OCEAN POLICY RESEARCH INSTITUTE
SASAKAWA PEACE FOUNDATION
「海の論考」 OPRI Perspectives

OPRI Perspectives No.36[2025]

# The Potential and Challenges of Rare Earth Mining at Minamitorishima: Can It Strengthen Japan's Economic Security?

Yuki Kobayashi, Senior Research Fellow, National Security and Japan-U.S Program, Sasakawa Peace Foundation

## 1. Successive Chinese Restrictions on Rare Earths Export

China has been tightening its restrictions on rare earths export. In April 2025, citing the need to prevent military applications and safeguard national security, Beijing began stricter export controls on seven types of rare earths[1]. In October of the same year, it announced further measures requiring foreign companies to obtain government approval if their products contained more than 0.1% Chinese rare earths, and mandating licenses for the export of refining and recycling technologies. The latter measure was subsequently postponed for one year in November, following an agreement reached at a U.S.–China summit[2]. Rare earths are indispensable for large wind turbine generators, electric vehicle motors, and data storage devices—key components in realizing both digital transformation (DX) and green transformation (GX), the defining global trends of the 21st century. They are also critical for national security, being used in fighter aircraft and rocket engines.

Countries worldwide are being forced to secure alternative sources of rare earths outside China, and Japan is no exception. When China implemented its export restrictions in April, Japanese automakers were compelled to temporarily halt production[3].

Thus, rare earths have become a central battleground in economic security. For Japan and other Western nations, reducing dependence on China for these strategic minerals has become an urgent priority. Against this backdrop, attention has turned to the Cabinet Office's Strategic Innovation Promotion Program (SIP) project on "Building a Maritime Security Platform." Led by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), participating institutions are scheduled to begin operational testing of mining equipment off Minamitorishima in January 2026. This unprecedented initiative aims to recover mud containing rare earths from the seabed at depths of around 6,000 meters. Whether this effort can pave the way for practical extraction remains to be seen, but its progress is being closely watched.

This paper will first provide an overview of China's tightening export controls and its monopolization of the international rare earth market, along with the resulting impacts. It will

then examine the SIP initiative and the outlook for operational testing, before considering the significance of this project for Japan.

## 2. China's Monopolization of the International Rare Earth Market

Rare earths refer to 17 elements with distinctive electrical and chemical properties, such as their use in permanent magnets. Of these, seven lighter elements are classified as light rare earths, while the remaining ten heavier ones are categorized as medium and heavy rare earths[4]. The seven rare earths subject to China's export restrictions in April this year all belong to the medium and heavy group[5], underscoring their indispensability not only for advanced civilian technologies but also for security-critical sectors such as laser equipment and the aerospace industry (see Table 1). Although not explicitly stated at the time of announcement, the tightening of export controls was widely interpreted as retaliation against U.S. tariff measures. The result was significant disruption to economic activity worldwide, including the suspension of automobile production.

Table 1: Rare Earths Subject to China's Stricter Export Controls and Their Main Applications

| Element | Main Applications |
|---|---|
| Samarium | Sensors, medical devices, automobile components |
| Gadolinium | MRI contrast agents, nuclear reactor control rods |
| Terbium | Anti-counterfeiting fluorescent printing, laser processing |
| Dysprosium | Motors for EVs and hybrid vehicles, wind turbine generators, data storage devices |
| Lutetium | Lasers, radiation therapy |
| Scandium | Electrode materials, lasers, aircraft components |
| Yttrium | Electronic filters, lasers, superconductors |

Source: Compiled by the author with reference to Katsuhiro Saito, "Rare Metals: The Astonishing Capabilities of Rare Earths," C&R Research Institute, 2019, pp. 216–229.

China is able to enforce such export restrictions because it virtually dominates the international rare earth market. According to the U.S. Geological Survey (USGS), China accounts for 68% of global rare earth mining output[6]. While light rare earths are relatively more evenly distributed worldwide, the medium and heavy rare earths—including the seven elements listed in Table 1—are disproportionately concentrated in China[7]. These elements are more critical for advanced technology industries and security-related equipment, giving China a distinct advantage. Moreover, rare earths cannot be used immediately after extraction. They must first be refined to separate the different elements contained within a single ore before being processed into products. In this refining stage, China's dominance is even more

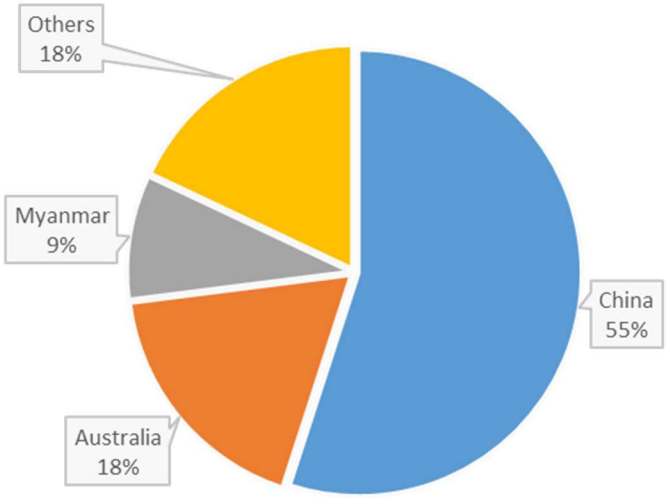
pronounced: the International Energy Agency (IEA) reports that China controls over 90% of global refining capacity[8].

The monopolization of the rare earth market by China is partly attributable to the actions of the United States and other Western nations. The process of mining, refining, and productizing rare earths generates large amounts of pollutants, including toxic gases, sludge, and radioactive substances[9]. This is due to the extensive use of chemical agents required to separate rare earths by type. Until the 1980s, France, alongside the United States, was a leader in the international rare earth market. However, wastewater from a French refinery in the western part of the country was reported to contain radioactive substances at concentrations nearly 100 times higher than the regional average[10]. As environmental awareness grew in Western countries, most operators either withdrew from rare earth mining and refining or drastically reduced their scale. In contrast, China—where environmental regulations were comparatively lax—seized the initiative and established its dominance in the sector[11].

Western countries have been seeking to reduce their reliance on China for rare earths. Japan, having been among the first to experience Chinese export restrictions following the nationalization of the Senkaku Islands in 2012, has repeatedly invested in and provided loans to Lynas Corporation, an Australian rare earth mining and refining company. Through Lynas's refinery in Malaysia, Japan secured contracts for the supply of medium and heavy rare earths—specifically dysprosium and terbium (see Table 1)[12]. In 2024 and 2025, Japan also contributed funds to the refining operations of the French company Caremag, concluding supply agreements to ensure deliveries to Japan[13]. In the United States, the Department of Defense invested $400 million (approximately ¥58.8 billion) in MP Materials, a domestic rare earth company, becoming its largest shareholder with a stake exceeding 15%. This investment not only supports the company's mining and refining operations but also places the U.S. government in a position to exert significant influence over its management[14].

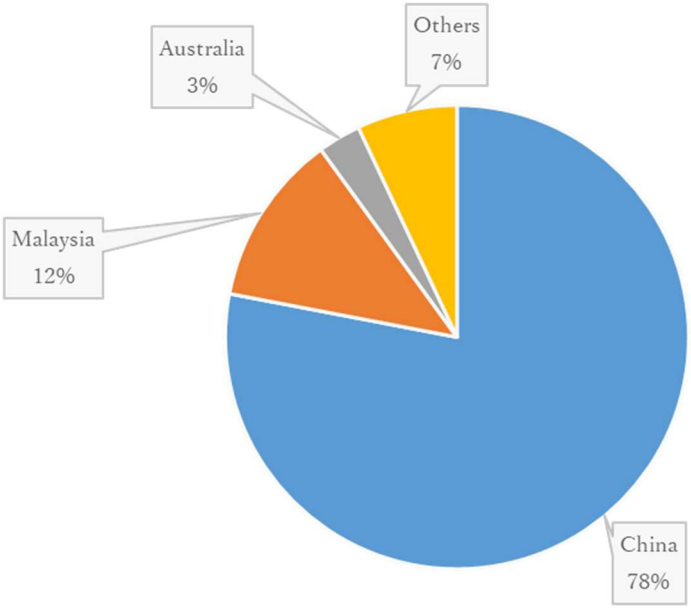
Will these efforts bear fruit? Forecasts by IEA provide useful insight. According to IEA scenarios, by 2040 China's share of global rare earth mining will decline by about 13 percentage points from 2023 levels, to 55%. Its share of refining is also expected to fall, to 78% (Figure1, 2)[15]. Nevertheless, with nearly four-fifths of global refining capacity still concentrated in China, the fundamental structure enabling Beijing to dominate rare earth supply worldwide is unlikely to undergo dramatic change in the near term.

Figure 1: Mining Ratio of Rare Earths by Country as of 2040




Source: Created by the author with reference to the International Energy Agency (IEA) "Global Critical Minerals Outlook 2024"pp. 177-189.

Figure 2: Rare-earth Refining Ratio by Country as of 2040




Source: Created by the author with reference to the International Energy Agency (IEA) "Global Critical Minerals Outlook 2024"pp. 177-189.

## 3. Current Status and Potential of the SIP Project

Although Japan has sought to reduce its dependence on China for rare earth procurement, more than 60% of its demand is still met by Chinese supply. For medium and heavy rare earths—those most critical to defense and advanced industries—over 90% originate from China. To overcome this situation, Japan has pursued diversification of supply sources while also exploring the possibility of self-sufficiency through the Cabinet Office–led SIP, which since 2014 has conducted rare mineral exploration in the waters around Minamitorishima.

During the first phase (FY2014–2018), exploration focused on seafloor hydrothermal deposits at depths shallower than 2,000 meters. The second phase (FY2018–2022) advanced research aimed at establishing technologies for deep-sea resource surveys below 2,000 meters. Building on these achievements, the third phase, launched in FY2023 under the title "Building a Maritime Security Platform," confirmed the presence of rare earth deposits at depths of approximately 6,000 meters within Japan's Exclusive Economic Zone (EEZ) off Minamitorishima, believed to be viable for industrial-scale development. In January 2026, operational testing of equipment designed to lift mud containing rare earths (hereafter "rare earth mud") from the seabed at around 6,000 meters will be conducted. If successful, the project is scheduled to move to a demonstration phase in February 2027, targeting extraction of 350 tons of rare earth mud per day.

Photo 1: Residue from rare earth mud mined near Minamitorishima in 2019

Source: JAMSTEC

During this period, some media outlets and symposiums have suggested that the estimated reserves of rare earths near Minamitorishima could exceed “a hundred years’ worth of global demand” and make it possible for Japan to “break free from dependence on China.” However, JAMSTEC, which plays a central role in exploration, has refrained from publishing precise reserve figures. Instead, it has limited its statements to the more cautious expression that “industrial-scale development is possible.” This restraint stems from two key factors[16].

The first factor is the difficulty of ensuring economic viability. Minamitorishima lies 1,950 kilometers from Tokyo. Moreover, with rare earth deposits located around 6,000 meters below the seabed, simply establishing the necessary mining technology requires enormous effort. Operating the SIP project’s research vessel “Chikyu” (it means the Earth) costs several tens of billions of yen annually—equivalent to several tens of millions of yen per day. Even if Japan were to achieve the world’s first large-scale extraction at such depths and establish the processes of separation and refining, some cost reductions could be realized. Nevertheless, competing with the price of Chinese rare earths would remain extremely difficult.

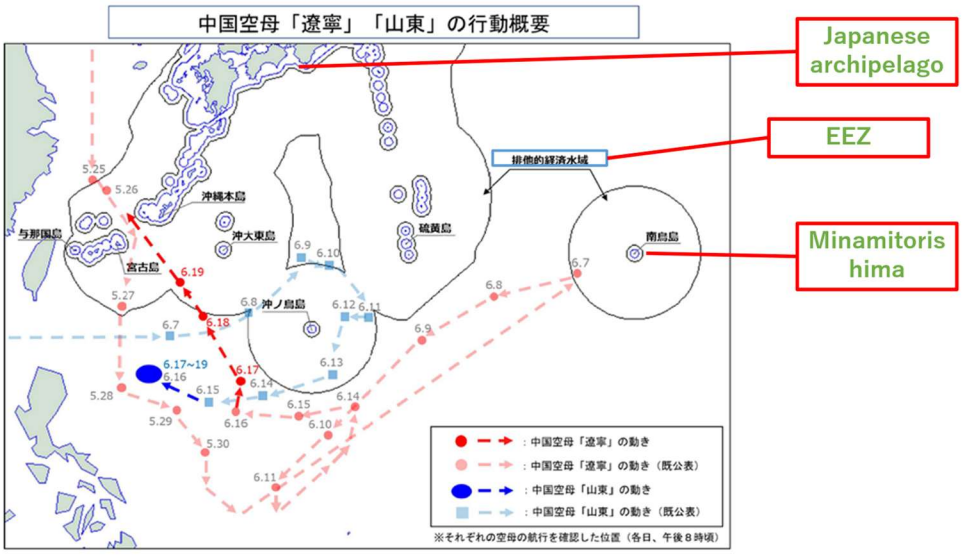
Photo 2: The research vessel "Chikyu" in the SIP project


Source: JAMSTEC

A second factor behind JAMSTEC’s cautious stance is the growing evidence of actions that appear to be Chinese interference, as projections of rare earth reserves have begun to circulate independently. Located in the western Pacific, Minamitorishima has seen heightened Chinese naval activity amid intensifying U.S.–China rivalry. Figure 3, released by Japan’s Ministry of Defense on June 17, 2025, shows that the Chinese aircraft carrier Liaoning temporarily entered Japan’s EEZ near Minamitorishima. This incursion may have been intended as a warning against Japan’s rare earth exploration activities. Looking ahead, there

is also concern that China could attempt to obstruct domestic supply by pressuring companies cooperating in rare earth mining at Minamitorishima—possibly by threatening further export restrictions.

Figure 3: Chinese naval activities in the western Pacific (April–June 2025)




Source: Created by the author based on materials from the Ministry of Defense

SIP's program director Shoichi Ishii emphasized that "this is a first in the world and we need to proceed in a quiet environment."[17]

## 4. Conclusion: Efforts Toward Stabilizing the Procurement of Critical Minerals

In light of the international situation surrounding rare earths, future projections, and the potential for commercialization in the Minamitorishima area, what should Japan do to stabilize the procurement of critical minerals and strengthen its economic security? Two proposals can be made.

First, Japan should continue its efforts to diversify sources of rare earth procurement. The potential for mining rare earths in the waters around Minamitorishima should, for the time being, be regarded as part of this diversification strategy. Step by step, Japan must advance operational testing, as well as the establishment of refining and productization processes. As JAMSTEC has pointed out, mining at depths of around 6,000 meters in a remote island area far from the mainland—even if abundant reserves are expected—offers little prospect of ensuring profitability or price competitiveness. Thus, it is unlikely to provide an immediate solution to Japan's dependence on Chinese rare earths. Nevertheless, even if domestic supply initially covers less than 10% of national demand, self-sufficiency in critical minerals would

enhance resilience against shifts in international circumstances, such as the tightening of export restrictions. This alone carries significant meaning for Japan.

Second, Japan must recognize that if SIP-led seabed rare earth mining reaches commercialization, it will add to the nation's strengths as a maritime power. As noted earlier, land-based rare earth mining and refining generate large amounts of pollutants, making environmental protection difficult. If Japan can establish technologies for extracting critical minerals offshore Minamitorishima with minimal environmental impact, this would not only strengthen economic security but also enable Japan to provide technical assistance in seabed resource extraction to island nations and coastal states. Such cooperation could serve as a tool for strengthening diplomatic relations.

For these reasons, initiatives toward rare earth mining at Minamitorishima should be pursued as a national strategy, grounded in a long-term perspective on their significance.

(End)

[1] 中華人民共和国商務部「商务部 海关总署公告 2025 年第 18 号 公布对部分中重稀土相关物项实施出口管制的决定」(in Chinese) April 4, 2025.
https://www.mofcom.gov.cn/zwgk/zcfb/art/2025/art_9c2108ccaf754f22a34abab2fedaa944.html

[2] 中華人民共和国商務部「商务部、海关总署公告 2025 年第 70 号 公布暂停实施商务部、海关总署公告 2025 年第 55 号、56 号、57 号、58 号及商务部公告 2025 年第 61 号、62 号的决定」(in Chinese) November 7, 2025.
https://www.mofcom.gov.cn/zwgk/zcfb/art/2025/art_b1ec77dd3f0d4762952904df7cdaadec.html

[3] Meredith, Sam. "Auto industry sounds the alarm as China's rare earth curbs start to bite" CNBC, June 5, 2025.
https://www.cnbc.com/2025/06/05/auto-groups-sound-the-alarm-as-chinas-rare-earth-curbs-start-to-bite.html

[4] Katsuhiro Saito, "Rare Metals: The Astonishing Capabilities of Rare Earths," C&R Research Institute, 2019, pp. 126-127.

[5] Japan External Trade Organization (JETRO), "China to Implement Export Controls on Seven Medium and Heavy Rare Earth Items from April 4," (in Japanese) April 7, 2025.
https://www.jetro.go.jp/biznews/2025/04/9008601e0d63d27d.html

[6] USGS, "Mineral Commodity Summaries 2024," U.S. Geological Survey, January 31, 2024. https://tableau.usgs.gov/views/MCSDashboardWorkbook_2024-01-30/MCSDashboard?%3Aembed=y&%3AisGuestRedirectFromVizportal=y#7

[7] USGS, "Mineral Commodity Summaries 2024," U.S. Geological Survey, January 31, 2024. https://tableau.usgs.gov/views/MCSDashboardWorkbook_2024-01-30/MCSDashboard?%3Aembed=y&%3AisGuestRedirectFromVizportal=y#7

[8] IEA, "Global Critical Minerals Outlook 2024," May 2024, pp.177-189. https://iea.blob.core.windows.net/assets/ee01701d-1d5c-4ba8-9df6-abeeac9de99a/GlobalCriticalMineralsOutlook2024.pdf

[9] Katsuhiro Saito, "Rare Metals: The Astonishing Capabilities of Rare Earths," pp. 128-131.

[10] French NGO "Commission for Independent Research and Information on Radioactivity" (CRIRAD), based on multiple inspections conducted since 1987, reported radiation levels nearly 100 times higher than the regional average. Guillaume Pitron, "The Rare Metals War: the dark side of clean energy and digital technologies,"(in Japanese) pp. 71–76.

[11] oshikiyo Shimamine, "The Cost of the U.S.–China Tariff War: Rare Earths (Part 1) — Is the United States Prepared to Abandon Rare Earths under China's Monopoly?" (in Japanese) Global Trends / Macroeconomic Analysis Report, Dai-ichi Life Research Institute, April 10, 2025.
https://www.dlri.co.jp/report/macro/431667.html

[12] Ministry of Economy, Trade and Industry (METI), "Japan Secures Its First Stake in Rare Earths (Heavy Rare Earths)," (in Japanese) March 7, 2023.
https://www.meti.go.jp/press/2022/03/20230307001/20230307001.html

[13] Ministry of Economy, Trade and Industry (METI), "The Governments of Japan and France Collaborate to Support a Heavy Rare Earth Project in the French Republic," (in Japanese) March 17, 2025.
https://www.meti.go.jp/press/2024/03/20250317001/20250317001.html

[14] MP Materials "MP Materials Announces Transformational Public-Private Partnership with the Department of Defense to Accelerate U.S. Rare Earth Magnet Independence" July 10, 2025. https://mpmaterials.com/news/mp-materials-announces-transformational-public-private-partnership-with-the-department-of-defense-to-accelerate-u-s-rare-earth-magnet-independence

[15] See footnote 8.

[16] Based on the author's interview with Shoichi Ishii, Program Director of the SIP, November 11, 2025.

[17] Author's interview with Shoichi Ishii, Program Director of the SIP, November 11, 2025.