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Australian Academy of Science submission on the
Australia's Critical Minerals Strategy: Discussion Paper

The Australian Academy of Science welcomes the opportunity to comment on *Australia's Critical Minerals Strategy: Discussion Paper*.

The Academy suggests that:

- Exploration, especially under the surface, should be supported to meet the urgent global demand for critical minerals.
- Australian resources should be linked to the opportunity to value add through onshore product development and manufacturing.
- Workforce gaps and the decline of training in earth sciences need to be addressed
- The strategy should establish robust recycling and circular economy provisions to ensure that the first generation of renewable technologies can be replaced with recycled materials.

Modernity and decarbonisation are fuelling an unprecedented and accelerating demand for critical minerals. It is evident that production of these minerals must significantly ramp up to meet demand.[1]

Australia must develop its substantial resources: (i) to ensure multiple suppliers into the burgeoning market; (ii) to begin to use Australian resources to build the products that modern decarbonising economies will need (iii) diversify the economy and use our comparative advantage to the advantage of Australians .

The urgent need for critical minerals can only be met with more supply

Most near-surface deposits in Australia have already been discovered, requiring exploration to focus on deposits under the surface. As outlined by the UNCOVER roadmap, this requires a greater understanding of Australia's geological structure and composition and a greater capacity for scientists to integrate knowledge across various fields, including geophysical exploration, geochemistry, tectonics, geodynamic modelling and AI.

International collaboration can enhance our understanding of the nature of critical mineral deposits and our ability to explore mineral.

The process of establishing productive mines after discovery of a deposit can take at least ten years (the International Energy Agency suggests an average of 16 years).[2]

Workforce.

A large and highly skilled workforce will be required for discovery, production and use.

The Academy is concerned that the supply of scientifically trained and technically skilled personnel is being given so little attention. For example, earth scientists will play a crucial role in addressing the need for exploration, yet there has been a 40% decline in geoscience student numbers in Australia since 2013.[3]

Moving up the value chain

The Strategy should also focus on moving up the value chain rather than just emphasizing the amount of 'a critical mineral' produced in Australia. It is in Australia's interest to move on from the default position: mining, exporting and importing the costly value-added product.

Regarding critical minerals, Australian capacity and global demand offer an opportunity to develop a range of new industries with the scale to be significant because of the expected size of the market. The Strategy should prioritise a long-term commitment to support technologies from the laboratory to production, which will require patient investors and stable government policy.

A circular economy

The strategy needs to establish robust recycling and circular economy provisions.

Global demand, global capacity, global supply and, importantly, environmental considerations suggest the need for parallel development of recycling capacity at scale. Better to recycle than keep looking for more and more. And much better for the environment.

The first generation of renewable technologies needs to be replaced, and they are a valuable source: one study estimated that end-of-life lithium-ion batteries could supply up to 65% of US domestic demand for cobalt in 2040—but only with highly robust regulations and supportive infrastructure in place.[4]

Australia has many opportunities to improve its recycling and circular economy approaches to critical minerals. Industry waste has the advantage of bulk collection; Australia should implement waste sorting at the end-user point. Extended producer responsibility frameworks are highly promising for critical minerals; an example scheme from Europe has seen 30,000 tonnes of used photovoltaic materials recycled.[5]

Upholding environmental protection provisions

The Discussion Paper acknowledges the need to maintain high environmental standards. Mining, including critical minerals mining and processing, can significantly impact local biodiversity and more.

Developing strong credentialing systems can address social and environmental consequences (including carbon footprint); Australia, with its strong labour laws, transparency, anti-corruption measures, and environmental protection laws, can leverage its comparative advantages in the export of ores and refined products.[6]

The Strategy should have a definition of 'critical minerals'

The Academy notes that the Discussion Paper does not adequately define 'critical minerals'. Without such a definition, there is a risk that the strategy may send unintended signals. Two examples illustrate this:

- Copper is a key metal for the modern era, especially for decarbonisation. The Academy estimates that 'in the next 15 years we will need as much copper as we have ever used to date'.[7] Yet the Discussion Paper does not discuss copper at all.
- Platinum is important as a catalyst in the production of hydrogen from water and thus may be critical to decarbonisation. Australia may have significant platinum resources (mainly associated with nickel deposits).

Both examples illustrate that the Strategy should develop a clearer definition of a 'critical mineral'; one with the flexibility that allows for future technological developments and manufacturing advances (including replacement and substitution) that will have flow-on effects on commodity demand.

This submission has been prepared with the assistance of Academy Fellows and members of National Committees for Science. The Academy is grateful for their assistance. To discuss or clarify any aspect of this submission, please contact Mr Chris Anderson, Director Science Policy at Chris.Anderson@science.org.au.

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[1] International Energy Agency (IEA), *The Role of Critical Minerals in Clean Energy Transitions* (International Energy Agency, March 2022), accessed via https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

[2] IEA, *The Role of Critical Minerals in Clean Energy Transitions*: 12.

[3] David R. Cohen, *Australian Geoscience Tertiary Profile 2003-2021. Report to the Australian Geoscience Council* (2022), accessed via https://www.agc.org.au/wp-content/uploads/2022/11/AGCTertiary-Education-Profile-2003-2021-Report.pdf

[4] Benjamin K. Sovacool et al., 'Sustainable minerals and metals for a low-carbon future', *Science*, 367, no. 6473 (3 January 2020): 32.

[5] Sovacool et al., 'Sustainable minerals and metals for a low-carbon future': 32.

[6] Sovalcool et al., ' Sustainable minerals and metals for a low-carbon future': 31.
[7] Australian Academy of Science, *Our Planet, Australia's Future, A decade of transition in Geoscience: A decadal plan for Australian Geoscience 2018-27* (Australian Academy of Science, October 2018), accessed via https://www.science.org.au/supporting-science/science-policy-and-sector-analysis/decadal-plans-science/australian-geoscience