



Securing critical minerals supplies in the context of a mineral-poor country: reviewing South Korea's domestic and international engagement

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Abstract

This review article addresses a gap in the literature that has largely sidelined South Korea's critical minerals strategies despite the country's leading role in low-carbon and defense technologies. In particular, we focus on the structure of South Korea's domestic and foreign engagement for critical minerals sourcing. We identify 18 documents that constitute the architecture of the resource-poor country's efforts to address supply risks. With an economy driven by industrial conglomerates highly reliant on these minerals, South Korea has mobilized a realistic approach of diversifying its supply chains. This contrasts with its U.S. and to a lesser extent European counterparts looking to decouple themselves from Chinese supplies. South Korea, by opposition, recognizes the immense capacities of China and intends to maintain part of its sourcing from its neighbor while diversifying through engagement with global mineral leaders in Asia, smaller African producers, and potentially the development of deep sea mining. This article constitutes a first step in understanding critical minerals strategies for resource-poor countries with significant industrial and technology sectors. Finally, we conclude by providing four avenues for potential future research.

Keywords Critical minerals · South korea · Diversification · Low-carbon transitions · Geopolitics

Introduction

South Korea's industries are important consumers of critical minerals. Industrial conglomerates with significant politico-economic power in the country, have driven innovation in automotive, ship manufacturing, battery production, consumer electronics, and defense. Household names, including Samsung, LG, Hyundai, and Kia, have created globally competitive industries for which securing the supply of critical minerals is a strategic necessity. This review is the result of an identified gap in

the literature on critical minerals politics which largely sidelines South Korea, despite the country's significant and strategic industries relying on these resources. South Korea is resource-poor and relies on foreign sourcing (Villalobos et al. 2025). We find that South Korea's (geo) political efforts are marked by a realistic approach recognizing China's dominance in the sector. The country thus focuses on a diversification strategy, by opposition to a full decoupling, as is the case, at least narratively, for the U.S. (Deberdt et al. 2025a and to a lesser extent the EU (Calabrese 2024). The result is a diversification of supplies through a number of agreements with foreign partners presented as mutually beneficial as well as the potential of developing deep sea mining (Kim 2024a).

Critical minerals are resources considered strategic and have spurred (geo)political, economic, industrial, and socio-economic tensions across the globe. Those resources are used for high-technologies, including for low-carbon transitions and defense. They are hard to substitute and face supply constraints due to a series of different factors (Eggert 2010), from geographical concentration of deposits

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to export limitations from producing countries. The International Energy Agency (IEA 2024) estimates that demand for lithium, cobalt, nickel, and copper is expected to increase by 700%, 219%, 200%, and 151% respectively. South Korea, in the meantime, does not hold deposits of significance for any of these raw materials (Armstrong et al. 2016) and thus, relies at 95.5% on imports to integrate them in semi-finished and finished products (Nanyang Technological University 2025).

This article builds on existing literature focused on the geopolitics of critical minerals (Kalantzakos 2020; Vivoda 2023) and the political ramification of de-risking and securitization strategies (Le Billon et al. 2025). We also inscribe this research in the study of state-led policies aimed at securing critical minerals supplies, from domestic and foreign sources. Research points at the development of multiple forms of extractivism, from traditional greenfield mine opening (Malone et al. 2023) to the reprocessing and re-mining of previously operating mines (Deberdt et al. 2025). In parallel, scholars also underline the socio-environmental impacts of the (re)development of mining operations in Western countries (Carr-Wilson et al. betta 2022024) and the creation of sacrifice zones in both the Global North (e.g. Dunlap and Riquito 2023; Lassila 2025) and the Global South (e.g. Meehan et al. 2025).

From 2021, the country developed a wide apparatus of foreign and domestic administrative and legal instruments with the aim to address the disruption risks that such reliance on imports create. As we find, it signed foreign agreements with 11 countries or organizations, including two Australian subnational entities. Focusing on both Global North and Global South partners, the South Korean government announced a \$38 billion investment to wean off its industry from dependencies on Chinese actors (Kim 2024b). This article addresses this effort from a political and legal perspective, reviewing the development and impacts of these instruments to provide a detailed analysis of South Korea's critical minerals strategy. This review article is inscribed in the (geo)political literature on critical minerals. In post-COVID context, marked by the Russian invasion of Ukraine and booming tensions between the U.S. and China, South Korea finds itself between a rock and a hard place. Nevertheless, as Bowen (2023) suggests, the administration of now impeached president Yoon Suk-yeol, engaged into neo-illiberal (Hendrikse 2018) policies of support to the mineral industry. In particular, the 2022 strategy for a Strategy for a Free, Peaceful and Prosperous Indo-Pacific Region expands on the role of South Korea and establishes it as a pivot in the securitization of global supply chains, including of critical minerals (Government of the Republic of Korea 2022). The 2025 International Forum on Critical Minerals organized by the Korea Institute of Geoscience and Mineral

Resources (KIGAM) only reiterated these priorities (Today Energy 2025).

This review article is based on the identification of administrative and legal instruments developed by the country to promote critical minerals supply security as well as an in-depth literature review. The former, conducted in English and Korean, spurred very few results, thus underlining the gap that this article aims at addressing. The remainder of this article proceeds as follows. In the second section we detail the methodology as well as the 18 instruments identified as in-scope and constituting the core of the review. In section III we address the domestic ramifications of critical minerals sourcing, pointing at the high level of reliance of the country on imports while also highlighting the mineral needs of its industries. Section IV briefly presents the mining potential within South Korea and underlines the severely limited domestic resources. In Section V we explore the critical minerals foreign policy mobilized by South Korea, focusing on Global North and Global South countries as well as deep sea mining. Finally, we conclude and propose avenues for future research.

Methodology

This article responds to a gap identified in the current literature on the role of South Korea in critical minerals policy-making. As a review, we explicitly focus on existing documents, including a literature review of academic publications as well as a deep-dive into politico-administrative and legal instruments currently in place and explicitly addressing critical minerals. Table 1 below provides more information on the academic literature review conducted in

Table 1 Overview of literature review on critical minerals in South Korea

Type of Document	Total number of Documents	English	Korean ^a
Article	16	4	12
Book	0	0	0
Book Chapter	0	0	0
PhD Dissertation	1	0	1
MA Thesis	2	0	2
Other (Research reports, etc.)	8	3	5
Total	27	7	20

^aThe scope of this search has been deliberately narrowed to literature whose titles include keywords such as “Korea” or “Korean,” along with “critical minerals” or one of the six specific minerals referenced in the main text. News articles have been excluded, as their inclusion would result in an unmanageable number of results. For Korean-language sources, we rely on the most authoritative academic databases, including Google Scholar, KCI (<https://www.kci.go.kr/kciportal/po/research/poSereSear.kci>), DBpia (<https://www.dbpia.co.kr/>), and KISS (<https://kiss.kstudy.com/>)

English and Korean. We conducted this literature identification using broad keyword searches on Google Scholar and only focusing on titles. Keywords included “critical minerals” and “Korea/n” as well as a similar search for a select group of core critical minerals, including “cobalt,” “lithium,” “graphite,” “manganese,” “nickel,” and “rare earth elements/REEs.” We only selected publications with a direct political and (geo)political link. We conducted this search between 2010 and 2025. 2010 was selected as the start of significant geopolitical tensions in the region linked to critical minerals after the Senkaku rare earth crisis between China and Japan (Yang 2025). Finally, an additional ad-hoc search was conducted to ensure that all publications were accounted for.

This article builds on an in-depth identification of politico-administrative and legal instruments developed by South Korea in the sphere of critical minerals. In total, we identified 23 tools, of which one is exclusively focused on domestic issues, three cases are both domestic and foreign, and 19 are foreign-oriented. Table 2 below provides detailed information on each of these instruments. Importantly, we only focus on established structures and do not include those described as one-offs. For example, while at the time of writing a MoU between South Korea and Tanzania appears to be under consideration, the table does not include the Tanzania-Korea Critical Minerals Roadshow 2025 as this event seems to be a one-off in preparation of the MoU. Similarly, while South Korea began talks with Japan on critical minerals (Na-young 2025), those are also not included in a structured approach. While South Korea and Ecuador have signed provisional agreements on a free trade agreement which would focus in part on graphite, manganese, copper, aluminum, and nickel, it is not yet in effect (IEA 2024). Finally, as a critical minerals research, we excluded all documents that are not specific to those resources, including for example far reaching free trade agreements without critical minerals specificities. Each document was then assessed for their scope, implementation, and orientation.

Table 2 underlines the strategy mobilized by South Korea, first with the dominance of foreign approaches compared to domestic ones. The country entered into 19 agreements and other foreign-oriented instruments while an additional three are both domestic and foreign. Similarly, South Korea also showed preference for administrative instead of legal instruments, thus providing more flexibility in the process of securing critical minerals supplies. In total, 22 out of the 23 identified instruments are administrative. The drawback, however, is a dependence of these mechanisms on national politics, thus questioning how these priorities will hold if governments shift priorities or if opponents get into power.

South Korea's conglomerates and critical minerals strategy

According to South Korea's Ministry of Foreign Affairs, 95.5% of the annual critical minerals needs of the country are imported (Nanyang Technological University 2025). In 2023, South Korea adopted a critical minerals strategy for which the Ministry of Trade, Industry and Energy (MoTIE) is responsible. The move, aiming to diversify supply chains more than decoupling from jurisdictions deemed risky, aligned with those of other countries, including Australia, Canada, the U.S., the EU, and China. Within this document, South Korea also included a list of 33 minerals which the government deemed critical for its economic and national security (see also Kim and Lee 2023 for the conceptualization of criticality). These minerals also include 10 elements considered strategic and which reflect the country's focus on high-tech industries, including battery manufacturing (cobalt, graphite, lanthanum, lithium, manganese, nickel), magnets (dysprosium and terbium), and steel and alloys production (cerium and lanthanum) (MOTIE 2023). The critical minerals strategy aims at decreasing the reliance on specific countries from 80% to 50% by 2030, thus ensuring a diversification of supplies and mitigating potential economic or geopolitical shocks (MOTIE 2023). To achieve this, the government introduced a \$38 billion plan to support the decoupling of the country's industry specifically from China's critical minerals dominance.¹ This decision also occurs in the context of China's strengthening export controls for specific minerals, including graphites and selected REEs, to the U.S. but also requesting South Korean companies to stop exporting products made with Chinese heavy REE-containing to the U.S. (Reuters 2025a, b). Je et al. (2025) underline that “geopolitical dependencies, supply-demand imbalances, and price volatility make it difficult to secure these critical minerals” while also highlighting that focusing on recycling could help reduce both economic and environmental impacts (Fig. 1).

In this sense, the critical minerals list² underlined both the importance of these economic sectors for the South Korean economy as well as the potential for disruption, in particular with high levels of concentrations of the mining and processing of these minerals by foreign actors misaligned with the country's democratic system. In particular, these point to Russia and mainly China. Graph 1 underlines the dependencies of South Korea towards Chinese processed minerals. However, it should be noted that on REEs, South Korea was successful in decreasing its dependency towards

¹ While China is not expressly named, the Ministry of Finance underlined that the investment was geared towards diminishing dependency towards a “certain country.”

² For more information on critical mineral lists globally, see Deberdt et al. (2025a, b).

Table 2 Identified in-scope legal and administrative instruments

ID	Title	Authority	Year	Legal or Administrative	Orientation	Details
01	Korea Mine Rehabilitation and Mineral Resources Corporation (KOMIR)	Ministry of Trade, Industry and Energy	2021	Legal	Domestic and Foreign	Merger of Korea Resources Corp. (Kores) and Mine Reclamation Corp. (Mireco) to create a state-owned company with focus on mineral security.
02	Republic of Korea-Australia Comprehensive Strategic Partnership+MoU on Critical Mineral Supply Chains.	Minister for Trade, Industry and Energy	2021	Administrative	Foreign	Increase cooperative efforts to ensure supply chain resilience for critical minerals and associated products. ROK-Australia Critical Minerals Working Group would lead collaboration across several joint initiatives, including supply chain mapping, research and development, and trade and investment opportunities. Increased cooperation between the two countries' private sectors, focused on connecting stakeholders at key points of the supply chain to bolster two-way trade and investment.
03	MoU on mineral cooperation between the Republic of Korea and Chile	Prime Minister Han Duck-soo and	2022	Administrative	Foreign	The MoU aims to strengthen bilateral cooperation on mineral resources to secure the mineral supply chain, especially lithium – e.g., government's subsidies if Korean companies use minerals from Chile.
04	MoU between the Ministry of Trade, Industry and Energy of the Republic of Korea and the Ministry of Energy and Mineral Resources of Indonesia on Cooperation on Critical Minerals	Minister for Trade, Industry and Energy	2022	Administrative	Foreign	Strengthen bilateral cooperation on core minerals (nickel and rare earth elements), electric vehicles ecosystem development, carbon capture, usage and storage, oil and gas development, and hydroelectric power..
05	Minerals Security Partnership	U.S. Based U.S. Department of State	2022	Administrative	Foreign	Four major orientations: (1) diversifying and stabilizing global supply chains, (2) investing in those supply chains, (3) promoting high environmental, social, and governance standards in the mining, processing, and recycling sectors, and (4) increasing recycling of critical minerals. Includes: Australia, Canada, Estonia, the EU, Finland, France, Germany, India, Italy, Japan, Norway, South Korea, Sweden, the UK, the U.S.
06	Strategy for a Free, Peaceful, and Prosperous Indo-Pacific Region	Ministry of Foreign Affairs	2022	Administrative	Foreign	Overarching strategy of cooperation in the Indo-Pacific. On critical minerals, the strategy underlines South Korea's focus on collaboration with partner countries sharing the same values to stabilize the supply of strategic resources.
07	South Korea's strategy for securing reliable critical minerals supply (incl. Critical Minerals List)	Ministry for Trade, Industry and Energy	2023	Administrative	Domestic	Seven core orientations: (1) designate 33 critical minerals as critical for economic security, among which 10 strategic critical minerals will be prioritized for intensive management to stabilize the supply chain of high-tech industries such as semiconductors and secondary batteries, (2) develop a global minerals supply map and an early warning system, (3) strengthen international cooperation, (4) mitigate supply risks, (5) encourage financial assistance and investment, (6) develop inter-agency collaboration, and (7) develop the public critical minerals infrastructure.
08	MoU between the Ministry of Trade, Industry and Energy of the Republic of Korea and the Department of Natural Resources of Canada and the Department of Industry of Canada on Cooperation in Critical Mineral Supply Chains, the Clean Energy Transition and Energy Security	Ministry of Trade, Industry and Energy	2023	Administrative	Foreign	Strengthen the partnership between South Korea and Canada to develop secure, resilient, and mutually beneficial critical mineral supply and value chains, a sustainable energy transition, and strengthening energy security

Table 2 (continued)

ID	Title	Authority	Year	Legal or Administrative	Orientation	Details
09	Statement of Cooperation between the Korea Mine Rehabilitation and Mineral Resources Corporation (KOMIR) and the Province of British Columbia	Korea Mine Rehabilitation and Mineral Resources Corporation	2023	Administrative	Foreign	Secure the supply chain of critical minerals through the promotion of trade and investment, Strengthen technical capacity through joint research and development projects in the areas of mineral exploration, mining, mineral processing and mine rehabilitation, Promote sustainable and safe practices throughout the entire critical minerals value chain, including recycling, and Share information, knowledge and experiences to foster the sustainable development of critical minerals in British Columbia and South Korea.
10	MoU between the Ministry of Foreign Affairs and Ministry of Trade, Industry and Energy of the Republic of Korea and the Ministry of Industry and Mineral Resources of Mongolia on Cooperation on Rare Metals Supply Chains (incl. Korea-Mongolia Rare Metal Cooperation Joint Committee + Korea-Mongolia Rare Metal Cooperation Center Project)	Ministry of Foreign Affairs and Ministry of Trade, Industry and Energy	2023	Administrative	Foreign	Strengthen cooperation for a stable supply of rare metals and sustainable industrial competitiveness. Ensure cooperation in critical minerals' research and development.
11	MoU between the Korean Mine Rehabilitation and Mineral Resources Corporation and the Northern Territories on Critical Mineral Supply Chains	Korean Mine Rehabilitation and Mineral Resources Corporation	2024	Administrative	Foreign Subnational	Promote cooperation in critical minerals resources and growth in all stages of the critical minerals life cycle including, exploration, mining, processing manufacturing and recycling.
12	MoU between the Ministry of Trade, Industry and Energy of the Republic of Korea and the state of Western Australia on Critical Mineral Supply Chains	Ministry of Trade, Industry and Energy	2024	Administrative	Foreign Subnational	Advance bilateral energy collaboration in various areas including critical minerals, hydrogen, carbon capture and storage, and renewables.
13	MoU between the Korean Trade Investment Promotion Agency (KOTRA) and the Economic Development Board of Madagascar (EDBM) on Critical Minerals Cooperation	Korean Trade Investment Promotion Agency	2024	Administrative	Foreign	Establish secured critical minerals supplies and partnership between POSCO and NextSource.
14	MoU between the Ministry of Trade, Industry and Energy of the Republic of Korea and the Department of Trade and Industry and the Department of Environment and Natural Resources of the Philippines on Strategic Cooperation on Critical Raw Materials Supply Chains	Ministry of Trade, Industry and Energy	2024	Administrative	Foreign	Establish stable supply chains for critical raw materials essential for electric vehicles, semiconductors, and renewable energy. Encompass the entire critical minerals value chain, from mining and processing to manufacturing and recycling, fostering investment and collaboration at all stages.
15	MoU between the Ministry of Trade, Industry and Energy of Republic of Korea and Kazakhstan's Ministry of Industry and Construction	Ministry of Trade, Industry and Energy	2024	Administrative	Foreign	It was agreed that if joint exploration of critical minerals proves to be economically viable, Korean companies will be given priority in participation.
16	Korea Assumes Chairmanship of the Mineral Security Partnership (MSP)	Ministry of Foreign Affairs	2024	Administrative	Foreign	The Korean government took the Chairmanship of the MSP to demonstrate leadership in the global critical minerals arena, such as setting long-term goals of the MSP.

Table 2 (continued)

ID	Title	Authority	Year	Legal or Administrative	Orientation	Details
17	MoU between the Ministry of Trade, Industry and Energy of the Republic of Korea and the Ministry of Energy and Mines of Peru on Critical Minerals Cooperation	Ministry of Trade, Industry and Energy	2024	Administrative	Foreign	Facilitate information exchange, joint geological surveys, and technological cooperation, leverage Peru's deposits of copper, silver, selenium, and zinc.
18	Korea-Africa Critical Mineral Dialogues	Ministry of Foreign Affairs	2025 (1st Dialogue at Mining Indaba 2025)	Administrative	Foreign	Bring together government representatives and business leaders from Korea and African countries to discuss how to foster mutually beneficial partnerships and ensure sustainable supply chains of critical minerals.
19	Inaugural Meeting of the Public-Private 'Critical Minerals Investment Council'	Ministry of Trade, Industry and Energy Ministry of Economy and Finance Ministry of Foreign Affairs (MOFA)	2025	Administrative	Domestic and Foreign	In collaboration with public institutions, including the Korea Mine Rehabilitation and Mineral Resources Corporation (KOMIR), the Korea Institute of Geoscience and Mineral Resources (KIGAM), the Export-Import Bank of Korea, Korea Trade Insurance Corporation, Korea Energy Agency, and KOTRA, the government promised to provide a comprehensive public-private support system, such as the Supply Chain Stabilization Fund (at an annual scale - approximately USD 38 million), overseas resource development research and financing, and overseas investment insurance.
20	Strategic Direction for Promoting the Recycling of Critical Minerals	Ministry of Trade, Industry and Energy Ministry of Economy and Finance Ministry of Environment	2025	Administrative	Domestic and Foreign	Promoting the localization of critical mineral supply chains by fostering the domestic critical mineral recycling industry - aiming to achieve a 20% recycling rate for the ten strategic critical minerals by 2030, based on international policy and technological cooperation.
21	G7 Critical Minerals Action Plan	Government of South Korea	2025	Administrative	Foreign	South Korea endorsed the G7 action plan. It includes: (1) building standards-based markets, (2) mobilizing capital and investing in partnerships, and (3) promoting innovation.
22	MoU between the Korea Institute of Geoscience and Mineral Resources and the African Minerals Development Centre	Korea Institute of Geoscience and Mineral Resources	TBA	Administrative	Foreign	N/A
23	MoU between the Korea Institute of Geoscience and Mineral Resources and the Geological Survey of Tanzania	Korea Institute of Geoscience and Mineral Resources	TBA	Administrative	Foreign	N/A

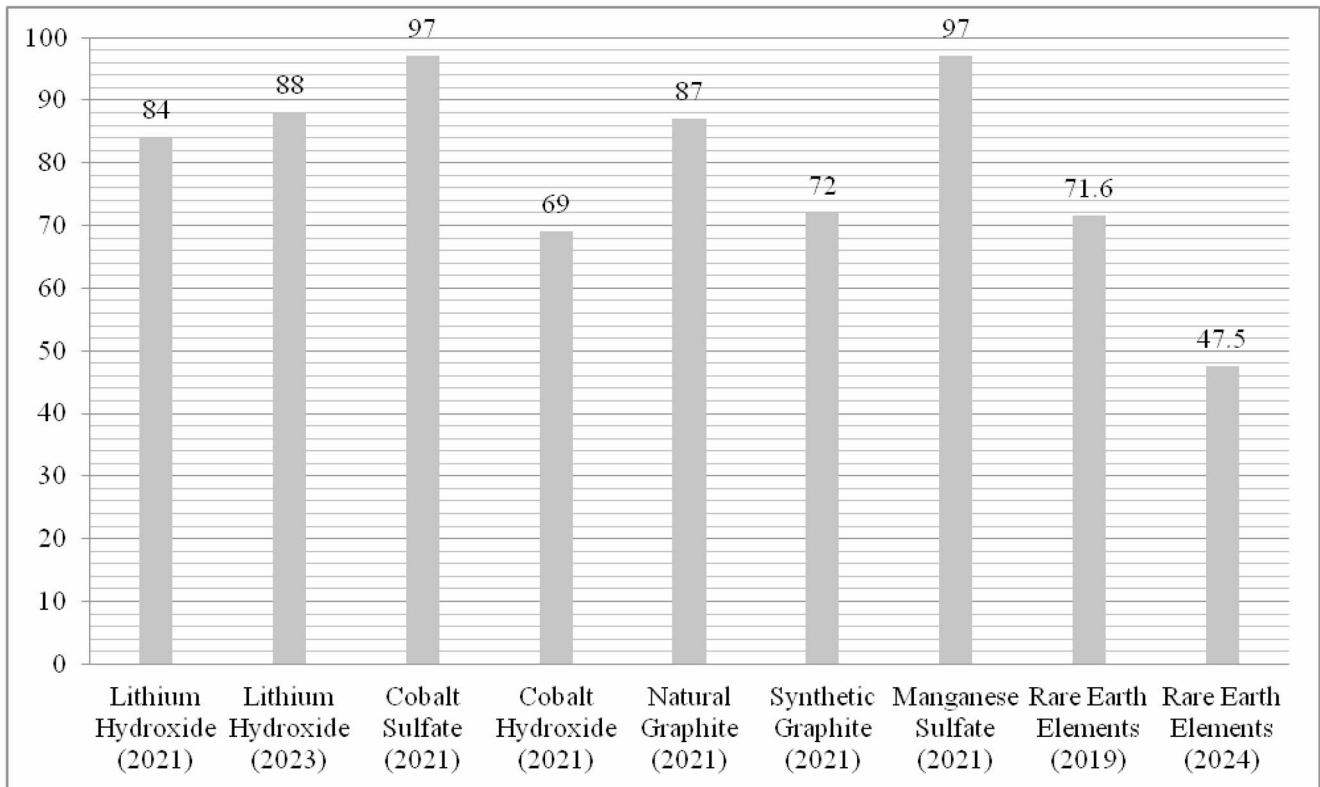


Fig. 1 South Korea's reliance on China for selected critical minerals products (%). Source: graph by the authors, informed by Ahn (2025), Herh (2023), and Ha-nee (2023)

China, with imports dropping from 71.6% in 2019 to 47.5% in 2024 (Ahn 2025). The diversification of markets, including imports from Vietnam and Australia, as well as stockpiling efforts have led to a decrease in reliance towards China (Eun-Jee and Chea 2025). However, both strategies face issues, with processing still dominated by China and stockpiling reaching critically low levels (Soon-chan, Lee and Seo-young 2025). The broader strategy mobilized by South Korea, building on this mineral list, appears to be proactive, collaboration-based, and financial. Through this strategy, the government aims at establishing warning systems, supported by an increased stockpiling of 100 days of demand instead of the previous 54 days, to mitigate supply risks while also relying on foreign (through MoUs and multilateral cooperation) and domestic (through interagency collaboration) engagement to ensure resilience (MOTIE 2023). The specificity of the South Korean model also lies in its focus on recycling, which is planned to increase from 2% to 20% by 2030. To achieve that, the country established in 2024 the Strategic Direction for Promoting the Recycling of Critical Minerals. This is also pointed out by Lee (2024) who finds that South Korea's battery recycling technology patents largely focus on waste treatments (see also Yoo 2023). This is also pointed out by Choi et al. (2024) in the case of nickel. They point to the resource circulation and recycling rates that respectively

increased from 5.64% to 22.1% and 19.3% to 94.73% in three years between 2018 and 2021. This approach also echoes the approach adopted by the European Union's Critical Raw Materials Act (CRMA) (EU Commission n.d.).³

In 2021, the government also established the Korea Mine Rehabilitation and Mineral Resources Corporation (KOMIR), from the merger of Korea Resources Corp. (Kores) and Mine Reclamation Corp. (Mireco). According to the company, its aim is to "promote stable supply chains of mineral resources" while also addressing the boom and bust nature of the industry through mine closures (KOMIR 2023). With mineral security as its first core value, KOMIR underlines its role in ensuring South Korea's supplies through three approaches – (1) overseas resource development, (2) stockpiling, and (3) recycling (KOMIR 2023). Thus, the organization also points to the limited resources that the country holds and promotes a trade based system. For example, the company invested in Madagascar's Ambatovy nickel project alongside Japan's Sumitomo Corporation (Ambatovy n.d.) and signed a cooperation agreement with Canada's province of British Columbia to promote sustainable production and trade (British Columbia 2023). However, in 2025 it was announced that KOMIR planned to offload some of its overseas mining investments.

³ The CRMA mandates that 25% of the EU critical minerals consumption be covered by recycling by 2030.

However, with the race to secure minerals, these sales only focused on assets with enough diversity to be replaced. In other words, while operations producing widely available minerals, such as copper, could be sold, those with more specialized mineral production will be maintained (Jong-yong and Jae-eun 2025).

South Korea's economy is highly reliant on conglomerates – very large, usually family-owned businesses that dominate the country's economy (Lee et al. 2023, 2024). In particular, these companies are active in the automotive, battery production, consumer electronics, steel making, ship manufacturing, and defense industries. Despite criticisms of the Chaebol model's capacity for distorting economic systems and its impacts on corruption at all levels (Chang 2025), these companies remain at the core of the country's industry. The country produced 4.2 million vehicles in 2023 (CEIC 2023), ranking 6th globally, even before heavy weights such as Germany. The production of batteries for electric vehicles is also a significant industry domestically and with operations owned by Korean companies abroad. 75% of the European battery production capacity is thus owned by Korean companies such as LG Energy Solution or SK On and the country is second to China for cathode manufacturing, albeit with only 9% of the market (IEA 2024). Household names, such as Samsung or LG Electronics, led consumer electronics exports and allowed South Korea to rank fifth globally after China, Hong Kong, Taiwan, and the U.S. In 2024, the country exported for \$194 billion in consumer electronics, with a 26% growth from 2023 (ITC 2024). In 2023, South Korea also produced 67 million tonnes of steel with POSCO Holdings accounting for more than half of this number at 38 million tonnes (World Steel Association 2024). Similarly, in terms of ship manufacturing, while the South Korean industry remains significantly smaller than its Chinese neighbor, it was second for number of commercial ship orders with a combined 734 orders, to be compared to 1,794 in China but five in the U.S. (Virtue Marine n.d.). Finally, since the Russian invasion of Ukraine, the South Korean military industry has shown its capacities and is now ranked 10th globally (SIPRI 2025). Thus, ensuring a secured critical minerals supply for these industries, in particular in the context of heightened geopolitical tensions, is at the core of South Korea's strategy, especially as the country is considered poor in minerals resources.

Mining critical minerals in the Korean Peninsula

The Korean peninsula holds limited critical minerals deposits both economically and technically feasible to extract. South Korea produces graphite at the Taesamjin mine in Gyeonggi Province, which halted in 2007 but restarted in

2021. The mine is operated by Taesamjin Corp., which also owns the Eunbok mine. In 2018, Peninsula Mines, an Australian company, through its South Korean subsidiary, Korea Graphite Co., announced its intention to develop four flake graphite deposits – Eunha, Gapyeong, Yongwon, and Daewon (Peninsula Mines 2018). The company's other subsidiary, Suyeon Mining, also suggested its involvement in the Ubeong zinc lead copper project (Peninsula Mines 2018). However, it appears that the company is now inactive. The country is the ninth largest producer of graphite, considered strategic under the *strategy for securing reliable critical minerals supply*. Nevertheless, with 9,600 tonnes produced in 2024 (USGS 2025), South Korea remains far from leading countries, such as China's 1,210,000 tonnes or Mozambique which extracted 98,000 tonnes the same year. On the other side of the demilitarized zone (DMC), North Korea⁴ also produces graphite with an estimated 8,100 tonnes in 2024 (USGS 2025). However, reliable data is lacking to effectively estimate the country's production (Fig. 2).

According to USGS (2021), the country also produces feldspar (420 tonnes in 2021), and limited amounts of lead (1,528 tonnes in 2021), molybdenum (408 tonnes in 2021), and zinc (4,371 tonnes in 2021). Additionally, significant deposits of tungsten are being considered, in particular the Sangdong mine in the Yeongwol District (Ha 2024). U.S. based Almonty Industries and its subsidiary, Almonty Korea Tungsten, describe the 40-year projected mine as holding the

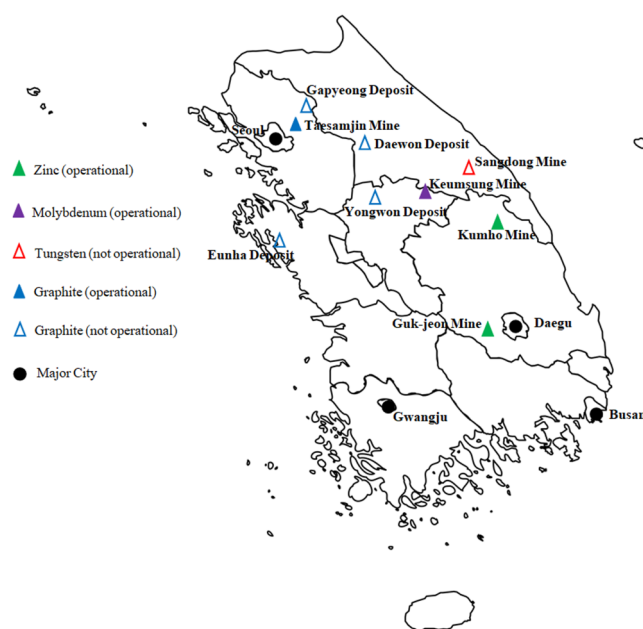


Fig. 2 Critical mineral operational and projected mines in South Korea. Source: Authors

⁴ Park et al. (2023) for more information on critical minerals in the Democratic People's Republic of Korea.

potential to produce 50% of the world's tungsten, excluding Chinese production (Almonty Industries n.d.). The Sangdong mine is a historical tungsten producer and was operating until 1992 when it closed due to low global prices (Choi and Song 2016). Map 1 details the location of the active and in-development mines of critical minerals in the country.

Thus, South Korean critical minerals production remains very limited, despite a potential for specific resources, including tungsten and graphite. This situation underlines the need for imports of these minerals and the high reliance on foreign countries. In the context of geopolitical tensions, including with China, this important-based reliance is perceived as a significant risk by the country (Fig. 3).

South Korea's foreign strategy to secure critical minerals

South Korea's foreign engagement to secure its critical minerals supplies is sensibly different from those adopted by other countries, including China, the U.S., and the EU. From the signature of the first foreign memorandum of understanding (MoU) with Australia in 2021, South Korean diplomacy actively engaged with eight other countries and three subnational entities (Australian states of Northern Territory and Western Australia and the Canadian province of British Columbia). This acceleration in foreign engagement is well visible on Graph 1.

South Korea builds on its extensive expertise in minerals processing and the midstream section of critical minerals supply chains to engage in bilateral cooperation deemed beneficial to both countries, including those from the Global North and those from the Global South. Map 1 below provides detailed information on South Korea's efforts at driving cooperation with mineral-rich countries (Fig. 4).

Finally, the priorities identified in the 14 signed MoUs and the statement of intent with BC underline continuities regarding the promotion of cooperation, investments, and research and development. In the meantime, three mention trade (Australia, Canada, and BC) and one also addresses the responsible production of these minerals (BC). Graph 2 provides more detailed information on the priorities of these bilateral instruments. These are underlined in each document and with core areas of cooperation described by the partner and South Korea. The focus on cooperation and investments underlines the strategy of the country to secure critical minerals through political and economic diplomacy, mobilizing significant resources to streamline the production of specific resources in foreign partners. Additionally, the role of research and development remains central and aligns with South Korea's focus on high tech and industrial development, a pillar of its economic system (Fig. 5).

In the following sections we discuss the structure of South Korea's engagement with its foreign partners. We suggest that the country adopted a unitary approach to critical minerals engagements with no significant discursive differences between the countries in the Global North and countries of the Global South. This, however, does not mean that differences exist in practice, during the implementation of those agreements. Additionally, beyond the bilateral approach that the government seems to embrace, South Korea is also part of a multilateral initiative led by the U.S., the Minerals Security Partnership (MSP). Finally, it engaged with the African Minerals Development Center (AMDC), an African Union (AU) initiative, thus encompassing its 55 member states.

South Korea's foreign engagement builds on the signature of MoU and other cooperation mechanisms targeting countries producing minerals deemed critical for the national economy. Thus, the engagement centers on

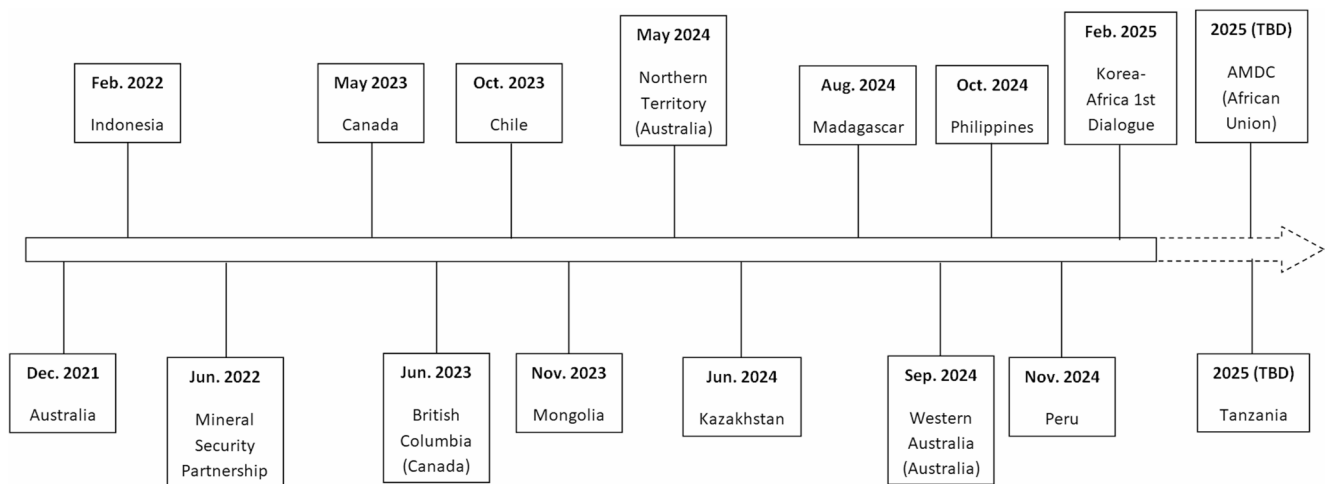


Fig. 3 Timeline of South Korea foreign engagement on critical minerals. Source: Authors

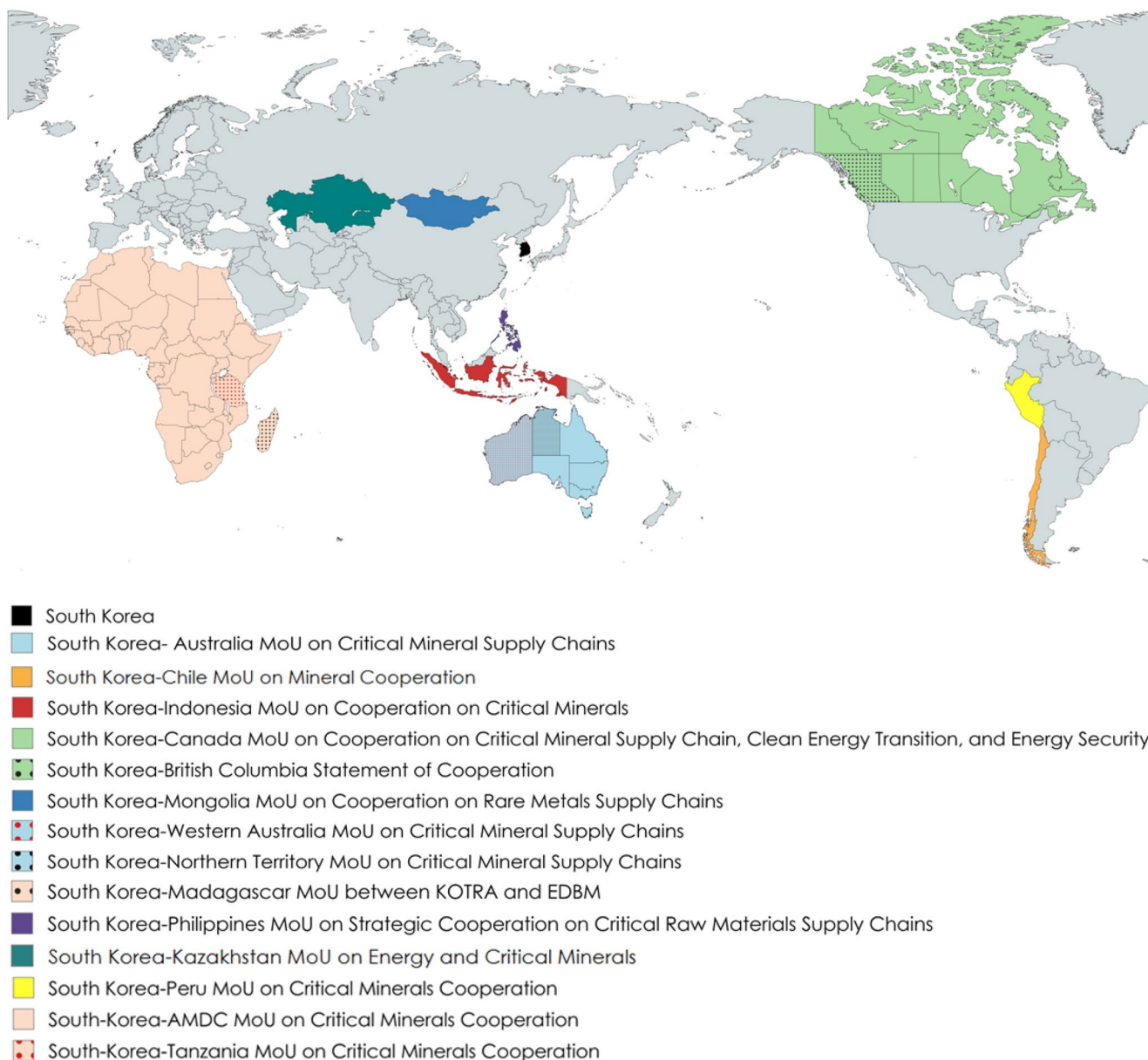


Fig. 4 South Korea's critical minerals foreign engagement through MoU and statements of intent. Source: Authors

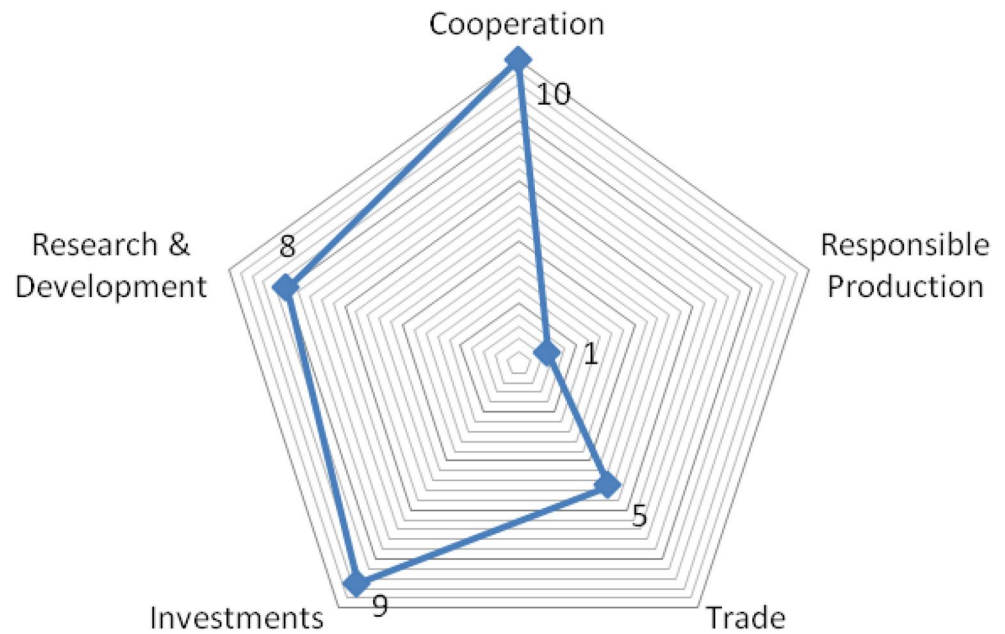
sourcing strategies, supporting both the signature of supply agreements but also Korean investments within each country's mining sector to acquire stake and accelerate production. As previously mentioned, South Korea has developed a midstream industry, with significant steel production and zinc refining. In this sense, the country took the opposite direction from European and American counterparts that largely offshored polluting refining to China. South Korea's continuous ability to refine certain minerals gives it a hedge in the race to secure critical minerals supplies. However, this is highly reliant on raw ore (or lightly transformed materials) supplies from minerals-rich countries, which aims at being achieved through bilateral agreements. Thus,

these are perceived as win-win agreements where South Korea receives minerals from non-Chinese suppliers while providing these with refined materials also avoiding potential Chinese risks.

Foreign engagement with Global North partners

South Korea's engagement with its Western partners mainly focuses on the development of midstream and downstream production units by its industry. This is particularly the case in Europe and North America where these companies are investing billions, often supported by public subsidies (Arsenault, Deberdt and Le Billon 2025), to establish

Fig. 5 priorities underlined in the 14 MoUs and Statement of intent. Source: Authors



battery manufacturing and recycling plants. This aligns with a localization of production plants close to low-carbon technologies consumption centers. In Australia and Canada, the strategy is based on a combined focus on these types of investments and the development of critical minerals partnerships.

South Korea signed MoUs with Australia and Canada as part of its bilateral efforts to secure its critical minerals supplies. Both countries are mining powerhouses and, as underlined by Hines, Gibson, and Mayes (2023), in the case of Australia, intend to establish themselves as stable suppliers of these resources. Deberdt and Letourneau (2025) highlight these dynamics in Canada as well with a detailed analysis of the efforts the country is mobilizing to become a recognized critical minerals supplier. These efforts are also strengthened by free trade agreements, including the 2014 Korea–Australia Free Trade Agreement (KAFTA) and the 2015 Canada-Korea Free Trade Agreement (CKFTA). In the case of these two countries, South Korea established a comprehensive system of economic cooperation, with significant private investments in the Australian mining industry and the Canadian battery manufacturing and green hydrogen. For example, South Korean companies pledged AUD500 million (\$326 million) between 2021 and 2023 to the Australian mining sector (Australian Government 2023). In Canada LG Energy Solution partnered with Stellantis on battery manufacturing plant in Ontario (Government of Canada 2024), POSCO Future M developed a cathode plant in Quebec with General Motors (Government of Canada 2023), and SK Ecoplant took a 20% stake in the Nujio’qonik Project (Fasken 2023).

Beyond these two standalone agreements, South Korea is also part of the MSP, for which it also assumed the chairmanship in 2024 for a year. This effort at positioning the country at the forefront of critical minerals geopolitical discussions aligns with the 2022 strategy which put forward cooperative engagements and explicitly mentioned the MSP. In particular, the government underlines the role of these fora to streamline and support South Korean companies to join overseas projects. Similarly, during the 2025 Group of 7 (G7) meeting hosted by Canada, South Korea endorsed the G7 Critical Minerals Action Plan, which places priorities on (1) building standards-based markets, (2) mobilizing capital and investing in partnerships, and (3) promoting innovation (G7 2025). The involvement in the MSP and the endorsement of the G7 action plan align with the country’s diplomatico-economic efforts to diversify partnerships and supplies while still relying on Chinese minerals for a part, albeit reduced, of its critical minerals. Importantly, the cooperation between South Korea and its Global North partners is largely based on research and development, as well as significant investments towards these countries. The logic appears to be based on the development of midstream to downstream operations in these countries, with batteries, cathodes, and other critical minerals-based technologies to be manufactured by Korean companies in Canada and Australia.

Foreign engagement with Global South partners

South Korea established MoUs with significant mineral producers from the Global South, including Indonesia (nickel

and cobalt), the Philippines (nickel), Chile (lithium and copper), Madagascar (nickel), Kazakhstan (uranium, REEs), and Mongolia (REEs and copper). It is now in negotiation with Tanzania to sign a bilateral MoU and the AMDC, which would allow the country to establish relationships with the African Union's mining body and its 55 member states. While engagement with Southeast Asian mining powers appears as a logical step both from a geographical location and a production capacity (Indonesia and the Philippines are the world's largest nickel producers), efforts to engage with African jurisdictions translates a more global perspective.

South Korea's critical mineral diplomacy is inscribed in its broader efforts on the African continent. In particular, the country announced increasing its development assistance to up to \$10 billion by 2030 while also providing export financing to its companies to invest in Africa (Government of South Korea 2024). In 2025, the first Korea-Africa Critical Minerals Dialogue took place at the Mining Indaba conference in Cape Town (African Mining Indaba 2025), following the 2024 South Korea-Africa Summit which gathered 48 African countries in Seoul (African Development Bank 2024). Thus, South Korea has significantly increased its diplomatic activity to attract African partners. The goal is to secure supplies from these mineral-rich countries in the context of "economic security." For example, in Madagascar, KORES (now known as KOMIR) is directly involved in the development of the Ambatovy (Ambatovy n.d.) nickel mine while POSCO is partnering with NextSource to produce graphite since 2023 (Mining Weekly 2023). However, the South Korean strategy also appears to avoid direct competition with Chinese operators. For example, the government has not expanded its relationships with the continent's mining heavyweights such as the DRC and its immense cobalt and copper resources, mainly controlled by Chinese operators. This is aligned with South Korea's realist approach towards Chinese supplies, aiming to diversify more than decouple. The effort is thus placed on diversification while maintaining some reliance on Chinese-owned mines and processing units.

Beyond formal MoUs and agreements, South Korea also engages on a more ad-hoc basis with some potential suppliers of critical minerals in the Global South. For example, Ripley and Roe (2012) underline Bolivia's partnership with South Korea to develop its lithium resources. In 2010, the countries' state-owned companies – Corporación Minera de Bolivia (COMIBOL) and Korea Resources Corp. (KORES, now KOMIR) – entered into a 50/50 agreement regarding the development of the lithium resources of the Salar de Uyuni. Despite the involvement of POSCO and the announcement of interest from LG Chem and SK Innovation, the project appears to have died down with no progress made on the extraction of lithium products.

South Korea's engagement with producing countries of the Global South focuses on Asian suppliers (Indonesia, Philippines, Mongolia) while also increasing its diplomatic efforts towards African partners recently. These attempts to secure supplies from Global South countries underlines the South Korean strategy to diversify its critical minerals supplies through diversification. While in Asia the country focuses on global mining leaders, it appears that its engagement in Africa relies on smaller producers with the ability to expand its suppliers base and avoid over-reliance on a single one. The strategy is also a combination of government-directed investments within and agreements with producing countries and an involvement of the conglomerates with significant financial capacity. These companies also bring a reputational backing to these engagements while promising long term consumption of these minerals resources.

Deep sea mining as an avenue for diversifying supplies

Finally, South Korea is an important but discreet player in deep sea mining research and development. The ocean floor is known for its immense cobalt, nickel, copper, and manganese resources. According to estimates, 21.1 billion dry metric tonnes of polymetallic nodules, holding up 600% of existing terrestrial reserves of cobalt, 340% of nickel, 30% of copper, and more than 100% of manganese terrestrial reserves (Lèbre et al. 2023). Nevertheless, potential risks to the extraction of these minerals at depth up to 6,000 m have raised concerns. Deberdt and James (2024) point to the limitation to develop verification systems of these operations in remote oceanic areas (see also Macchi 2025). Similarly, Alger et al. (2025) describe the "false promises" of DSM building on overblown narratives of mineral scarcity and social and economic benefits while Childs (2019) addresses the greenification of DSM companies as a legitimization of the industry. International politics and the geopolitical ramifications of these developments were also explored (Vivoda 2024; Childs 2020). On the other side, researchers also point to the potential decrease of impacts on land-based ecosystems (Paulikas et al. 2022). DSM is a hotly debated topic and particularly contentious within the research community. Nevertheless, from a supply security perspective, in particular in the case of resource-poor countries such as South Korea, the industry is an attractive solution to the securitization of its critical minerals supplies.

South Korea secured exploration contracts from the International Seabed Authority (ISA) – the United Nations (UN) organization in charge of managing the area beyond national jurisdiction – for polymetallic nodules in the Clarion Clipperton Zone (CCZ) (ISA 2021), polymetallic sulphides in the Indian Ocean (ISA 2014), and cobalt-rich

ferromanganese crusts in the Western Pacific Ocean (ISA 2018). These contracts, managed by the Ministry of Oceans and Fisheries (MOF), place South Korea among the largest recipients of ISA exploration contracts after China (five contracts) and equal to Russia (three contracts). The interest of the country in DSM is not new and dates back from the signature and ratification of the United Nations Convention on the Law of the Sea (UNCLOS) in the early 1990s (see Kee-Hyung 1995). Since then, the government has attempted to establish a domestic legislation addressing the sector, so far without success (Lee and Yang 2018; Kim 2023). In early 2025, South Korea announced unveiling a Development and Management of Deep Sea Water Act draft, aligning with the ISA requirements to develop a domestic legislation on the management of deep sea resources. If adopted, this act would constitute a significant progress for the country in its pursuit of deep sea mining, but would still bound it to the ISA's progress on the development of the mining code (Statute of the Republic of Korea 2015).

South Korea has steadily engaged with the ISA and uses this multilateral forum as an avenue for research and development with a view to enter production when the mining code is in place. The country is a member of the Council, one of the three main organs of the ISA, and recognized as one of the four major investors – among the eight countries which have made the largest investments in preparation for and the conduct of activities in the Area, either directly or through their nationals. South Korea joined France, India, and the Netherlands in this group (ISA n.d.). In 2022, the MOF also signed an agreement with the ISA to partner in supporting deep-sea research, data management, sustainable development of seabed minerals and capacity development (ISA 2022). Finally, Korea Zinc Company became a strategic investor after spending \$85.2 million in Canada-based The Metals Company, a leading deep sea mining company (The Metals Company 2025). This decision constitutes the first direct partnership between a South Korea refiner and supplier of precursor Cathode Active Material (pCAM) and a deep sea mining company.

While the risks linked to DSM are beyond the scope of this article, we suggest that, for resource-poor countries such as South Korea, the industry could provide an avenue to diversify part of its supplies through diversification. Watzel, Rühlemann, and Vink (2020) argue that the industry holds the potential to facilitate this diversification, thus reducing reliance on a few mineral-producing countries while also providing an important geopolitical and strategic edge (see Vivoda 2024). Nevertheless, South Korea remains limited by the development of the mining code at the ISA, which has so far stalled as the organization is pushed to embrace a precautionary approach (Wang et al. 2023). The recent push by the U.S. – which is not a signatory of UNCLOS and

thus not a member of the ISA – to streamline its concession granting process, is likely to increase pressure on the UN organization and its member states to expedite the mining code definition process. In parallel, China is rapidly engaging in the industry, aiming to secure additional supplies and strengthen its position as global leader for critical minerals mining and processing (Lu 2025; Agarwala 2021; Yu 2024). In parallel, the industry also impacts tensions and territorial disputes in the South China Sea (McCook and Rothwell 2024). In this rapidly changing geopolitical context, future research should monitor and address how South Korea will position itself – a supporter of a precautionary principle or an advocate of a rapid development of the industry.

Conclusion and future research

South Korea is an industrial and technological power. Its conglomerates have shaped global technology advances of the past decades and are now integral to the low-carbon and defense industries. Nevertheless, the resource poor country is almost entirely reliant on imports of critical minerals, thus creating significant dependencies on foreign actors. In the meantime, its neighbor, China, established itself as a global leader in the mining and processing of these minerals through domestic and overseas operations especially for REEs, graphite, lithium, cobalt, copper, and manganese. In this article, we reviewed these conditions and the efforts mobilized by South Korea to maintain access to these strategic resources.

This article is inscribed in current research addressing the geopolitics of critical minerals production and trade (Vivoda 2023; Deberdt et al. 2025a; Kalantzakos 2020). This literature often focuses on powerhouses of mineral consumption – China, the US, and to a lesser extent the EU – as well as production – Australia, Canada, the DRC. However, few studies explore the ramification of mineral geopolitics on less visible but still powerful economies such as South Korea. This article aims at bridging this gap to highlight the diversity of strategies deployed by countries to address critical mineral-related issues. In parallel, we also show that, while contentious and politically tense, the strategy embraced by South Korea aims at de-escalation and recognizes the centrality of China. This realistic perspective also clashes with the US and maybe less the EU, which suggest a complete delinking of their supplies from China, a position unlikely to be achieved in the coming decade. South Korea, in this way, constitutes a third way, which is worth exploring to de-risk supplies.

South Korea's critical mineral policies are marked by a realism that differentiates it from its U.S. and EU counterparts. The country is aware of the risks posed by an over

reliance on a single jurisdiction for its mineral supplies and explicitly points at China as a significant supply chain choke point. However, its goal is not to decouple its industry from Chinese supplies entirely but to diversify by introducing diversity in its supply partners. Thus, the South Korean government recognizes the dominance that China built over the past decades in critical minerals mining (REE, graphite) and processing (cobalt, lithium, copper) and its limited ability to compete with such behemoths. The government signed MoUs and other supply partnerships with producing countries in both the Global North and the Global South to develop equal partnerships promoting collaboration in deposit development and in new technologies for mining, processing, and manufacturing of semi-finished and finished products. Importantly, the South Korean strategy appears to avoid direct confrontation with Chinese interests, a path selected for example by the U.S. (Gulley et al. 2018; Deberdt 2024). In parallel, the country's continuous engagement with the ISA, especially at a time of increased pressures on the UN organization, also reflects an attachment to multilateral fora. On the other hand, it illustrates the push by the country to diversify its supplies.

So far the success of these strategies is complex to measure. In the midst of the 2025 China - U.S. tariff spat, Beijing requested South Korea not to ship technologies produced with Chinese REEs to U.S. defense companies (Reuters 2025a, b). The result has been a reliance on companies' own stockpiles which have been quickly depleted. This political issue underlined the role of the KMOIR in supporting these companies by mobilizing parts of its national reserves (Soon-chan, Young-kwan and Seo-young 2025). In a recent report, the Rand Corporation (Villalobos et al. 2025) suggested a trilateral cooperation system with the U.S. and Japan as a way to increase South Korea's critical minerals security. While this approach could provide some benefits, it partially hides the *third-way* that the country aims at following – independent from China and the U.S. but collaborating with both. This approach, recently developed, drives engagement with other producers and its results are yet to be understood. However, under South Korean leadership, processes appear to have been strengthened. For example, the Critical Minerals Management and Strategy for Sustainable Environment in ASEAN project, first held in 2024 was supported by the ASEAN-Korea Cooperation Fund (AKCF 2024) and has led to increased collaboration between these countries.

This article is a first step in a broader effort to understand the subtleties of industrial and resource poor powers. Unlike its U.S. and Canadian counterparts with significant potential for mineral extraction, and its European allies part of the broader European Union and for whose low-carbon industries lag behind those of South Korea, the country faces

significant resource constraints. This article thus points to several avenues for future research, reflecting South Korea's critical minerals list and its specific needs, especially for graphite, manganese, cobalt, and REEs. First, an assessment of the effectiveness of cooperation mechanisms, including MoUs and other letters of intent will need to be conducted. These diplomatic efforts rarely materialize and their recent application will need to be followed. Second, a detailed exploration of South Korea's critical minerals diplomacy on the African continent will spur important learnings, for both the Asian country and its African counterparts. The strategy deployed by South Korea appears sensibly different from Western development aid and Chinese infrastructural diplomacy. The South Korean model relies on a combination of both while promoting equal partnerships, at least in theory. Third, the engagement with Western countries, in particular through major midstream and downstream investments, is slightly beyond the scope of this article but should be studied as a way to secure critical minerals supplies while developing closer production units from consuming jurisdictions. Fourth, the geopolitical balancing that South Korea engages in, between the U.S. and China, is mirrored in its critical minerals policies. This field constitutes an important case study to understand broader dynamics defining the country's foreign policy. Finally, the fifth field of inquiry is the development of deep sea mining and the role South Korea will play at a time of growing tensions and an acceleration of Western and Chinese efforts to mine the seafloor. In all, research on the Korea case, as well as most critical minerals-reliant economies, should also take into consideration the dynamic nature of the industry and the technologies using these minerals. With rapid technological innovation, some minerals are increasingly being used while others' use decreases. This reality will require a flexible critical minerals strategy, able to tailor itself to new political and technological realities. These research avenues will underline South Korea's position between a rock and a hard place and the need for the country to engage in diversification to preserve its technological primacy and industry capacities.

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Declarations

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