Cobalt

for the energy transition

Key locations

Mining

DRC 70% | Indonesia 5%

Refining

China 75%

Energy transition share of total demand

2030: 45-65%

2050: 20-45%

Current market size[1]

$11 bn

Outlook to 2030 and key challenges

Demand

- Cobalt demand from EVs could increase six-fold by 2030, driving a **increasing total cobalt demand 2–3x.**
- Strong potential to reduce future material requirements with **battery innovation**: chemistries are already shifting rapidly away from high-cobalt nickel-manganese-cobalt (NMC) batteries (e.g., to low-cobalt NMC or to lithium-iron-phosphate (LFP)).

Supply

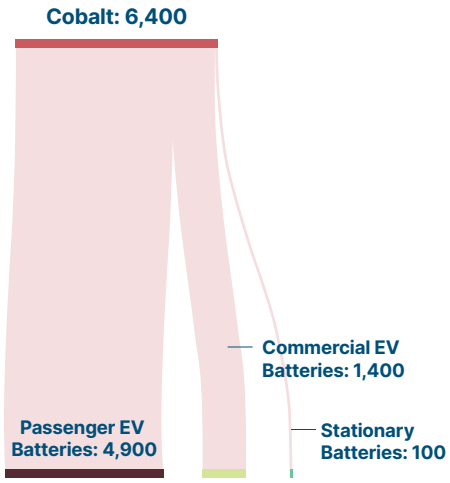
- **Uncertainty in supply** from Democratic Republic of Congo (DRC) due to instability and local conflict.
- Large recent **expansions in supply** from Indonesia.
- Potential to unlock future supply from re-processing of copper tailings.

Key challenges

- Cobalt is **mined as a by-product** of copper and nickel, meaning supply is often dictated by prices of those metals.
- Major **human rights and child labour concerns** for supply from the DRC, especially in artisanal and small-scale mining sector.
- Refining of cobalt sulphate is dominated by China (75% of production).

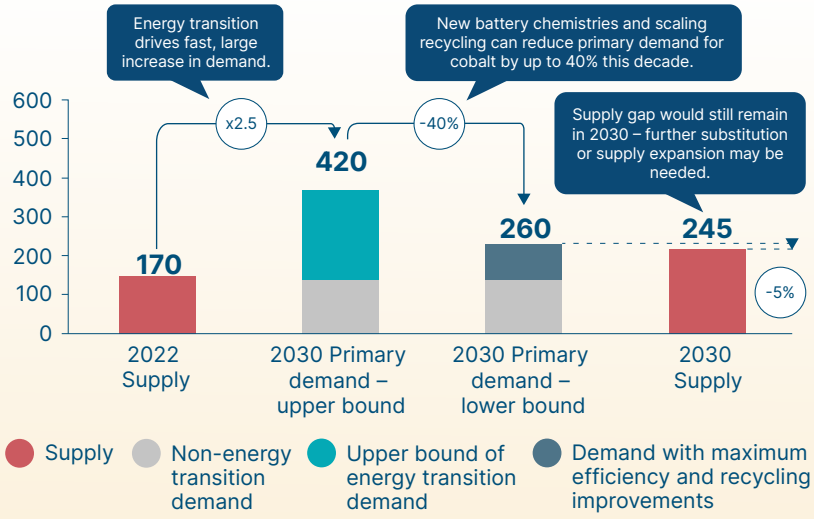
Cumulative demand 2022–50 from clean energy technologies

Thousand metric tonnes



Demand and primary supply in 2030

Thousand metric tonnes



Efficiency and recycling could lower primary cobalt requirements by 75% through to 2050

Cumulative primary demand 2022–50, reductions due to efficiency and recycling levers, and resources and reserves

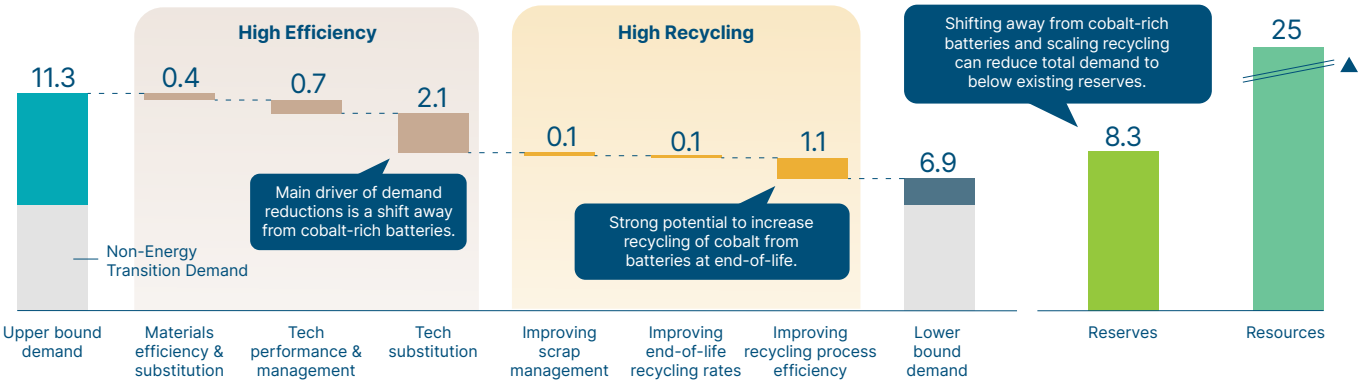
Million metric tonnes

Potential for substitution

H

Potential for recycling to meet supply

H — 80% of material demand could be met by recycling by 2050



SOURCES: Systemiq analysis for the ETC, US Geological Survey (2023), *Mineral commodity summaries*, IEA (2021), *The Role of Critical Minerals in Clean Energy Transitions*; BNEF (2022), *2H Battery metals outlook*; IEA (2023), *Energy Technology Perspectives*.

NOTE: The upper bound demand is the ETC's Baseline Decarbonisation scenario, which assumes an aggressive deployment of clean energy technologies for global decarbonisation by mid-century, but materials intensity and recycling trends follow recent patterns. The lower bound demand is the ETC's Maximum Efficiency and Recycling scenario, which assumes accelerated progress in material and technology efficiency, and recycling clean energy technologies, thereby reducing requirements for the primary supply (i.e. mined supply) of materials. "Resources" is an estimate of material supply available in sufficient concentration to make exploitation an economic interest at some time. "Reserves" are the currently economically and technically extractable subset of resources. It is important to note that even these estimates tend to increase over time. [1]Calculated assuming average 2022 price of around $65,000 per tonne of cobalt metal. L=Low, M= Medium, H = High.