



Coordinating the Quad on critical minerals

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Key points

- Current global supply chains for critical minerals – which are essential for the clean energy transition – are neither scalable, secure nor sustainable.
- No country can achieve a fully sovereign capability in critical minerals, but like-minded partners can do more to ‘friendshore’ their supply chains.
- The efforts of Quad countries to do this have been slowed by economic nationalism.
- Quad countries should coordinate their respective roles to improve shared critical mineral supply chains.

Introduction

Critical minerals are one of the more vexing security problems of the 2020s. This loose collection of exotic metals – including lithium, nickel, cobalt, graphite, vanadium, rare earths and around two dozen others – would not normally be considered the stuff of high geopolitics.

Critical minerals are geologically abundant, have been used in industry for decades, and their trade is worth only a tiny fraction of the US\$2 trillion global oil market. Yet China’s recent announcement of export licensing for two obscure critical minerals (gallium and germanium) signals, according to some, a widening global tech war. What explains this?

Critical minerals matter to 21st century geopolitics because of the energy transition. As economies substitute renewables for hydrocarbons in the march to net zero, they will require astonishing amounts of these metals. Some critical minerals (particularly lithium, nickel and graphite) are used in batteries, and thus are an essential component of electric vehicles and energy storage systems. Rare earths are the key ingredient in permanent magnets, required for wind turbines and high-performance electric motors. The minor critical minerals are widely used in electronics such as solar panels and semiconductors.

Supply chain stresses

Without critical minerals, there can be no energy transition, but existing global supply chains are simply not up to the task. The threats to critical minerals security are now well understood, and can be neatly summarised using the ‘three Ss’:

- **Scalability:** as renewables and electric vehicles come to dominate global energy systems, perhaps an order of magnitude more critical minerals will be required within a decade. The current global industry is simply unable to scale fast enough, leading to supply constraints and spiralling prices, which are holding back the net zero transition.
- **Security:** most critical minerals are subject to some degree of monopoly, either at the upstream (mining) or midstream (processing) stage of production. China controls many of these critical minerals monopolies – most notably for lithium and rare earths processing – and has repeatedly threatened to cut supplies as a geopolitical weapon.

- **Sustainability:** the social and environmental conditions for critical minerals production are often abhorrent. Forced child labour, ecosystem destruction and poorly managed toxic wastes are sadly routine in many key global suppliers. Social license for the energy transition requires rectifying these sustainability challenges.

The sovereign capability mirage

Most major governments around the world have belatedly recognised the problem. Japan was the first to adopt a purposive critical minerals strategy, catalysed by its experience of being cut off from rare earths during a diplomatic dispute with China in 2010. Others slowly joined the club, and by 2023 all the major consumers (US, EU, UK, Japan, Korea, India) and several producers (Australia, Canada and Indonesia) now have some form of critical minerals security policy in place.

While the policies differ with national context, they all correctly identify critical minerals as an essential industrial capability for the clean energy transition, and offer some form of additional government support (typically investment subsidies or trade incentives) to catalyse project development. Given critical minerals are a matter of both economic and national security, a desire for 'sovereign capability' usually underpins these strategies.

The problem, however, is that sovereign capability in critical minerals is a fool's errand. These supply chains are extraordinarily complex, involving very disparate capabilities in mining, chemicals processing, components manufacture, final products manufacture and recycling. Multiply those steps across approximately 30 different critical minerals, and the breadth of technical requirements for genuine sovereign capability becomes prohibitive. No country in the world can realistically hope to build a secure critical minerals supply chain on their own.

So-called 'friendshoring' seems like an appealing solution. Governments are keen to build new and more secure supply chains, with a clear (if often implicit) objective of minimising dependence on Chinese monopolies. Yet the breadth of capabilities required makes national-only solutions unviable. Supply chains built between politically trusted partners, where each specialises in the steps where they are competitive, offers the best of both worlds. A plethora of intergovernmental MOUs, dialogues and 'partnerships' – Australia now has them with practically every major critical minerals player, bar China – have sprouted to support the growth of 'friendshored' supply chains.

'Friendshoring', Quad-style

On paper, the Quad is an ideal group for 'friendshoring' critical minerals. Economically, the four have an ideal mix of complementary industrial capabilities. Australia brings world-class geology and mining capabilities; Japan leads in components and processing; the US has large auto and renewable sectors at the high-end of the market; and India is building a formidable low-cost manufacturing base. The US and Japan are major capital exporters; while Australian and India offer a secure and attractive investment environment. The Quad is more than the sum of its parts when it comes to critical minerals.

Politically, the Quad also offers the right relationship equities. While the four governments differ widely on economic matters, when it comes to critical minerals, they share common objectives. All view critical minerals-related industries as a core part of their economic future, all are trying to reduce their economic dependence on China, and all prioritise deepening trade and investment links amongst the group. Building Quad-based critical minerals supply chains is a no-brainer in the current geopolitical environment.

Despite these complementarities, critical minerals linkages within the Quad are thin on the ground. Australia and Japan have a strong relationship in rare earths, which traces back to Japan's sponsorship of Australia's Lynas Corp following Chinese trade bans in 2010. There is,

unfortunately, little to show for the intervening 13 years. The lithium-to-EVs supply chain provides an instructive example. It is an industry in which all Quad countries are actively engaged, yet there are no major trade or investment linkages between any of the four. Each remains more closely integrated with China – the country they are actively attempting to diversify from – than with its Quad partners.

With everything in its favour, why has critical minerals not happened for the Quad yet? The answer lies in short-sighted economic nationalism. Government support for critical minerals has been led by various subsidies or incentives for investment, and in the prevailing political context these subsidies are directed towards local investments only. The US *Inflation Reduction Act* offers a staggering US\$300 billion in subsidies for clean energy – on the proviso the products are ‘Made in America’ and use as many locally made inputs as possible. The Self Reliant India campaign aims to build Indian manufacturing behind staggering tariff walls. The Japanese auto sector has been a laggard in reorienting towards EVs, and has thus far held its limited capacity tightly at home. Australian government ministers have declared ‘if we mine it here, we should make it here’.

Smaller pieces of a larger pie

An economist will quickly recognise this as a classic coordination dilemma. The Quad countries are all building critical minerals industries, and recognise they could do it better and cheaper if they do so together. Cooperation will surely produce a larger pie, but which piece of that pie does each participant get?

Everyone wants to work on EVs and wind turbines. No one wants to carry out mining (except Australia, but only if it gets manufacturing on top). And no-one is paying attention to the mid-stream processing stage – the stage where China wields its monopoly power! In the absence of coordination, all four governments are going after the same piece of the pie. In doing so, they pass up the opportunity to work together and create a bigger pie from which each will get a larger piece.

Coordination is therefore key to getting critical minerals supply chains established within the Quad. The parties must reach an understanding of who-does-what that fairly distributes the opportunities available. This will inherently involve compromising national goals with the goals of others. The US needs to take a ‘Made in America and Friends’ approach to industrial policy. Japan needs to share both its mature and emerging technologies. India needs to open its growing market in exchange for tech transfer. Australia needs to be realistic about how much local value-adding of its minerals will be economically viable.

Such compromises will require a fundamental change in mentality from all four governments. With the exception of Japan, none have a good track record of compromising over industrial objectives with partners, and they have never done it with each other. Nor are the intergovernmental mechanisms of the Quad – a grouping which started as an Indian Ocean maritime security dialogue, and has since evolved into a leaders’ meeting – configured to deliver the sensitive economic bargains required. Critical minerals require the Quad governments to do something they do not usually do, in a structure not originally designed for it.

But it is not impossible. The foundational case for Quad cooperation on critical minerals – political alignment, economic complementarity, and the need for a secure, scalable and sustainable approach to critical minerals – remains extremely compelling. The governments simply need to find a *modus vivendi* on the role each country is expected to play, and what policies are needed to make the pieces work in harmony. A much larger critical minerals pie waits tantalisingly for us if we can.



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About this paper

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About the Quad Tech Network

The Quad Tech Network (QTN) is an initiative of the NSC, delivered with support from the Australian Government. It aims to establish and deepen academic and official networks linking the Quad nations – Australia, India, Japan, and the United States – in relation to the most pressing technology issues affecting the future security and prosperity of the Indo-Pacific.

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