

The Raw Materials of Economic Security: South Korea's Evolving Energy and Critical Minerals Policies in an Era of Disruption

By James Bowen

Introduction

Economic security begins with raw materials security. Few states can appreciate this more than South Korea. Korea achieved its postwar economic miracle despite a profound lack of domestic energy and minerals. Yet a correspondingly intense foreign dependence has remained an acute concern, particularly during periods of upheaval. Recent events have returned resource insecurity to the forefront of Seoul's attention. Covid-19 and Russia's war in Ukraine compounded long-standing economic and political fragmentation, threatening the efficient and apolitical operation of markets and supply chains. The transition to clean energy has also invited a raft of new cross-border concerns.

This article explores how Korea, particularly under current President Yoon Suk-yeol, has responded to its rising resource challenges. It begins by exploring Korea's historically intense energy and minerals interdependencies and how recent phenomena complicate past management of these. This includes consideration of commitments under Yoon's *Strategy for a Free, Peaceful and Prosperous Indo-Pacific Region*.

The article then closely examines Korean policy responses in two increasingly interrelated areas: energy security and critical minerals. International exposure—coupled with a resource-intensive economy—defines both challenges. Authoritarian states' influence on trade and global markets worsens insecurity in each. Some policy goals span the energy and critical minerals spectrum, including diversifying trade and investment with trusted partners.

Korean energy security policies dramatically shifted following the chaos unleashed by Russia's war in Ukraine. They have simultaneously had to adapt to the escalating climate crisis and need for rapid clean energy deployment. Yoon has correctly argued that optimal policy responses can respond to both these challenges simultaneously. The article calls the resulting policy goal "green security."

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Transitioning away from Korea's heavy dependence on imported fossil fuels will not be easy. Seoul's past inability to achieve both growth and decarbonization under the longer-standing "green growth" banner is proof of this. National policymakers remain married to a manufacturing-heavy, export-oriented development model. Even national decarbonization pathways, including strong support for hydrogen and, under Yoon, nuclear at the expense of renewables, appear at least partly designed to ensure minimal disruption of this approach.

Korea's critical mineral concerns are similarly informed by issues of scarcity and authoritarian influence. The energy transition, among other trends, has seen global demand for certain minerals outpace supply. Korea's neighbor, and sometimes foe, China has amassed unparalleled control over value chains from processing onwards. Beijing also has a history of disrupting cross-border commerce both unintentionally and for intentional gain.

Korea's contemporary critical minerals insecurities can appear more intense than its fossil fuel equivalents. Yet they are ultimately more manageable through policy intervention. The overarching priority is accelerating and diversifying global supply chains. Korea has reinvigorated its program of resource diplomacy to aid this process. More considerable intervention may, however, be required. Seoul's critical minerals policies must also find better ways of managing tensions from rising geoeconomic and geopolitical competition.

The article concludes by arguing that the disruptive forces now impacting Korea's resource security are larger and more complicated than those it has previously overcome. There is an understandable urge for Seoul to protect the essential character of its economic miracle in spite of this. Yet some degree of transformational change may prove unavoidable.

Resources: The Fragile Bedrock of Korea's Economic Miracle

Korea's former United Nations Secretary-General Ban Ki-Moon once noted how the "advent of affordable modern energy" helped lift his country from postwar poverty into the ranks of advanced economies.¹ Export-focused manufacturing industries such as steelmaking, shipbuilding, and car-making have been vital to this journey and today generate about 30 percent of GDP.² This has given Korea the highest industrial energy use in the OECD, as well as high demand for minerals.³

Most resources powering Korea have come from abroad. Korea has limited domestic energy and mineral reserves, and imports meet 94.8 percent of resources consumption.⁴ Korea's import dependence for coal, oil, and gas—which provide

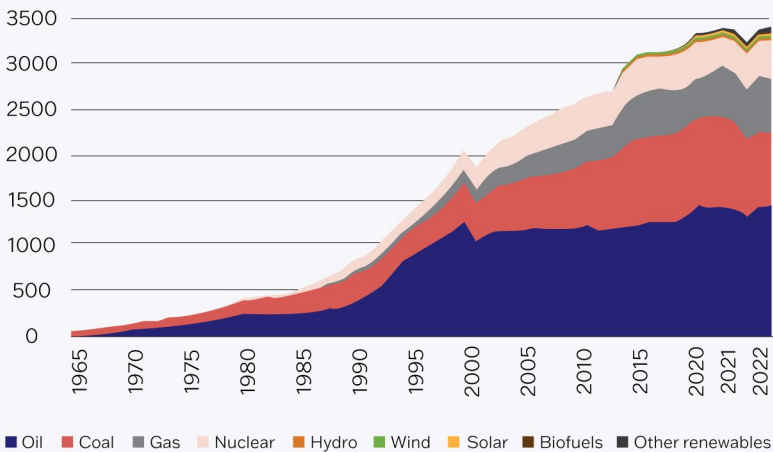
more than 80 percent of its primary energy—is 98 percent.⁵ Certain locations and routes also play an outsized role in trade. Almost 60 percent of Korean crude oil comes from the Middle East.⁶ Korea also depends on the sea for all its oil and gas.⁷

High-import dependency creates vulnerabilities. It incurs higher and more volatile costs. Supply shortfalls and price spikes can come either through market inefficiencies or physical disruptions. Overdependence on certain suppliers—especially authoritarian economies which can, and do, manipulate resource flows—and contested trade routes adds to the risk. About 64 percent of Korea’s oil and 46 percent of its gas transit the South China Sea.⁸

Oil has inflicted particular pain on Korea’s economy. A 2011 study found Korean GDP contracted at more than twice the OECD average following oil shocks up to that time.⁹ The Arab oil embargo of 1973 saw Korea’s annual growth rate of 15 percent (still its highest-ever recorded) drop to about eight percent within two years.¹⁰ Social unrest often follows oil price spikes. In 2008, President Lee Myung-bak was confronted with thousands of striking truck drivers as fuel prices rose 60 percent in six months.¹¹

Despite these challenges, Korea has generally maintained its imported resource-dependent economy. It has, however, had some success in minimizing or at least dispersing vulnerabilities. It has, for example, diversified its energy mix through greater use of gas, imported as liquefied natural gas (LNG), and nuclear energy (see Figure 1).¹²

Figure 1. Korean Energy Consumption by source (TWh)



Source: Author’s calculations from Ritchie & Roser (2023).¹³

Seoul has also sought to improve its access to international energy and minerals through “resource diplomacy.” This was most notable in response to the early 21st century’s commodities boom. President Kim Dae-jung (1998-2003) established Korea’s first *Overseas Resources Development Basic Plan*, and Presidents Roh Moo-hyun (2003-2008) and Lee (2008-2013) sanctioned significant state-owned enterprise investments, including in Madagascar’s Ambatovy nickel mine, Panama’s Cobrepanama copper mine, and Australia’s Prelude floating LNG project.¹⁴ Resource security also partly motivated numerous Korean bilateral trade agreements with resource-rich nations in the early 2000s.¹⁵

Resource diplomacy has, however, fallen from favor in more stable times. Scrutiny of disappointing returns on investment, public debt accumulation, and even corruption, saw mass asset sell-offs under President Park Geun-hye (2013-2017) and further downgrades under Moon Jae-in (2017-2022).¹⁶

Korea has, on the other hand, unequivocally benefitted from participating in and helping sustain highly globalized and dynamic markets—financial in addition to physical—for energy and minerals. Development of these has often accelerated in the wake of major commodities shocks and, through a mix of inbuilt responsiveness to price signals and deliberate policy interventions, helped to minimize the severity of future disruptions.

Eventual positive impacts of the Arab oil embargo included oil production spreading to new, including more democratic, frontiers, a more diverse global energy mix, and enhanced energy efficiency. The creation of the International Energy Agency (IEA), which Korea joined in 2001, was emblematic of increased energy security policy coordination, largely among advanced economies. The IEA defines energy security as the “uninterrupted availability of energy sources at an affordable price.”¹⁷ It also distinguishes between short- and long-term security. The former concerns “the ability of the energy system to react promptly to sudden changes in the supply-demand balance,” while the latter targets “timely investments to supply energy in line with economic developments and environmental needs.”¹⁸

Responses to the early-2000s commodities boom—which followed explosive economic growth in China and other Asian economies—also helped boost security. High prices made the extraction of previously uneconomic resources, including U.S. shale oil and gas, profitable, creating more abundant, affordable, and—owing to a greater presence for liberal over authoritarian producers—somewhat depoliticized trade.¹⁹

China's management of growing resource insecurity in the early 2000s also delivered significant results.²⁰ China's rapid, dramatic cost-lowering development of clean energy technologies such as solar panels and electric vehicles (EVs) has largely benefitted the global energy transition. Typically, however, Beijing has ensured its companies enjoy a commanding lead in associated markets, by leveraging benefits of scale and strategically minded state support across the industrial ecosystem. As this report notes, China's intense control of clean energy supply chains extends to the raw materials of key technologies.

Energy, Minerals, and Economic Security Amid Global Disorder

Korea's resource-intensive and import-dependent economy has survived various storms and often benefitted from a new sense of calm that followed. But a confluence of largely novel factors is testing Seoul's resolve once more. Concern around security of key resources is again spiking on a global level. Traditionally liberal governments have sought renewed resilience as part of wider-ranging policies for 'economic security'.²¹

Proponents of economic security typically seek insulation from supply chain disruptions such as those after Covid-19 and Russia's war in Ukraine. The latter had particularly profound impacts on global energy—Russia is among the top two to three global producers and exporters of both oil and gas, and top five for coal.²² Moscow deliberately reduced gas flows to Europe ahead of its invasion. Subsequent chaos affected all fossil fuels, and interlinked electricity markets, resulting in what the IEA called the “first truly global energy crisis.”²³

Economic security proponents oppose the subversion of trade and investment rules and weaponization of economic interdependencies. China looms larger than Russia in many states' thinking on these counts. Some responses to the issue defend and seek to improve the liberal economic order, while others essentially emulate perceived transgressions. The United States, most notably, has adopted a “new Washington consensus”—including through the potentially US\$1 trillion-plus Inflation Reduction Act (IRA) clean energy spending program—which focuses more on promoting domestic industry, and geoeconomic realignment, over free trade.²⁴

These disruptions have also occurred against a backdrop of the world needing to more rapidly decarbonize amid a growing climate catastrophe. Post-Ukraine Europe, in particular, has realized the significant energy security co-benefits of accelerating deployment of cheap, indigenous renewables. This has allowed more rapid decoupling from Russia and other volatile fossil fuel suppliers, and their influence on energy markets.²⁵ Government and industry are also jockeying to control new or, as with nuclear, potentially revived technology markets. This

has produced new resource security concerns, even as others erode. The most intense anxiety surrounds 'critical minerals,' which underpin clean technologies such as batteries for EVs and grid storage, and a variety of non-energy sectors including semiconductors and advanced weapons systems.

Global critical minerals supply is insufficient to meet expected future demand. The IEA estimates mining for clean energy must at least quadruple to a total of more than 28 million tons per annum by 2040 to meet climate goals.²⁶ Extraction is highly concentrated: Australia extracts half the world's lithium, Indonesia a third of its nickel, China 60 percent of its rare earths, and the Democratic Republic of the Congo 70 percent of its cobalt.²⁷ But the most alarming concentration is downstream from mining, where China dominates.²⁸

The Yoon Suk-yeol administration has embraced the economic security concept and applied it to its energy and mineral pursuits. This sits somewhat uncomfortably with the president's avowed liberalism, or even libertarianism—Yoon has cited U.S. economist Milton Friedman as a major policy influence²⁹—yet it responds to exigent circumstances. It is also at peace with Yoon's conception of Korea as a 'global pivotal state,' which engages more expansively and assertively, aligns more closely with fellow democracies, pursuing interests and values alike.³⁰ Yoon's *2022 Strategy for a Free, Peaceful and Prosperous Indo-Pacific Region* (hereafter the *Indo-Pacific Strategy*) commits Korea to "expand regional economic security networks for stable and resilient supply chain management" and to stabilize supply chains for "strategic resources" by cooperating "with partners with whom we share values."³¹

The Yoon administration does, on the other hand, retain strong preference for returning to more *laissez-faire* economic pursuits. In a January 2023 World Economic Forum (WEF) address, Yoon said free trade had "contributed to global economic growth and enhanced humanity's freedom" and called it a "global public good that can never be forsaken."³² He argued that even as states, Korea included, began to preference commerce with likeminded partners, they should expand their "small bloc to form a larger bloc," by "allowing the free flow of products, capital, knowledge, and information across borders."³³ Similarly, the *Indo-Pacific Strategy* notes Korea will "work with others to prevent the overwhelming dominance of security concerns over economic issues."³⁴

Korean Energy Security in Transition

The global energy crisis set off by Russia significantly impacted Korea's short-term energy security and long-term policy landscape. Priorities include the diversification of trade; enhanced stockpiling and energy efficiency; and, most

important of all, accelerated diversification and decarbonization of the national energy mix. A preference for working with likeminded partners spans fossil fuel to emerging clean energy interests. Seoul has also pledged to take a leadership role in Indo-Pacific energy security policy coordination.

Korea's fossil fuel import bill rose almost 60 percent in 2022, even as volumes were largely flat.³⁵ Korea did not apply international sanctions to Russian energy, but it did voluntarily cut imports. Its consumption of Russian crude oil dropped more than 60 percent and LNG 30 percent in 2022.³⁶ However, Korean imports of Russian coal increased to 26.5 million metric tons (Mmt), up from 21.9 Mmt, in 2022, and remained high in 2023. In September 2023, however, Seoul asked national power generators to curb purchases of Russian coal from the short-term 'spot' market, which could signal rising resolve.³⁷

Korea's pain was, at the same time, likely far less than it could have been. In the intensely integrated oil market, for example, the dynamic rerouting of supplies—helped by India, China, and others maintaining or even increasing their Russian import exposure³⁸—has maintained relatively high volumes and low prices. The interaction of markets, technology, and policy also already helped diversify Korea's import partners ahead of the crisis, including towards likeminded partners. Buoyed by its fracking revolution, the United States became a new LNG exporter to Korea in 2016 and was providing 18 percent of its gas by 2021. Australian LNG exports have also exploded since 2016 and now meet 20 percent of Korean demand (second only to Qatar).³⁹ U.S. oil rose from zero to 12 percent of Korean imports in the same period.⁴⁰ Russian exports to Korea, by contrast, were relatively flat in the decade preceding the war, and satisfied five percent of LNG and six percent of oil imports in 2021. The latter was despite Seoul once considering Russia its best bet for shifting oil trade from the Middle East, and co-investing in a series of projects in the country's far east since the 1990s.⁴¹

Seoul can pull several levers to accelerate partner diversification. The Yoon administration extended freight incentives to Korean oil refiners which purchase non-Middle Eastern oil.⁴² Revitalized investment in foreign projects may follow. The Moon administration rescinded its opposition to resource diplomacy in the wake of the Ukraine war.⁴³ Yoon subsequently pledged to restore public companies' "ability to secure resources and resume normalization of management" and to "help invigorate private entities' investment in overseas resources."⁴⁴ The long timeframes involved in developing new fossil fuel projects must, however, be balanced against Seoul's climate targets.

A potentially more significant obstacle to diversification is how prospective partners are themselves responding to ongoing disruption. Australia provides a good case study. It is the largest coal and second-largest LNG supplier to Korea and Yoon's *Indo-Pacific Strategy* notes an intention to increase Australian energy volumes even further.⁴⁵ Yet Canberra, and some sub-national Australian governments, have recently placed a raft of new constraints on domestic fossil fuel production, seeking to calm local prices, tax windfall profits, and enhance decarbonization. These policies include price caps, royalty increases, stronger emergency mechanisms for domestic energy reservation, and tighter emission restrictions. Korean—and other Asian—officials are increasingly concerned about the combined effect on near-term trade and also long-term investment attractiveness.⁴⁶

Meanwhile, an unfortunate flipside of globally integrated markets is that, even if it can minimize direct trade with problematic actors and regions, Korea will still experience contagion arising from these sources. Domestic stockpiling can help manage some of the shocks. Yoon's *New Government Energy Policy Direction*, issued shortly after taking office, accordingly increased Korea's strategic oil reserves to over 100 million barrels by 2025, up from 96.5 million barrels, and LNG storage from 13.7 kilolitres (Kl) to 18.4 Kl.⁴⁷ The long-term priority must, however, be reducing national dependence on fossil fuels in aggregate.

Minimizing energy usage and diversifying continued demand by energy type are critical. The *New Government Energy Policy Direction* built on existing efficiency commitments. It paved the way for an agreement with 30 high energy-consuming firms to achieve 25 percent efficiency improvements by 2027, aided by incentives such as reduced tax loads. However, making any improvements permanent may prove difficult. Korean businesses have long had strong incentives to reduce their energy usage, yet the country as a whole continues to rank 33rd out of 36 OECD members for energy efficiency.⁴⁸

So long as Korea's preference for energy-intensive development persist, its long-term focus must be on diversifying its energy mix. Many countries have in recent years recognized the significant energy security co-benefits of decarbonization. The IEA notes energy security as a major driver behind renewable capacity additions reaching an expected record 440 gigawatts in 2023—an annual increase of almost a quarter.⁴⁹ Yoon's *Indo-Pacific Strategy* seemed to pick up this international thread. It noted the urgent need for “stabilizing energy supply through clean energy transition.”⁵⁰ This sense of synchronicity might be termed “green security,” in an echo of the “green growth” principle Lee popularized after the 2008 financial crisis. Green growth argued decarbonization could accompany economic growth. It was

incorporated into Korea's first climate law, 2010's *Framework Act on Low Carbon Green Growth*, and its successor, 2021's *Framework Act on Carbon Neutrality and Green Growth*.⁵¹

The Moon administration made particularly significant green security commitments. In a now familiar pattern, it used its own major crisis, Covid-19, to develop the *Green New Deal*, which committed US\$61.9 billion to accelerated action across numerous clean energy sectors.⁵² The government legislated carbon neutrality by 2050, pledged to phase out coal power by 2050 and achieve a "100 per cent renewables energy future."⁵³ This was highly ambitious considering renewables currently generate 5.4 percent of Korean electricity—and three percent of total energy—compared to a global average of 12 percent.⁵⁴ Moon also set an interim goal for Korea to reduce its emissions 40 per cent from 2018 levels by 2030.⁵⁵

Moon made clean hydrogen a major priority of Korea's decarbonization strategy. Seoul unveiled its *Hydrogen Economy Roadmap* in 2019, with plans to source a third of national energy from hydrogen by 2050 through applications across transport, power generation, and industry. Hydrogen would initially be produced from emissions-abated fossil fuels, but transition to zero carbon sources by 2050. Seoul expects hydrogen consumption to grow from 130,000 tons in 2018 to 5.3 million tons per annum by 2040.⁵⁶

Yoon has retained the Moon administration's 2030 and 2050 emissions reductions goals and many associated commitments, including to hydrogen. The government has significantly departed, however, on the roles of nuclear and renewables. Yoon's *New Government Energy Policy Direction* and *10th Basic Plan for Long-Term Electricity Supply and Demand*, from January 2023, downgraded renewables, which the president has called "too expensive." They favor a revival in nuclear, which the *Indo-Pacific Strategy* called the "most powerful and efficient source of clean energy currently available."⁵⁷ Seoul still plans for renewables to provide 30 percent of national electricity generation in 2030, though this is down from Moon's 34 percent. Nuclear's share is expected to reach 32 percent in 2030, up from 26.5 percent—already high compared to a global average 10 percent—in a reversal of Moon's policies for a near total phaseout by 2050.⁵⁸

The Korean Ministry of Trade, Industry and Energy (MOTIE) estimates Yoon's policies will reduce fossil fuel imports from 80 to 60 percent of energy consumption by 2030.⁵⁹ Yet Korea has strong path dependency on carbon-intensive development. Even the green growth paradigm has little to show in

terms of emissions reductions. A 2016 study found it had produced no relative or absolute greenhouse gas reductions by that time, and Korean emissions have largely continued rising since that time.⁶⁰ Korea's more notable green impact has been manufacturing and exporting, but not necessarily similarly deploying, clean technologies. Korean companies are, for example, emerging EV manufacturing giants (see next section), but EVs currently account for 10 percent of Korean passenger car sales, compared with about 30 percent in China and 24 percent in Europe.⁶¹ Policy support has made Korea the world's largest hydrogen fuel cell vehicle market, though total passenger stock is just 30,000 and sales still represent less than one per cent of the new car market.⁶²

Korea's strong regard for economic continuity may even complicate its clean energy choices. National hydrogen and nuclear plans appear at least as motivated by commercial as climate or energy pursuits. The *Hydrogen Economy Roadmap* seeks to generate US\$43 billion in economic growth and 420,000 jobs through manufacturing and exporting technologies such as fuel cell vehicles.⁶³ A 2022 MOTIE nuclear energy plan also set three goals for 2030, one of which was to generate 30 percent of electricity from nuclear sources, while the other two were to export 10 power plants and develop a unique small modular reactor.⁶⁴

Successfully deploying hydrogen and revitalizing nuclear could certainly help reduce Korea's fossil fuels-derived insecurity. But ramping up production to meet 2030, and even 2050, emissions goals, could prove difficult, especially with the corresponding downgrading of renewables. Yoon has cited local challenges with deploying wind and solar compared with elsewhere in the world. But a study from March 2023 found Korea had the necessary assets—including sufficient land not subject to competitive use or geospatial constraints—to generate 5000-terrawatt hours of renewable electricity per year—far larger than existing fossil fuel-based output—and cheaper even than gas on a levelized cost of electricity basis.⁶⁵

Korea also has untapped offshore wind potential. A 2019 IEA assessment noted Korean offshore wind farms could produce more electricity per unit of capacity than conventional gas plants.⁶⁶ The Moon administration recognized this potential. In February 2021, it unveiled a 48.5 trillion won (US\$43.2 billion at the time) plan to build what would be the world's largest offshore wind farm, off the coast of Sinan.⁶⁷ The Yoon administration, by contrast, announced it would reassess this project's economic feasibility upon taking office. Then-Minister for Trade, Industry and Energy Lee Chang-yang eventually cleared it to progress but not before spooking prospective investors in similar projects.⁶⁸

Hydrogen and nuclear will also require significant policy support to effectively displace fossil fuels. Hydrogen's cost and technical challenges compared to direct electrification powered by renewables have, on a global basis, seen clean technology analysts limit its suitability to decarbonizing production of industrial goods such as steel, fertilizers, and chemicals.⁶⁹ High costs and long project timeframes for newbuild nuclear projects are an additional challenge.⁷⁰ Seoul will also require increased trade in fuel for its expanded ambitions in each sector. It has no domestic uranium reserves and expects to eventually import 82 percent of its hydrogen.⁷¹

Seoul must ensure its international relationships and multilateral policy settings continue to work in its favor regardless of its future energy mix. To this end, it is already seeking clean energy partnerships with trusted countries. Australia is a major prospective hydrogen supplier and already a significant uranium supplier (alongside fellow advanced democracy Canada).⁷² Yoon's *Indo-Pacific Strategy* also commits Korea to strengthening “international cooperation on clean energy...as well as on the development of a hydrogen economy” and to “establish a framework for nuclear energy cooperation in the Indo-Pacific region.”⁷³

The shape of Korea's energy mix will have a big bearing on its future economic profile. A manufacturing-heavy, export-focused development pathway may be impossible to maintain without successful decarbonization, as consumer preferences, and decisions by governments and businesses, increasingly favour cleaner trade.

Korean officials and businesses are struggling to come to terms with policies such as the European Union's Carbon Border Adjustment Mechanism, which is progressively developing tariffs for goods imported from higher emitting jurisdictions.⁷⁴ The EU is also negotiating with the U.S. on a steel and aluminium-specific agreement that would levy tariffs on carbon-intensive imports to both markets. While mostly directed at China, this could extend collateral damage to countries including Korea.⁷⁵ Korean supply chain partners are also imposing new restrictions. Technology giant Apple—a key partner of chaebol such as Samsung and LG—is, for example, seeking to have only carbon neutral partners by 2030.⁷⁶

The most likely commercial response to a sustained carbon-intensive Korean economy will be the offshoring of energy-intensive activity. Samsung already runs its factories in the U.S. and Europe on entirely clean energy, for example, and has expressed frustration at the difficulties of doing the same at home.⁷⁷ Korean steel giant Posco has also indicated it may shift significant energy-intensive production elsewhere if unable to successfully decarbonize domestic production.⁷⁸ It is already pursuing a “green iron” plant in Australia, as a precursor to green steel. This will utilize hydrogen produced locally with Australia's more advanced renewables sector, while removing cost and technical barriers to shipping hydrogen.⁷⁹

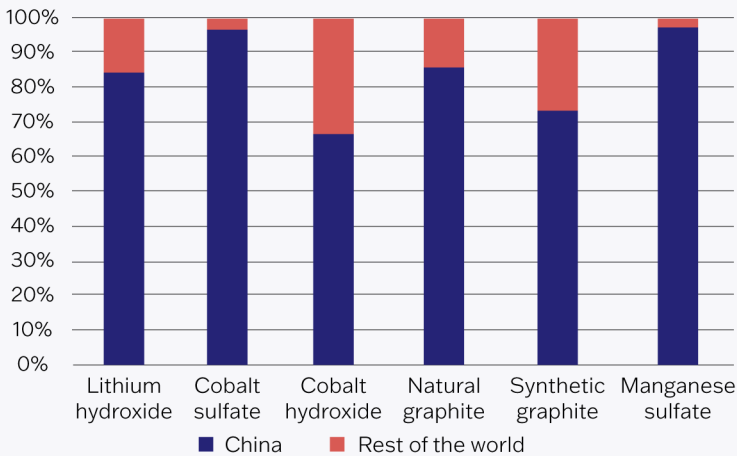
Critical Minerals: The New Resource Security Frontier

Reducing fossil fuel usage would offer significant energy relief, but South Korea will likely always have resource security concerns of some nature. The growing importance of critical minerals to a new, greener, economy is creating particular headaches. Russia's war in Ukraine has again played a big part in exacerbating supply concerns. Russia is a major producer of battery grade nickel and has large reserves of other critical minerals.⁸⁰ The energy crisis also accelerated the energy transition and associated minerals demand. It was Covid-19, however, that highlighted the particular vulnerability of supply chains focused on China.

Critical minerals security is vital to Korea's economic future. Divisions of LG, SK, and Samsung have already captured about 26 percent of the global EV battery market, which is second only to China.⁸¹ Korea also has strength and continued ambition in other, non-energy, critical mineral-dependent sectors. It is the world's second-largest semiconductor manufacturer, behind the U.S., and its defense technology industry has grown at a world-leading pace during the past five years.⁸²

Korea again depends on imports to meet about 95 percent of its critical minerals demand. The geographic concentration of its trade is even higher than for oil. China provides 80 percent of total processed inputs, and individual mineral percentages are often higher (See Figure 2.)

Figure 2. Chinese share of Korean processed critical minerals (battery value chain)



Source: Author's calculations from Shin (2023).⁸³

South Korea is concerned with Beijing's potential to both inadvertently reduce and deliberately weaponize critical minerals supply. China was accused of unofficially banning rare earth exports to Japan following a 2010 dispute over the Senkaku Islands.⁸⁴ In July 2023, Beijing introduced global export controls on gallium and germanium in, suspected retaliation against U.S.-led restrictions on Chinese access to semiconductor technology.⁸⁵ In October of the same year, China announced restrictions on exports of several graphite products, which are key to electric vehicle battery manufacturing.⁸⁶ Korea has itself already suffered under weaponized Chinese trade. Beginning in 2016, China blocked imports of a range of Korean goods and services in response to Seoul's deployment of the U.S.-developed Terminal High Altitude Area Defense weapons system.⁸⁷

The Yoon administration has an overarching critical minerals goal of reducing dependence on Chinese imports to 50 percent of demand by 2030.⁸⁸ This is essentially a “derisking, not decoupling” approach.⁸⁹ Yet it still remains highly ambitious. China has developed its intense stranglehold through policies implemented over more than a decade.⁹⁰ The most notable effort of any country to reduce dependence on Chinese minerals involves Japan's rare earths policies. Yet these have only succeeded in reducing Japanese reliance on China from 91.3 per cent to 58 per cent of demand during the 2008 to 2018 period.⁹¹ Challenges are also arising elsewhere, including intense and nationalistic competition for critical mineral resources and associated value-adding activity.

Critical minerals insecurities are, on the other hand, qualitatively different to those for fossil fuels and more reduceable in the long-term. Shortages of individual minerals for manufacturing will never have as much, or as immediate, an impact as shortages of coal, oil, or gas, which are used in much larger volumes, often directly by consumers. The comparison between a industrially dominant China in critical minerals versus a geologically blessed Middle East in oil shows policy decisions will also be more important than natural capital in determining success. Stockpiling can be a more complicated process than for some fossil fuels, but it remains highly viable.⁹² Reducing consumption of problematic materials is also easier without need for large infrastructure shifts, including through developing alternative chemistries for technologies and end-of-life recycling of materials.⁹³

Seoul recognizes its interventions can significantly mitigate future critical minerals insecurity. This process necessarily starts with identifying those minerals most important to future economic and strategic priorities. In February 2023, MOTIE released an updated list of 33 minerals eligible for policy support, with 10 of these, including five rare earth elements, receiving greater prioritization (see Table 1).

Table 1. Korea's critical minerals list (MOTIE, 2023)⁹⁴

Priority critical materials

Lithium, Nickel, Cobalt, Manganese, Graphite

Rare earth elements: Lanthanum, Cerium, Neodymium, Terbium, Dysprosium

Critical minerals

Niobium, Copper, Aluminum, Silicon, Magnesium, Molybdenum, Vanadium, Tin, Titanium, Tungsten, Antimony, Bismuth, Chromium, Lead, Zinc, Gallium, Indium, Tantalum, Zirconium, Strontium, Selenium

Platinum group elements: Platinum, Palladium

The ideal end result of critical minerals policy would be creation of well-functioning and transparent markets that can trigger timely investments, efficient trade, and improved oversight over often poor environmental, social and governance (ESG) outcomes. Yet Seoul's more immediate priorities under Yoon have included refining an early warning system for supply chain risks established by Moon. The government is also expanding existing stockpiles from 54 days to 100-days of demand. It has additionally committed to create an EV and battery recycling industry through demonstration facilities, industry clusters, and legislative frameworks. This aims to increase recycling rates from two to 20 percent.⁹⁵

Successful expansion and diversification of critical minerals supply chains is the larger challenge. The imperative to do so has been another factor in Korea's revived resource diplomacy. An important step forward was the August 2021 creation of the Korea Mine Rehabilitation and Mineral Resources Corporation (Komir) from the ashes of several debt-laden agencies. Komir has since provided significant de-risking support for developing overseas projects. In October 2023, most recently, it provided US\$3 million to an early-stage Australian lithium exploration project to potentially supply Korea's LG Energy Solution.⁹⁶

The Yoon administration policies outlined in February 2023 improved Komir and other agencies' abilities to issue loans, guarantees, and insurance to Korean companies investing in mines and processing facilities and securing long-term offtake agreements. Seoul has also reinstated an overseas development tax credit axed in 2012, which broadens the scope of deductible expenses on project write-downs and impairments.⁹⁷

The Moon and Yoon administrations have also formed strategic bilateral partnerships with governments in resource-rich countries, including Australia, Canada, Ecuador, Mongolia, Indonesia, the U.S., and Kazakhstan.⁹⁸ These have various levels of formality, but they typically seek to leverage and coordinate public and private financing from the partnering country. Seoul has additionally signed up to numerous multilateral policy coordinating bodies. The latest of these is the U.S.-led Minerals Security Partnership (MSP), which Korea joined in 2022. The MSP aims to “help catalyze investment from governments and the private sector for strategic opportunities—across the full value chain—that adhere to the highest environmental, social, and governance standards.”⁹⁹

While growing in assertiveness, Seoul's critical minerals policies still place most of the onus for supply chain diversification on private industry. Overseas public investment is mostly limited to de-risking upstream investment, and state support for establishing processing facilities—where diversification is most crucial—is largely domestically focused.¹⁰⁰ National priorities nonetheless vary across critical minerals sectors. Policymakers in Korea and elsewhere are generally eager to attract as much of the battery value chain as possible. Processing rare earth elements, however, involves significant environmental challenges, including handling radioactive materials, which makes offshore activity more attractive.

Developing new projects is a complicated process, so assessing the validity of Korea's approach will take some time. One of the best examples of state-supported critical minerals security does, however, suggest Seoul may need to offer longer-term support with a whole-of-value-chain view. This case saw Japan Australia Rare Earths (JARE)—a joint venture of Japanese trading company Sojitz Corporation and the Japan Organization for Metals and Energy Security—commit US\$250 million loan and equity finance to Lynas Rare Earth's Australian mining operations and Malaysian processing operations in 2011, to supply Japan with rare earths following its 2010 China dispute. The partnership remains a valued concern for the parties involved; JARE secured a further US\$9 million in Lynas equity in 2022 to facilitate project expansion.¹⁰¹

The agnostic partnerships that Seoul and Korean businesses are pursuing may also pose challenges. As noted earlier, Yoon's *Indo-Pacific Strategy* pledged to stabilize supply chains for strategic resources by cooperating with “partners with whom we share values.”¹⁰² Yet Seoul has formed government-to-government links with a wide range of disparate states, as outlined above. Korean businesses have operated with similar flexibility. They have, for example, been the largest foreign investors in U.S. battery factories following the 2022 passage of the IRA.¹⁰³ Korean firms such as LG and Posco are simultaneously investing heavily in Indonesian value chains.¹⁰⁴

Partnering widely is in superficial accord with Yoon's defense of depoliticized commerce. Yet Korean investment in the United States and Indonesia in fact results from Washington and Jakarta eschewing free trade and prioritizing domestic interests. Korean manufacturers building batteries in the United States will need to source minerals produced or processed in that country or a U.S. free trade agreement partner to access the full benefits offered by the IRA's Clean Vehicle Tax Credit. Firms operating in Indonesia are heavily motivated by gaining access to Indonesian nickel, which is unavailable on the open market following a ban on unprocessed exports reintroduced in January 2020.¹⁰⁵

Yoon supported expanding a "small bloc to form a larger bloc" in his 2023 WEF speech, yet the U.S. and Indonesia examples reveal what are currently some severe limitations of this approach. Washington has so far rejected Seoul's requests to extend IRA subsidies to cover Indonesian minerals.¹⁰⁶ Likely U.S. rationales include avoiding any backdoor subsidization of Chinese firms, which are well-represented in Indonesian value chains, or disadvantaging U.S. firms, which must meet higher ESG standards than their Indonesian counterparts.

More importantly perhaps, Korean firms investing in the United States and Indonesia, rather than domestically, reveals the challenges of Korea's own domestically focused industrial policy (as well as some of the contradictions in Yoon's ongoing defense of free trade). Seoul has long offered heavy state support to domestic industry, but its success has typically relied on other economies maintaining open access to material inputs and consumer markets alike.¹⁰⁷

Seoul already increased support to domestic manufacturers in the wake of the IRA, including increased tax credits and credit lines and reduced interest rates and insurance premiums.¹⁰⁸ These, coupled with other commitments outlined above, may help Korea maintain a secure and competitive industrial ecosystem from raw materials onwards. Policymakers will, however, likely continue to lobby other states to moderate their policies. Other options may eventually also be needed. These include greater policy harmonization with likeminded partners or, more radically, greater tolerance for offshoring Korean industrial activity.

Conclusion: Restoring Order or Embracing Rebalance?

Korea's emergence from poverty was considered a miracle, rather than inevitable. Policymakers thus consider disruption of its resource-intensive, manufacturing-dominated, export-focused basis to be highly threatening. Yet this model has always rested on a fragile bedrock of domestic scarcity and

overdependence on imported energy and minerals. Up until now, Korea has been able to ride out repeated crises without eliminating this fundamental vulnerability. But there is no guarantee that this will remain the case.

Seoul has seemed to manage even the recent period of intersecting crises with relative calm and respect for continuity. There are, however, signs of evolution in national thinking around resource security. In the energy sector, President Yoon has noted the ability to achieve both energy security and energy transition in parallel—what this article calls “green security.” While not necessarily reducing the energy intensity of Korea’s economy, meaningful decarbonization would be a transformational achievement. It could dramatically decrease the most intense of Korean resource insecurities, concerning fossil fuels.

Turning rhetoric into reality has, however, proven historically difficult for Korea, as the challenges of realizing the earlier national policy paradigm of “green growth” can attest. Some policies, such as Yoon’s downgrading of renewables, suggest moderation will remain the focus. There are, on the other hand, signs that the actions of other states might inevitably force reconsideration of the tradeoffs involved with slower decarbonization. Korea’s pursuit of more reliable fossil fuel trade with trusted partners might run afoul of these prospective partners’ own conflicting policies, as the example of Australia suggests.

Korea is also pursuing a more complicated energy security pathway than many other states. This includes a larger role for hydrogen and, under Yoon, an upgraded role for nuclear at the expense of renewables. This responds to idiosyncratic concerns, but it also increases the pressure on Seoul to succeed. Should it fail, one of the costs may be increased offshoring of energy-intensive manufacturing to greener jurisdictions, as Korean industry have indicated.

Korea’s critical minerals goals appear far less complicated by comparison. The overarching focus is to accelerate the development and diversification of supply chains to service Korea’s traditional economic priorities. Yet here too, there is a potential need for a more radical reconsideration of Korea’s historical resource security bargain. Fierce, nationalistic competition for value-adding activity is a feature of many other countries’ efforts to diversify supply chains. Geopolitics, and what might be broadly called “values,” including high regard for ESG considerations, are also playing a key role. If Seoul’s industrial and foreign policies cannot successfully adapt, this too might force more domestic industry offshore.

Policymakers will likely oppose shifts in the energy and minerals-intensiveness of the Korean economic model. The protection of the essential character of the ‘miracle on the Han River’ remains at the heart of Korea’s economic security pursuits and Yoon’s *Indo-Pacific Strategy*. Yet the disruptive forces these are responding to may be difficult to overcome. A somewhat forced rebalancing of the national economy need not necessarily be a negative, however. Successful diversification into new economic sectors is entirely possible. A new equilibrium could also help Korea further minimize fallout from disruptions impacting resources.

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