



Australia China Business Council  
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# CRITICAL FACTS, CRITICAL MINERALS AND CHINA: What Australians need to know

## **Critical Insight 3 :**

What Australia needs to understand about China's technological edge in critical minerals supply chains

# Critical facts, critical minerals and China: What Australians need to know

## CRITICAL INSIGHT 3.

### What Australia needs to understand about China's technological edge in critical minerals supply chains

There is a presupposition that features in some commentary, both in Australia and elsewhere, around China's prominent position in critical minerals supply chains. This holds that the key sources of the country's competitive advantage are subsidies extended by Beijing favouring domestic producers, as well as cheap labour and a disregard for environmental costs. But for at least the past decade, China's fundamental strength has been an unrivalled number of industrial and technological clusters, spanning the different stages of critical minerals supply chains. This makes the recent suggestion put by a former Defence Minister that Australia has the capacity to "completely replace the dependency" of the West on China in critical minerals supply chains within five to ten years both unrealistic and unclear.<sup>1</sup> A more practical starting point would be to recognise that China's place in the global value-adding ladder makes it a potentially advantageous partner – and then set about managing the risks that flow from this economic reality.

Metrics attesting to the strength of China's position in critical minerals supply chains are readily available. Starting with basic science, researchers affiliated with a China-based institution now account for 29% of global peer-reviewed publications related to rare earths. This compares with 10% for the U.S. in second place. In terms of the most cited publications, a quality metric, Chinese researchers have produced more than half of the global total over the past decade.<sup>2</sup> On critical minerals extraction and processing research more generally, China also leads, accounting for 36.7% of the most highly cited publications globally, compared with 13.4% from the U.S in second place, and 2.8% from Australia.<sup>3</sup>

China's capabilities can also be seen in intellectual property indicators. By the end of 2019, China had filed 25,911 rare earth-related patents. This compared with 9,810 patents held by the U.S., 13,920 by Japan, and 7,280 by the E.U.<sup>4</sup> A new study found that China accounted for 58% of patents around rare earths globally.<sup>5</sup> By 2019 China had also emerged as the third largest holder of International Patent Families covering batteries, following only Japan and Korea. If nationally filed patents were included, China would lead battery patent counts over the past decade.<sup>6</sup> These days, Chinese company CATL, the world's largest battery manufacturer for Electric Vehicles (EVs), spends more than 5% of its revenues on R&D,<sup>7</sup> exceeding the 3.9% spent by LG Energy Solution, the South Korean company that currently holds the most battery patents globally.<sup>8</sup> In terms of potential technology successors to currently dominant lithium-ion batteries, China accounts for more than half of all patents globally.<sup>9</sup>

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Driving China's critical minerals capabilities are a multitude of factors.

One is an exceptionally large pool of human capital. For example, it has been estimated that there are now 12,000 full-time researchers in China focused on rare earths, spread across four national labs. This compares with just 300 in the U.S. The commercial rare earth elements sector in China is also estimated to host over 300,000 full time employees, compared with around 400 in the U.S.<sup>10</sup>

Another is economies of scale. In 2022, the Chinese market accounted for nearly 60% of new EV registrations globally, and more than 50% of the stock of EVs on the world's roads.<sup>11</sup> China also accounted for half of the additions in global renewable energy capacity.<sup>12</sup>

The third is the span of its clean energy supply chains. For example, in a ranking of lithium-ion battery supply chains (comprising raw materials, manufacturing, downstream demand, etc) China has attained the number one spot for three consecutive years.<sup>13</sup>

All of these factors combine to help explain why the cost of battery packs produced in the U.S. and the E.U. are 24% and 33% higher than in China!<sup>14</sup>

Public policies in China promoting the development of critical minerals supply chains have been markedly more sophisticated than just subsidies doled out to domestic producers. Aside from investing in basic science, Chinese authorities have also disincentivised purchases of vehicles with internal combustion engines, such as by charging much higher license plate fees,<sup>15</sup> and supported the deployment of public charging infrastructure supporting the adoption of EVs. By the end of 2022, China accounted for more than half of the global stock of public slow chargers, and more than 80% of fast chargers.<sup>16</sup> All of these policies are consistent with World Trade Organization rules and available to Canberra and its allies, partners, and friends.



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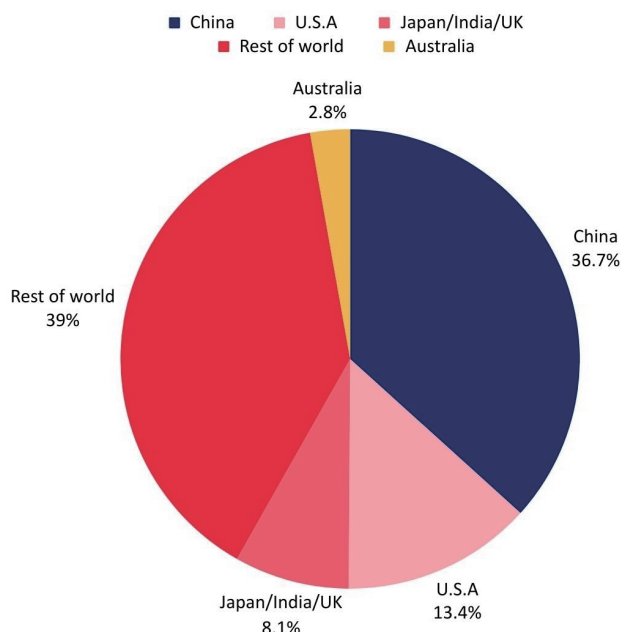
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Of course, China's technological prowess in critical minerals supply chains does not mean that Canberra, its allies, partners, and friends should conclude that pursuing risk mitigations are unnecessary or futile. But many sensible mitigations are, in fact, already in place. For example, legislative changes around foreign investment in 2020 allow the Treasurer to impose new conditions (or even require divestment) on a transaction previously approved under the Foreign Acquisitions and Takeovers Act if national security risks emerge.<sup>17</sup>

And the broader point is that disengagement from a technology leader would cut off opportunities, and at the same time, it is not clear that a separate and comparable supply chain can be created, even in the longer term. China will not stand still even as progress is recorded elsewhere. This suggests that while Canberra can offer positive inducements for greater cooperation with geopolitically-friendly capitals, an effective approach to bolstering supply chain efficiency needs to be more comprehensive and involve all key players, including China. Yet at present, initiatives led by Washington, such as the Minerals Security Partnership, are exclusive rather than inclusive and so run the risk of escalating geopolitical tensions, promoting trade fragmentation and potentially having the perverse effect of undermining supply chain resilience.

There are some signs that Beijing is amenable to greater cooperation. For example, while foreign investment in China's rare earths sector was previously prohibited, mining was removed from the country's "negative list" in 2022.<sup>18</sup> Foreign involvement in China's critical minerals processing sector extends back further. The largest foreign investor in Australia's critical minerals sector, U.S. company Albemarle, has spent recent years "flooding China with fresh investment". The company's leadership says its broader strategy is "heavily China-focused because that's where the market is".<sup>19</sup> In 2021, to complement its existing China-based assets, Albemarle announced the construction of two new lithium processing facilities in Jiangsu and Sichuan,<sup>20</sup> and then in 2022 acquired another such facility in Guangxi that was previously owned by a Chinese company.<sup>21</sup> Still, Canberra would be on firm ground reminding Beijing that many of its policies limit cooperation possibilities and force countries like Australia to work with other partners, including China's geopolitical rivals. For example, Beijing has long prohibited the export of technology relating to the extraction and processing of rare earths. More recently, it also banned the export of technology for manufacturing rare earth magnets.<sup>22</sup>

#### HIGHLY CITED CRITICAL MINERALS EXTRACTION AND PROCESSING RESEARCH GLOBALLY



Irrespective of Beijing's choices, however, the complacency that assumes superior and enduring Western technological know-how relative to China in critical minerals supply chains needs to be addressed in order to formulate the strongest possible public policy in 2024.

ESTIMATED FULL-TIME RESEARCHERS IN THE RARE EARTHS SECTOR

**CHINA - 12,000**  
**U.S.A - 300**

ESTIMATED FULL-TIME EMPLOYEES IN THE RARE EARTHS SECTOR

**CHINA - 300,000**  
**U.S.A. - 400**

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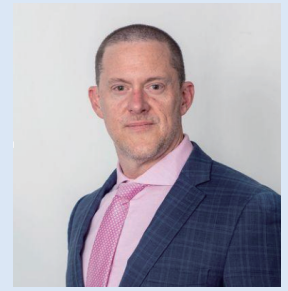
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## ABOUT CRITICAL FACTS, CRITICAL MINERALS AND CHINA: WHAT AUSTRALIANS NEED TO KNOW

### ACBC and UTS:ACRI collaborative project

As the Australian Federal Government implements its critical minerals strategy, the ACBC together with the UTS:ACRI have embarked on releasing “Critical facts, critical minerals and China: what Australians need to know” - a series of thought leadership analysis pieces around China’s historical and potential future involvement in Australia’s critical minerals and rare earths sectors.

Aside from China being a major market, it is not well known that whether it be through foreign investment, labour up-skilling or technology transfer, Chinese companies have played a crucial role in Australia’s emergence in the critical minerals and rare earths sector. With China’s booming green economy, the demand for such resources and interest in partnering with Australia is likely to continue and to increase. However, there have been questions raised in the Australian national debate as to whether Chinese interests are welcome in the sector. This series of analysis pieces explores and unpacks some of the history and facts that are required to have a wholistic understanding of what an ongoing presence or lack thereof of Chinese involvement in the sector is likely to mean for Australia. The views and opinions expressed are those of the authors and do not necessarily reflect the official policy or views of the ACBC. UTS:ACRI also does not take an institutional position on any issue.



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