Overview of critical energy transition minerals

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Outline

- What are critical energy transition minerals?
- Mineral requirements in selected energy technologies
- Reserves, production, price movements
- Demand projections
- Policy implications

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Critical raw materials

- Any non-fuel mineral, element, substance, or material that the Secretary of Energy determines: (i) has a high risk of supply chain disruption; and (ii) serves an essential function in one or more energy technologies, including technologies that produce, transmit, store, and conserve energy (US, DOE)
- Raw materials of high economic importance for the region, with a high risk of supply disruption due to their concentration of sources and lack of good, affordable substitutes. (EU)

US DOE list, 2023

Aluminum	Magnesium
Cobalt	Natural graphite
Copper*,	Neodymium
Dysprosium	Nickel
Electrical steel*	Platinum
Fluorine	Praseodymium
Gallium	Terbium
Iridium	Silicon*,
Lithium	Silicon carbide*

*Materials not designated as critical minerals by the Secretary of Interior

Source: US DOE

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EU list, 2023

Aluminium/Bauxite	Fluorspar	Natural Graphite	Tungsten
Antimony	Gallium	Niobium	Vanadium
Arsenic	Germanium	Platinum group metals	**Copper**
Baryte	Hafnium	Phosphate Rock	**Nickel**
Beryllium	Helium	Phosphorous	
Bismuth	Heavy rare earth elements	Scandium	
Boron/Borate	Lithium	Silicon metal	
Cobalt	Light rare earth elements	Strontium	
Coking Coal	Magnesium	Tantalum	
Feldspar	Manganese	Titanium metal	

Source: europa.eu

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Critical energy transition minerals (CETM's)?

- Minerals fueling the clean energy revolution; minerals that are critical to clean energy technologies
  - Potential risk of supply disruption due to their concentration of sources and
  - lack of good, affordable substitutes.
  - high economic importance
- Minerals are naturally occurring inorganic substances with defined chemical compositions and crystalline structures.
- Minerals serve as sources of metals and other valuable materials, found in the Earth's crust.

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Critical mineral requirements 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	○	○	●	○	◉	○	○	●	◉

Notes: Shading indicates the relative importance of minerals for a particular clean energy technology (● = high; ◉ = moderate; ○ = low), which are discussed in their respective sections in this chapter. CSP = concentrating solar power; PGM = platinum group metals.

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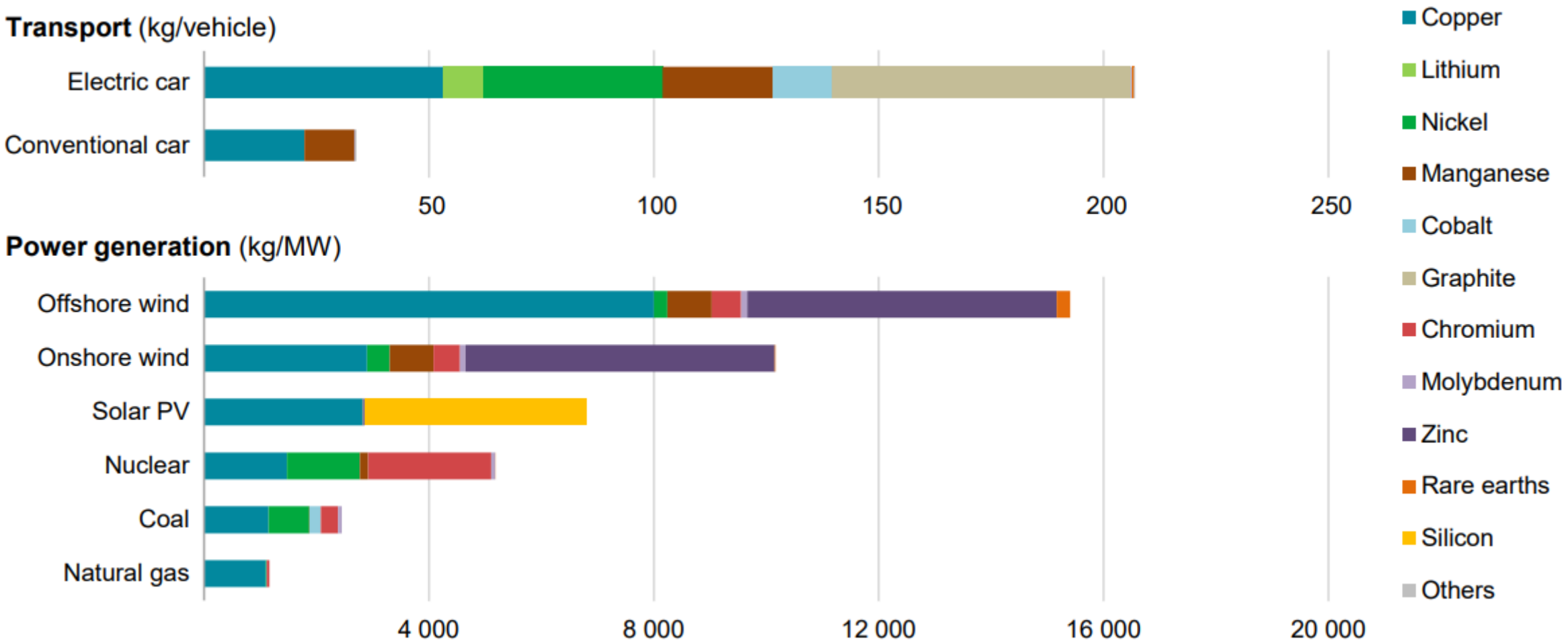
Source: IEA

Quantity of minerals required in selected energy technologies



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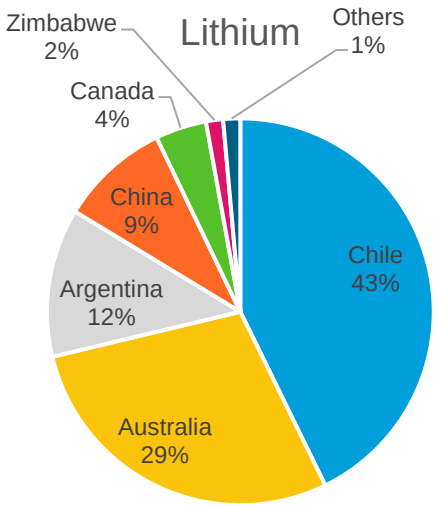
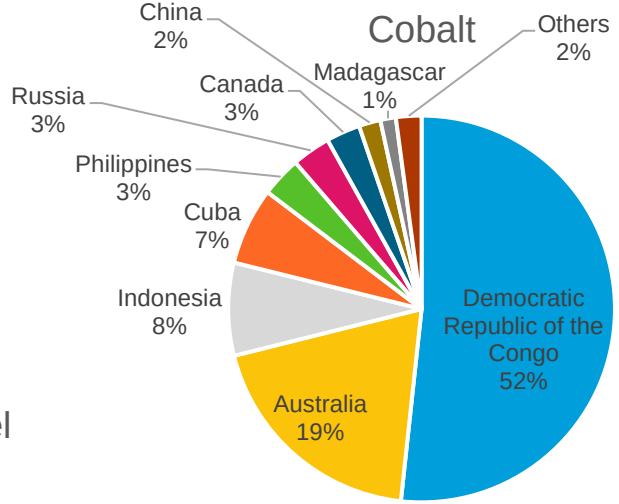
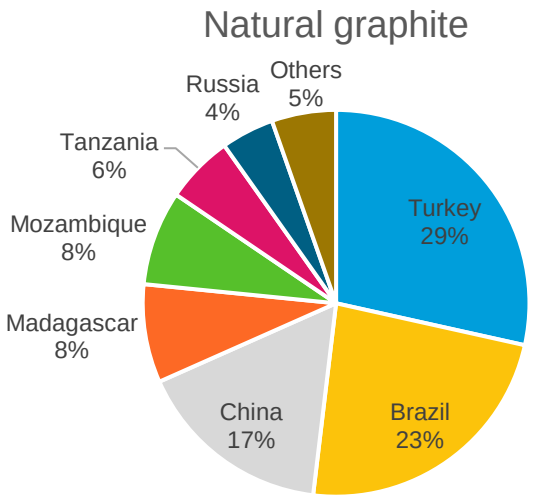
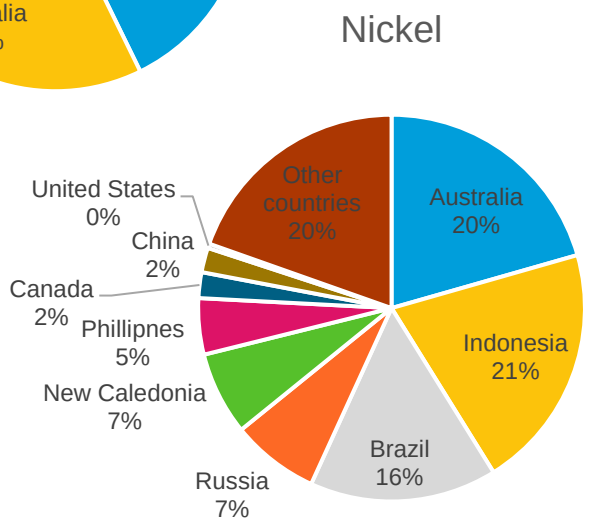
Source: IEA

Reserves of selected minerals, 2022









Source: UNCTAD using USGS Data

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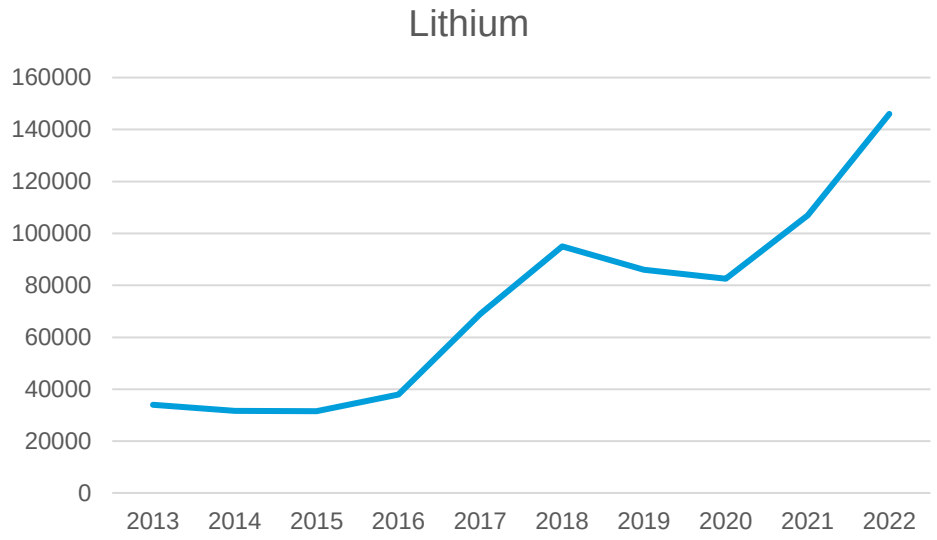
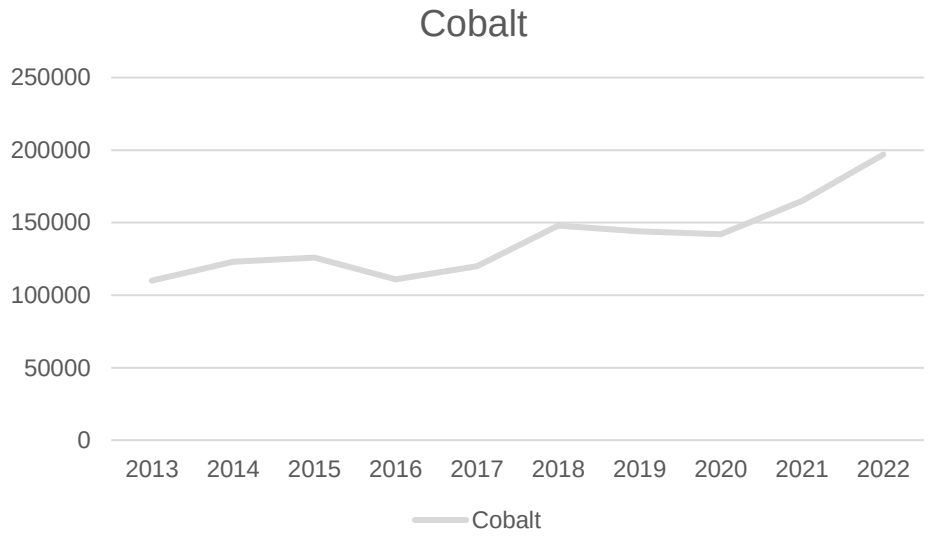
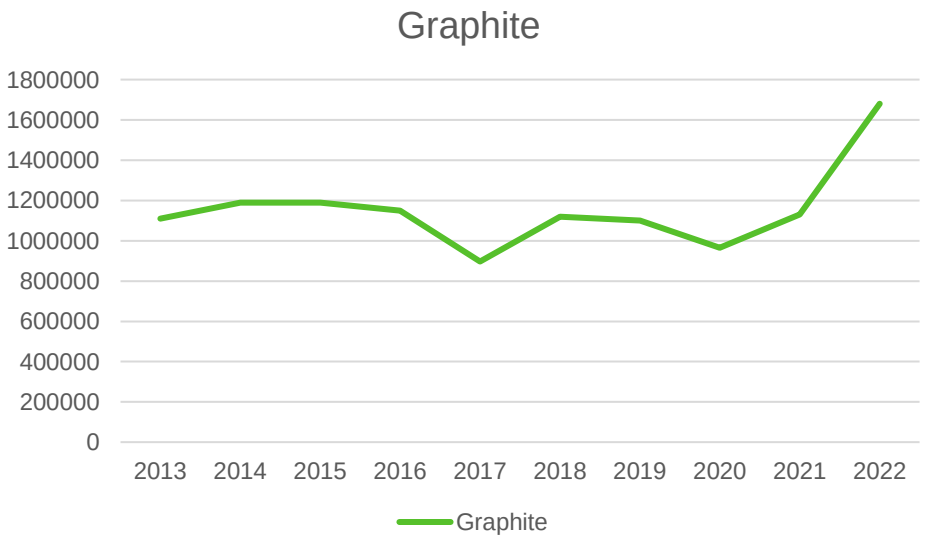
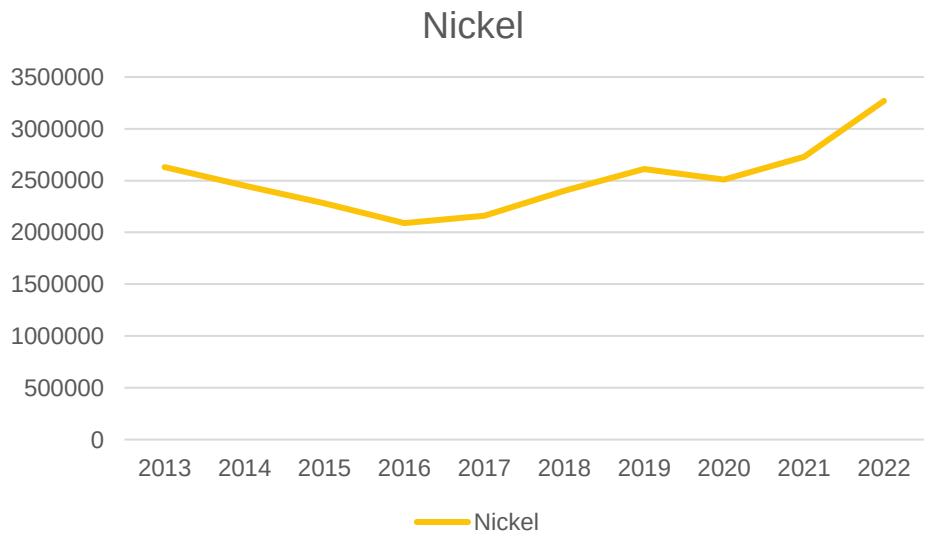
Production, 2013 to 2022









Source: UNCTAD using USGS Data

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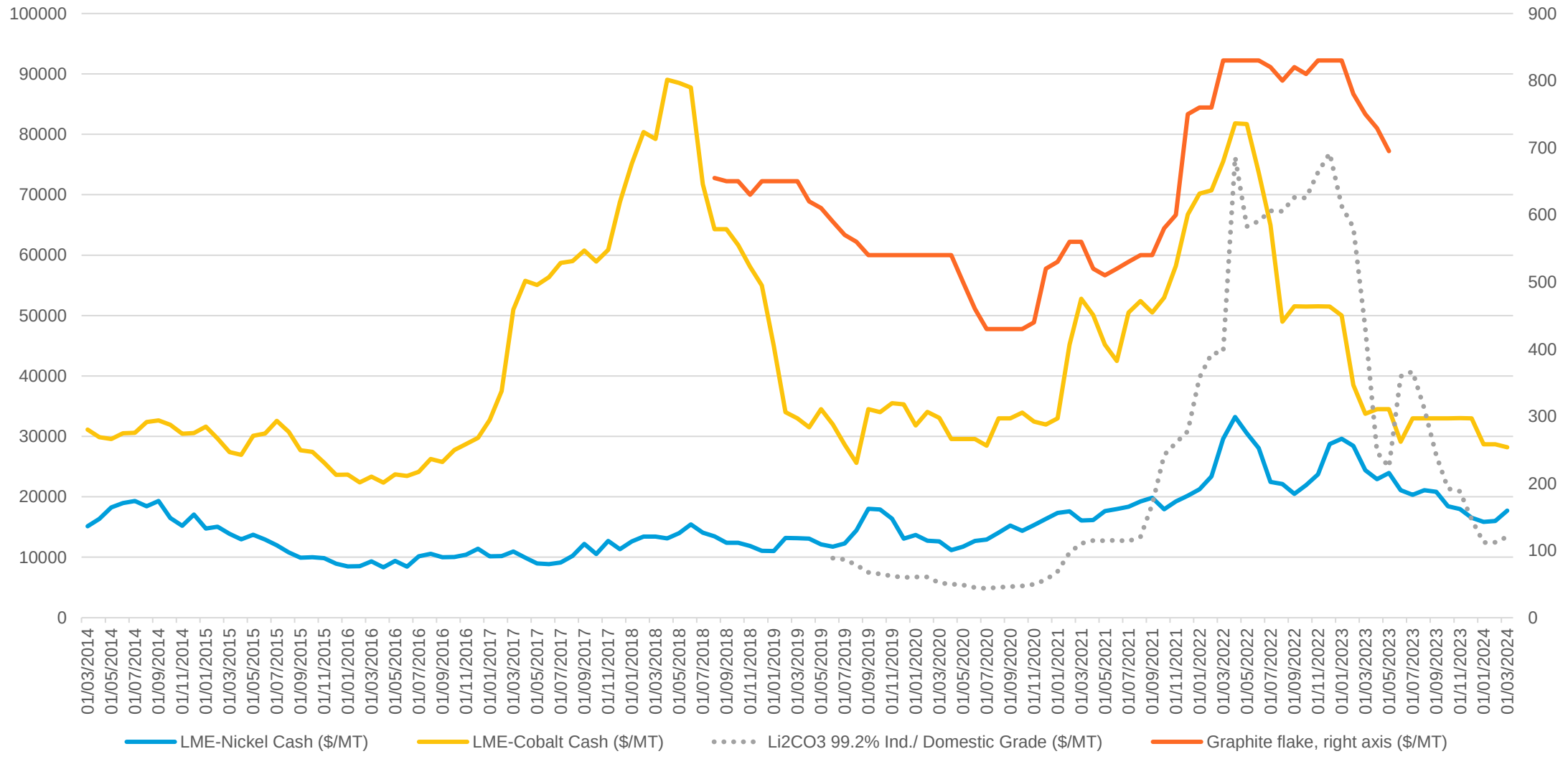
Prices of selected minerals, 2014 to 2024



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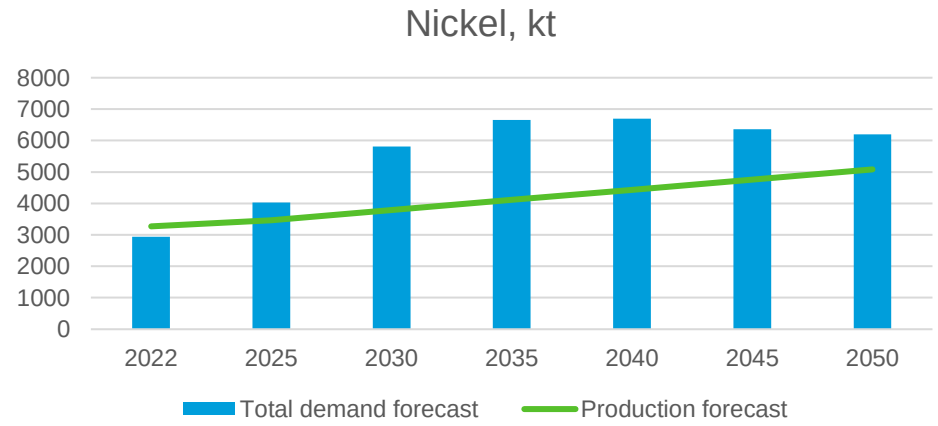
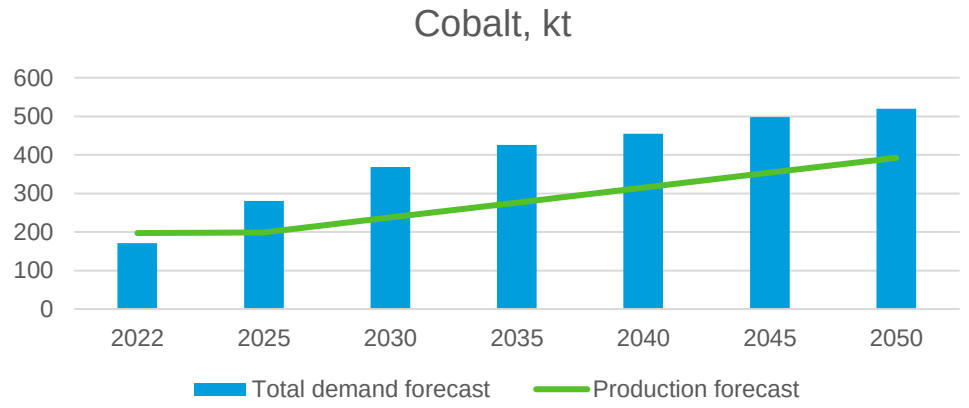
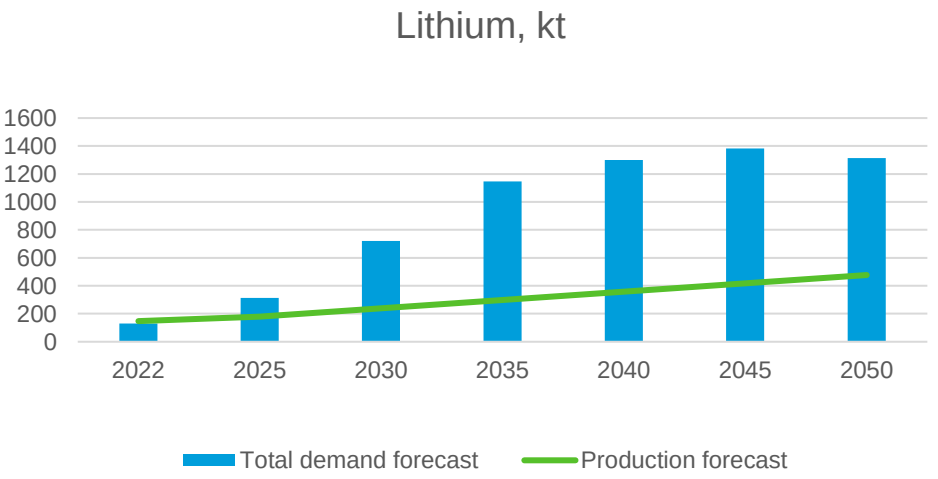
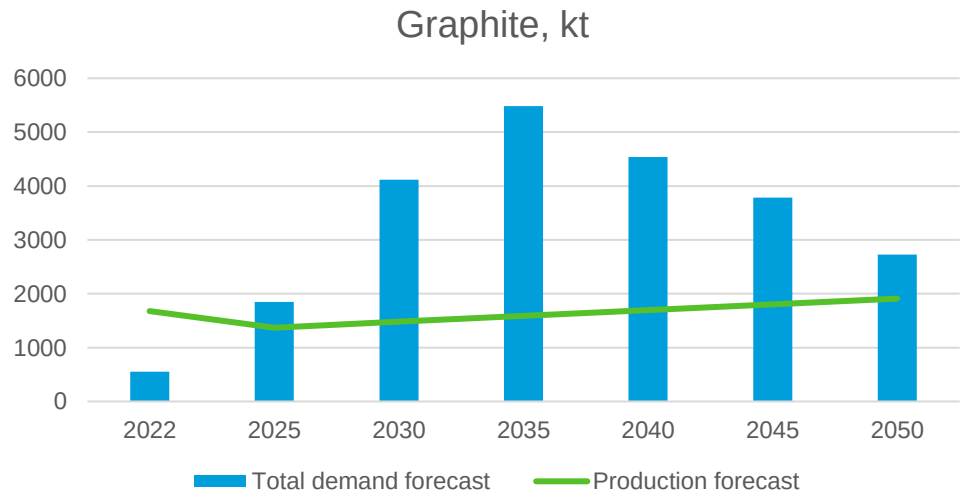
Demand and production projections









Source: IEA, UNCTAD

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Policy implications (I)

- Attracting responsible investments in mining sectors – e.g. improving infrastructure, streamlining regulatory processes, offering incentives
- Supporting the development of domestic processing and manufacturing capabilities to capture more value from natural resources
- Promoting investment in other sectors, such as manufacturing, technology, and services, to create new sources of employment and income.
- Investing in research and development to find alternative materials, technologies, and processes, thereby enhancing supply chain resilience and reducing dependency risks.

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Policy implications (II)

- Strengthening environmental regulations to mitigate negative impacts of extraction such as pollution and habitat destruction.
- Respecting the rights of indigenous peoples and marginalized groups.
- Strengthening regulatory measures and enforcement to promote local content, providing training and capacity-building opportunities for communities
- Strengthening regulations and enforcement mechanisms to prohibit the employment of children in hazardous or exploitative working conditions.

Thank you!

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Reference

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