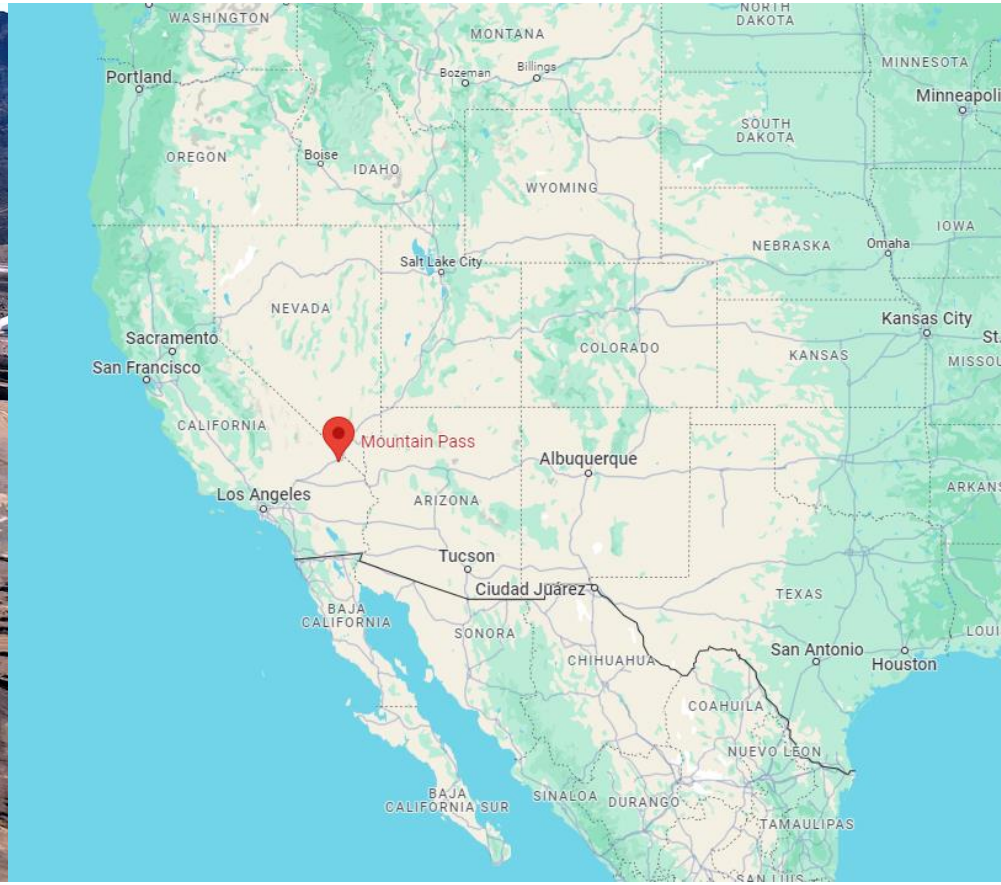
An alternative: MP Materials, located in California



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MP Materials is vertically integrated: from the mine, to the refinery and the magnet production

Stage I: Concentrate Production

- Turn mid-to-high single digit % ore into 60% REO concentrate
- Largest ex-China producer
- ~12% global market share in 2023
- Upstream 60K project to increase Stage I production by 50% within four years

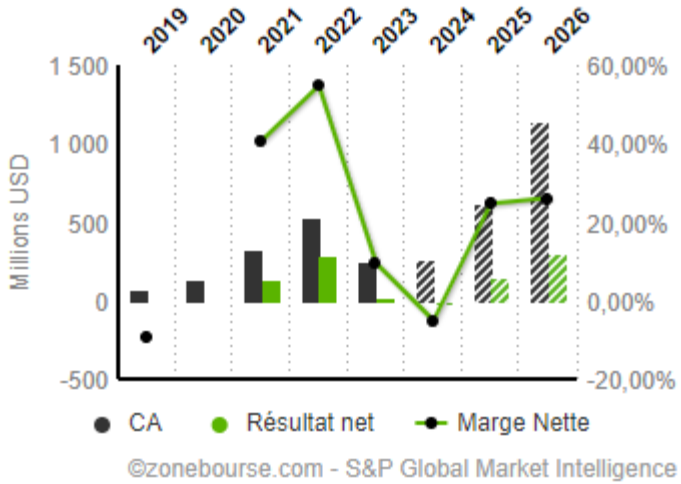
Stage II: RE Separations

- Separate RE concentrate into individual REs
- Optimize refining capability for low-cost NdPr oxide production
- ~6,075 mt NdPr targeted annual production

Stage III: RE Magnets

- Produce NdPr metal, alloy & magnets
- Established foundational, long-term General Motors supply agreement
- Executing buy, build, and/or JV strategy

MP MATERIALS



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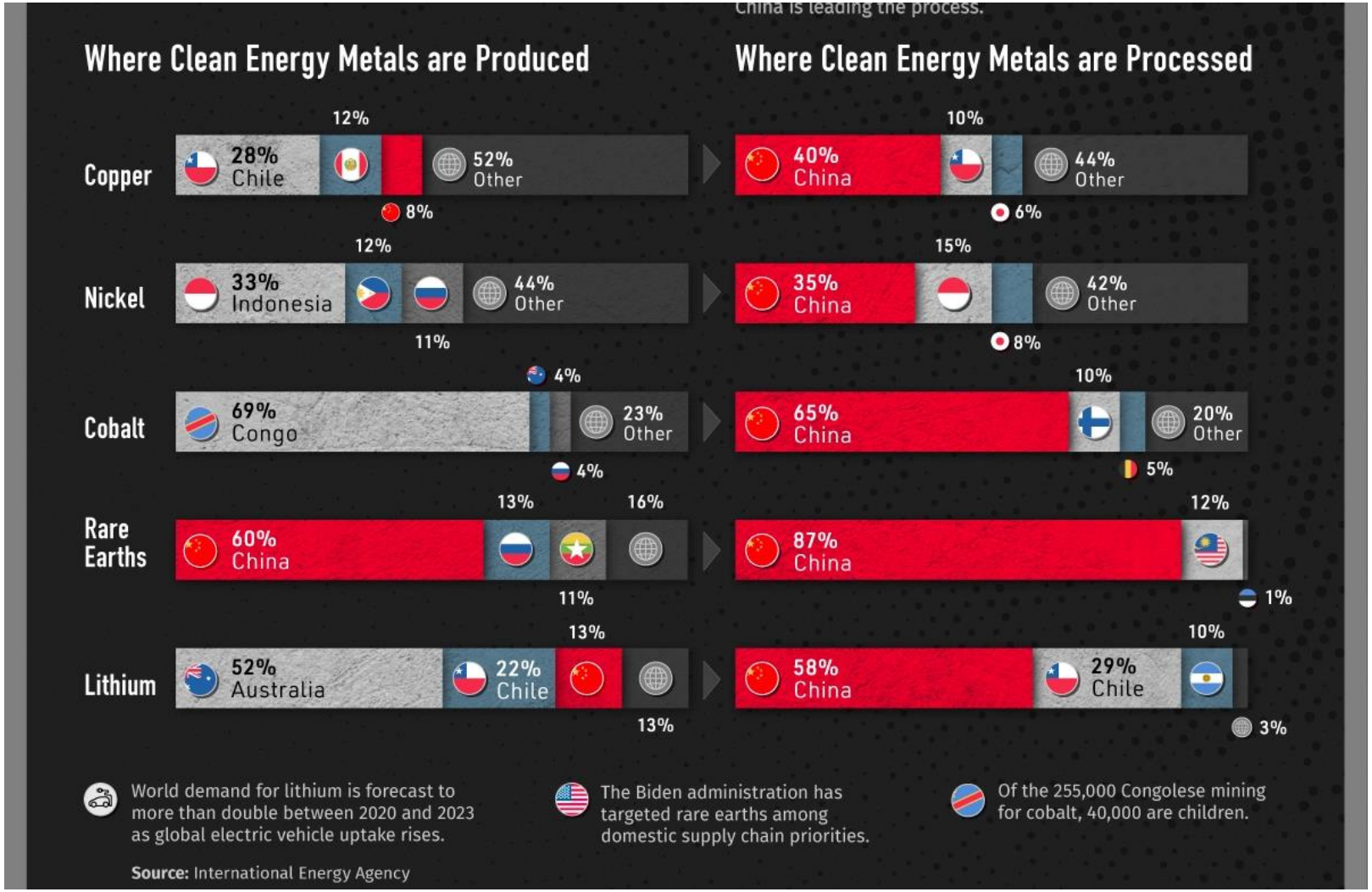
Other metals lack of supply diversification



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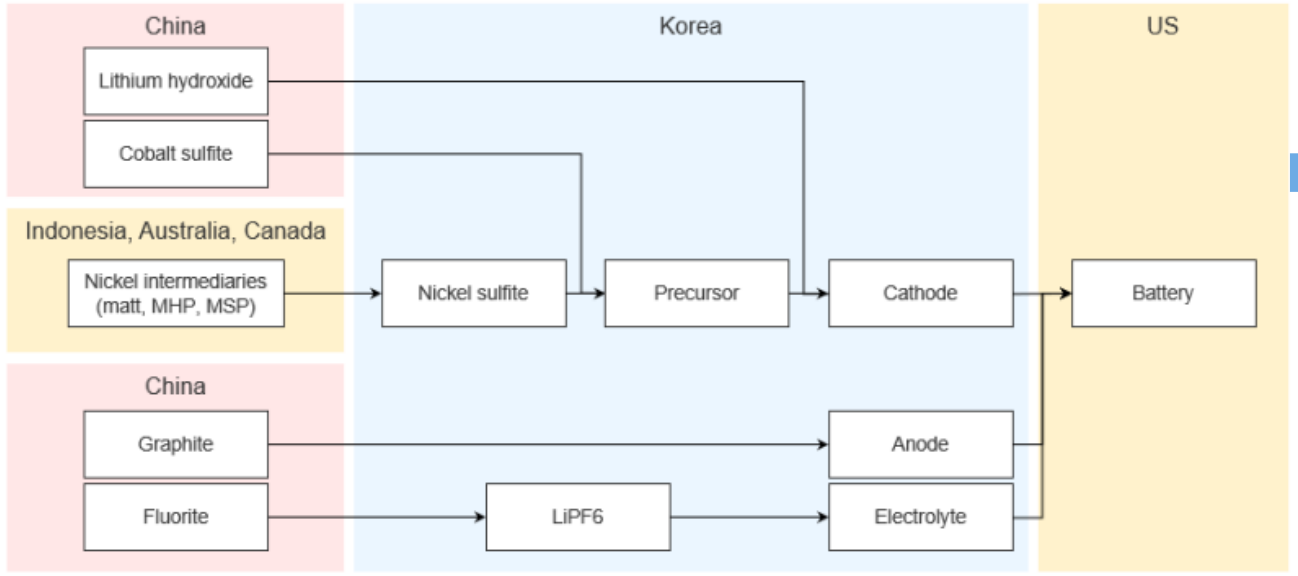
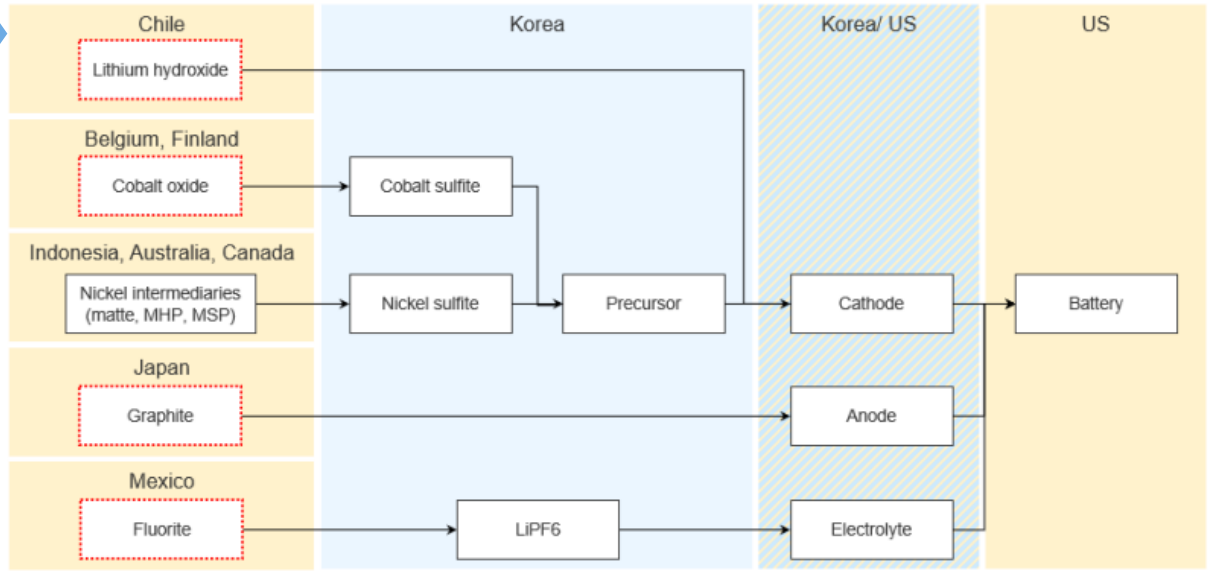
US IRA: a game changer

Typical upstream supply chain for made-in-US EV battery: before and after IRA

Before IRA: Key supply chains heavily dependent on China



After IRA: 1) Supply chain no longer needs to pass through China (highlighted in red-dot-lines), and 2) mid-stream to expand in the US



Source: KITA, Company data, Macquarie Research, November 2022

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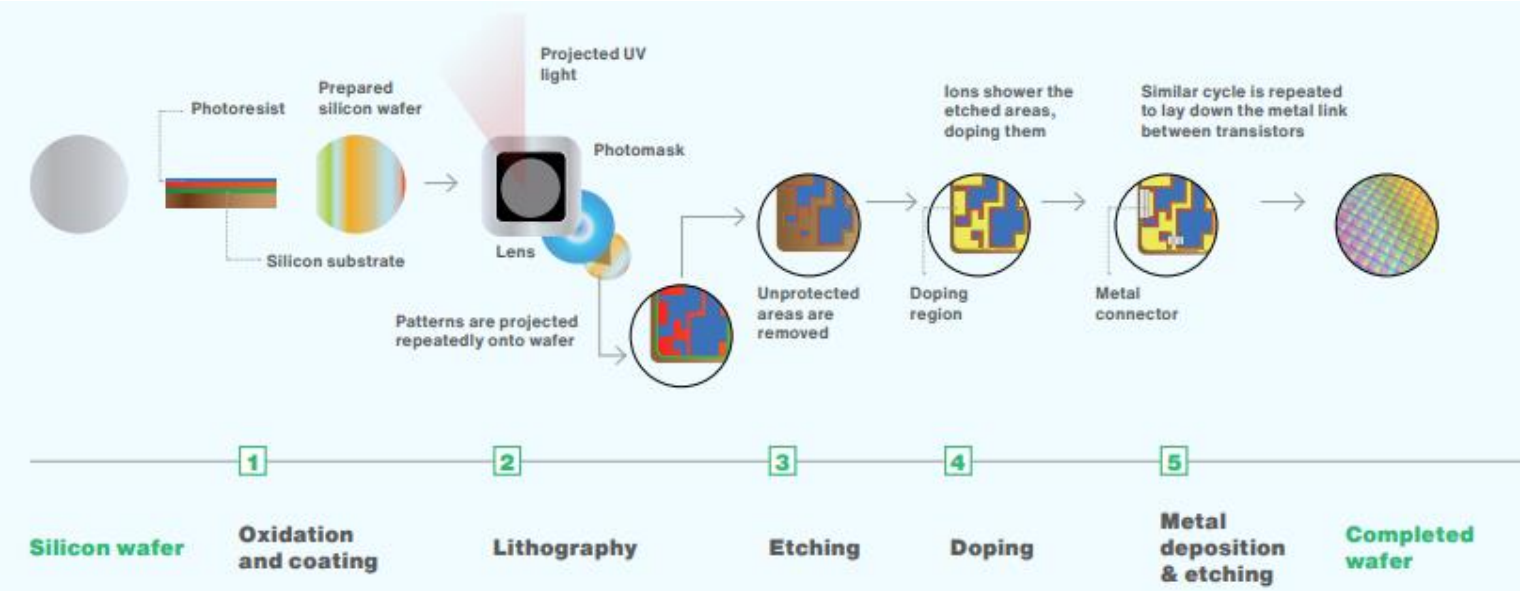
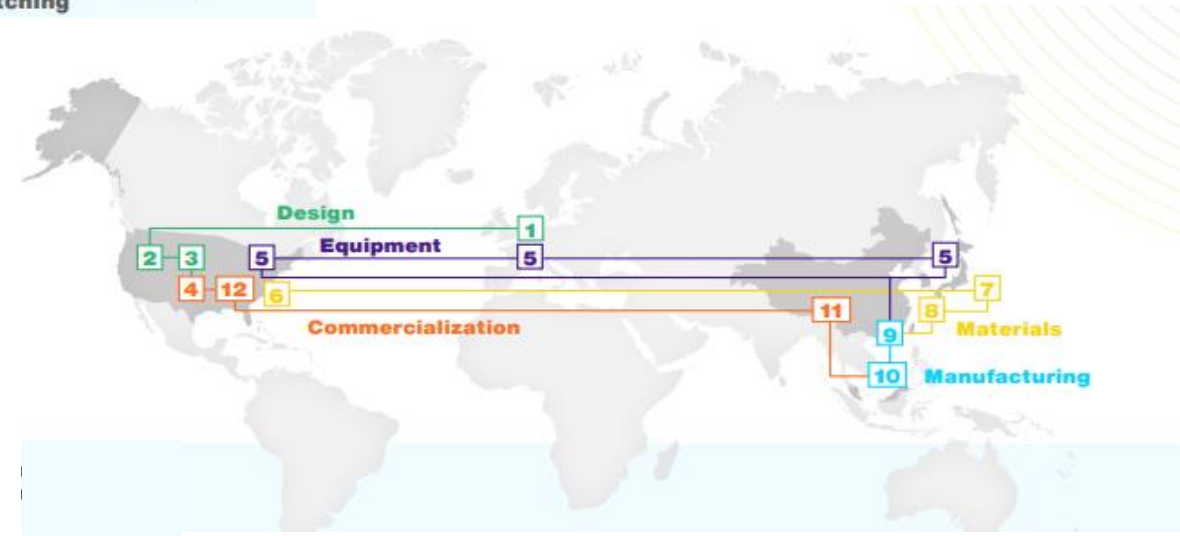
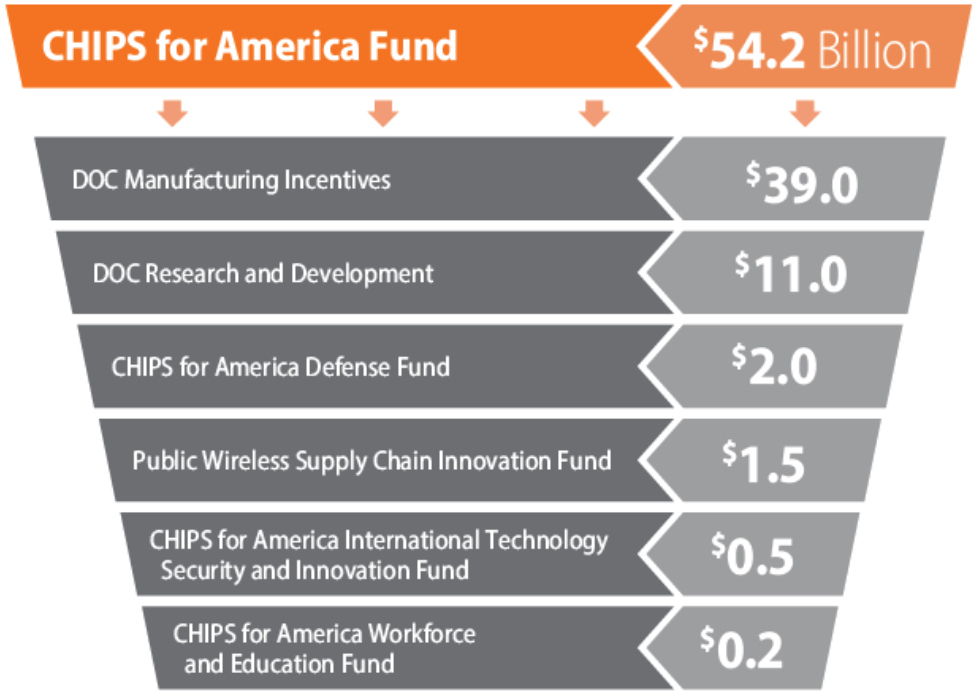
The semiconductor supply chain

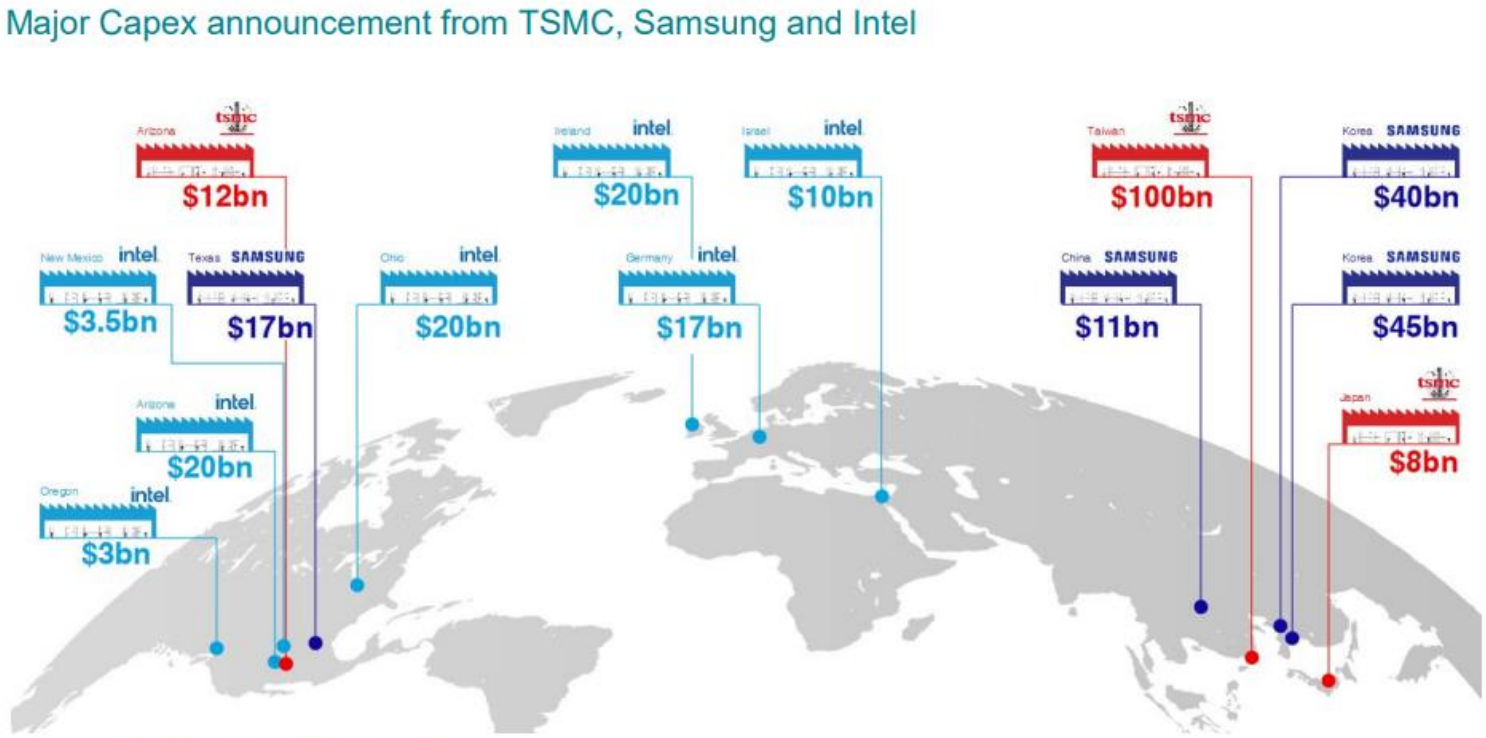




Relocalisation of the supply chain



EU target :
€ 43 billion for local production



Source: ASML, CMD, Nov 2022

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