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Countering China's Grip on Rare Earth Commodities

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Key Points

- As it possesses some of the most abundant deposits, China was, by the 1990s, already set to be the world's largest producer of rare earth elements (REEs).
- China is able to maintain a monopoly on both supply and demand, which could potentially be used as the determining factor in its trade war with the US.
- The important lesson learned from the 2010 REE embargo, for both China and the rest of the world, is that it is possible to diversify the sources of REE supplies.
- Possessing mine-side supplies is only half of the equation; innovation and the creation of more processing facilities are required to counter a monopoly of REEs.

Summary

In January 1992, during his tour of southern China, Deng Xiaoping stated that just as 'there is oil in (the) Middle East, China has rare earth'. Today, the stark reality of that statement is evident as technology becomes increasingly reliant upon those resources. Consequently, that becomes a geopolitical issue; while China remains the world's manufacturing hub, it also has the power to manipulate and ultimately weaponise, both economically and militarily, the supply of rare earths.

China also controls around 80 per cent of global rare earth elements processing. Chinese facilities produce rare earths, trace quantities of which are used around the world in items such as smartphones, electronic appliances, electric vehicles and in military applications, such as missile guidance systems. Thus, just as with its other geopolitical contests, China's ability to acquire and control these resources becomes vital to its quest for geopolitical hegemony.

Beijing's control of the global REE supply is an Achilles heel for other states, especially the US amid its ongoing trade war with China. Apart from a brief diplomatic spat between China and Japan in 2010, involving the detention of Chinese fishermen, which led to China reducing its REE exports to Japan, the US and the European Union by around 40 per cent, there are scant examples of the weaponisation of these commodities. Nonetheless, China could choose to use its resources as a bargaining chip with other countries. Those countries, in turn, are thereby forced to diversify their rare earth supplies by sourcing them from countries other than China. The recent visit by US Commerce Secretary Wilbur Ross to Australia for discussions on creating a joint strategy between the two countries on rare earth and critical minerals, serves to underline the importance of REE to global market stability.

This paper will explore how China has strategised its monopoly on rare earth commodities and the impact of that action at the geopolitical level. Second, it will examine how countries such as Australia and the US may navigate around that monopolisation, which will also have implications at the political level. It will also examine, lastly, what impact the discovery of significant REE deposits outside China will have on the global rare earth market.

Analysis

Rare earth elements are strategic, non-renewable resources that comprise fifteen elements in the periodic table, and range from heavy to light REEs. The heavy REEs include europium, lutetium and yttrium, while light REEs include lanthanum, cerium, praseodymium, neodymium and samarium. Despite the name, REE deposits are widely available; what makes these elements "rare" is that, in general, they are often found within a compound, which makes their extraction often expensive and toxic. It is the reason why China has been left to process these elements; dealing with the consequences of chemical waste can be too costly for developed countries that have stricter environmental regimens. Further, not all of these elements are equally available; in general, the larger the atomic number, the less abundant those elements are. Thus, cerium is the most widely available, while lutetium is the least abundant.

According to information from Geoscience Australia, there are approximately 120,000 kilotons (kt) of REEs globally that exist in oxide form. Of that amount, about 44,000 kt or 38 per cent of the world total, is found in China; Brazil and Vietnam rank second-equal, each with 22,000 kt (19 per cent). Australia, on the other hand, possesses about 3,660 kt or three per cent of the global total, but is ranked second in production with 19 kt, while China produces 120 kt per year. The most abundant rare earth deposit in the world is located in

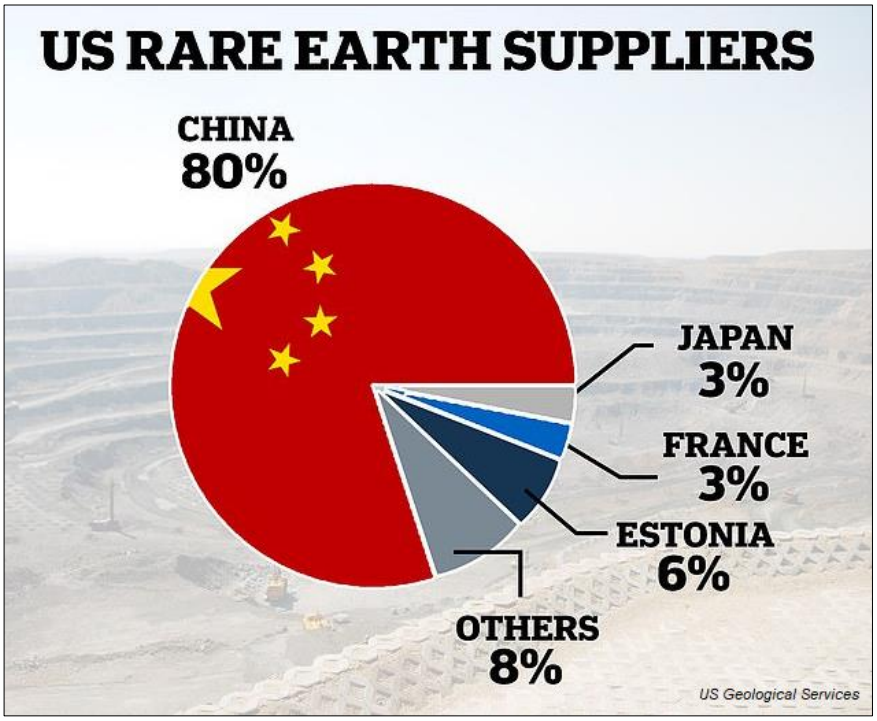
Bayan Obo, in the Chinese region of Inner Mongolia, which accounts for around half of the total global REE production.

Geopolitical Monopolisation

Although China employs a "no-strings attached" foreign policy to advance its strategic interests, Beijing does have ulterior geopolitical motives that, nevertheless, combine to benefit it in the long run. For instance, China looks towards Afghanistan to secure the estimated US$1 trillion in REE deposits in Helmand province. That figure equates to about 1.4 million metric tons of REE. That motivates Beijing to negotiate Kabul's involvement in its Belt and Road Initiative (BRI) project, especially now that the US appears to have decided to withdraw from the area.

A similar case can be seen in Brazil, which possesses the largest known deposits of niobium, along with significant amounts of tantalum and dysprosium. Brazil found itself unable to resist Beijing's economic lure. Although niobium and tantalum are not counted as REEs, their use and rarity are arguably on par with true REEs. Niobium is mainly used to harden steel, with applications in aero-technologies and missiles, which makes it a strategic metal, according to the US Government. As Beijing controls the majority of steel production, five of its companies, Bao Steel, CITIC, Anshan Iron & Steel, Shougang Corp. and Taiyuan Iron & Steel acquired 15 per cent of Brazil's niobium producing mill, CBMM, worth US$1.95 billion in 2011. This means that, while Brazilian President Jair Bolsonaro wishes to reduce his country's dependence on China as a source of income, particularly when it comes to ore exports, Beijing will be sure to include Brazil's strategic resources in the agreement.

The monopolisation of REEs by China becomes most visible in its possible use in a trade war with the US. In May this year, President Xi Jinping visited a rare earths processing facility, JL Mag Rare-Earth in the city of Ganzhou, where he remarked that China must prepare itself for a "long march", referring to the 1934-36 strategic retreat of the Communist Red Army from the opposing Kuomintang troops. On one hand, the symbology of the visit was



designed to reflect and galvanise a spirit of unity amid hardships. The practical intent of the visit, on the other hand, was to convey a veiled threat to Washington over its reliance on Chinese REEs. Furthermore, as the extraction process for REEs differs from site to site, Beijing has also increased its grip on REEs by increasing the number of patent registrations for processing them. Between 1950 and October 2019, China registered 25,911 patents, versus 9,810 registered by the US, 13,920 by Japan and 7,280 by the European Union.

The application of REEs in civilian and military uses could also alter the geopolitical landscape. As long as China remains the hub of global manufacturing, it dominance poses a challenge to other countries that might stand against Beijing. Also, as with other potential scenarios, should a US-China conflict occur, the US and its allies would be hard-pressed to secure the supply of REEs for their missiles, particularly those for the *Predator* UAV systems, as well as laser-targeting and combat systems. The US increased its imports of rare earths from China to US$160 million in 2018, a rise of 17 per cent over the previous year, for the construction of its F-35 fighter aircraft alone, as each requires 415 kg of rare earths over the course of its production. In comparison, the *Virginia*-class submarine requires four tonnes, while each *Arleigh Burke*-class destroyer requires 2.3 tonnes of REE alloys. The US, despite having a rare earth mine in Mountain Pass, California, exports the majority of its 4,000 tons of RRE to China to be processed. That growing dependence compelled the Pentagon to adopt the Defence Productions Act III to strengthen the security of domestic production of rare earth metals.

Aside from military use, REEs are crucial for civilian use in rechargeable batteries, magnets used in electric motors and generators, and computer components. With increased application, the criticality of the resource has been exacerbated by its monopolisation by China, which amounts to a weaponising of the resource sector. In 2018, Beijing was accused of dumping products that undermine the security of US-based rare earth metal productions. In doing so, China undoubtedly lowered the price of materials, thereby undercutting producers in other countries and driving them out of business.

For example, Molycorp Inc. acquired the Mountain Pass mine in California in 2005 from Chevron. It then re-opened the mine in 2011 and produced 19,000 metric tons of rare earths per year, particularly cerium and lanthanum. Trouble soon began when the cost to produce one kilogram of REE reached US$20, while the market price for REEs at the time was at US$7. At the same time, China was ordered by the World Trade Organisation to lift its 2010 embargo on REE trade, leaving it free to flood the market with cerium – the cheapest and most abundant REE, which also happened to be the most-produced REE at the Mountain Pass mine.

In short, along with the monopoly and abundance of REEs, China has relied upon its ability to cause a surge in availability to put its rivals out of business with its low costs and overall cheap production. Besides, California's stringent environmental laws rule out competing with China.

Weaponisation of REEs

It is important to note, however, that despite the temptation for Beijing to impose a ban similar to that of 2010, there are two reasons why it is not feasible for it to do so. First, using REEs as a means to pressure the US would only highlight China's own reliance on the global production chain. That would undoubtedly put a dent in Chairman Xi Jinping's US$300 billion "Made in China 2025" initiative, whereby the majority of the world's high-end electronics – all of which require REEs – would be produced in China. That would include electric vehicles, which require high-end neodymium and samarium magnets.

If Beijing decides to limit the export of REEs, the US could impose similar limitations on its exports of those REEs that China requires, for instance, neodymium-praseodymium oxide, while simultaneously limiting the export of semiconductors, which are critical to China. Countries other than China can also innovate and recycle these vital materials. Japanese car companies such as Toyota and Honda have developed innovations that do not require REEs to build permanent magnets in their electric vehicles. Hitachi has found a method to recycle used REEs, use more widely available rare earths in its alloys, or avoid them altogether. South Korean conglomerate Samsung and US Apple, on the other hand, have chosen a more direct approach of recovering rare earths from their products while simultaneously reducing electronic waste. There is also a substitute for the REEs that can be used in case of shortages which includes further research to synthesise products using standard metal alloys and the development of paramagnets.

Beijing has cracked down on illegal mining, production smuggling and the reuse of REEs. The Chinese Government started this clampdown in 2009, arguing that it drives down the price of rare earths. Any further restrictions will undoubtedly incentivise individuals outside the state's six mining companies to take advantage of the higher market price of the REEs and lower domestic cost. Also, the quantity of REEs needed to manufacture various products are not the same. Smartphones, computers and display screens require fewer materials than more sophisticated military equipment. Consequently, REEs can be sourced from other countries, such as Australia and Japan, which means the impact on importing countries may not be as large as anticipated.

The second reason why China will not succeed in its REE trade restrictions, and perhaps the most crucial, is the development of REE processing facilities in countries as diverse as Malaysia and the US. After the 2010 embargo, countries that were dependent on Chinese REEs started to diversify their sources of the elements. The problem, as noted earlier, is not about supply, as they are widely available; the issue is a matter of processing the materials without incurring significant environmental damages. While China has been successful in this matter, the Japanese-backed, Australian company Lynas Corp., the largest supplier of REEs outside China, has received growing attention for both its Mt. Weld mine and Kuantan processing facility. The Pentagon, in particular has been in talks with the Australian Government to establish processing facilities that 'would take care of our DoD needs, [and] a variety of other international needs as well', according to Ellen Lord, the Undersecretary for the US Department of Defence.

A similar tone was conveyed by the US Secretary of Commerce, Wilbur Ross, during his visit to Canberra to meet Resources Minister, Matt Canavan. During that meeting, both parties stipulated that the US and Australia need to break the stranglehold of Chinese dominance in the REE market by continuing to develop capabilities outside China. Consequently, Lynas Corp. has also started talks with the US-based mining processor, Blue Line Corp., to form a joint venture that aims to fill the gap in the US supply chain. A possible new processing centre in the US will be opened in Texas to increase domestic production. The US has also started to develop its capabilities at the Mountain Pass mine under the new ownership of Las Vegas-based MP Materials.

A Changing REE Landscape

In 2018, Japan discovered REE deposits on Ogasawara Island that have the potential to supply REE commodities for the next 780 years. The 400-square kilometre seabed contains an estimated 16 million metric tonnes of rare earth oxides. There are two perceived problems with this discovery. First, is the extraction, as the ores are located six kilometres below the surface and, second, it does not solve the problem related to the processing of the materials, which will have to be processed in Chinese-controlled facilities unless Western environmental laws are changed to accommodate their processing.

Similarly, North Korea has also discovered rare earth reserves worth between US$6-10 trillion, perhaps the largest in the world. China has been looking to exploit such reserves but has been unable to do so effectively due to the crippling sanctions in place against Pyongyang. Nonetheless, China has infrastructure projects near its border with North Korea to give it easier access to the resources. South Korea, on the other hand, sees the discovery of REEs as a potential bargaining tool for reunification with its northern neighbour.

Overall, as long as China remains the world's production hub for REEs, Beijing will continue to assert its economic power by essentially weaponising its REE production. There are ways, however, as seen with Japan's initiatives, to counteract such moves. Primarily, the two critical initiatives required are innovation and more processing facilities. For the immediate future, despite the environmental degradations, opening more processing facilities will enable countries other than China to secure their REE supplies. In the longer term, using fewer of those materials, or replacing the use of rare earths in electronic products, will slowly reduce the importance of these commodities and, in doing so, reduce the strategic REEs advantage currently enjoyed by China.

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