



The Asia Foundation

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# What a Clean Energy Future Demands:



A Massive Shift in Critical Minerals and Global Supply Chains

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# WHAT A CLEAN ENERGY FUTURE DEMANDS:

## A MASSIVE SHIFT IN CRITICAL MINERALS AND GLOBAL SUPPLY CHAINS



**The Asia Foundation**



**Australian Government**



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# FOREWORD

There are several areas of potential cooperation between the Republic of Korea (ROK), Australia, and the United States that need timely attention. These include enhancing collaboration in the security, defense, and diplomatic domains and building new and deeper ties in energy cooperation, critical minerals, and supply chains.

Economic and trade cooperation between the ROK, Australia, and the United States will do more than bring prosperity to each country. Their wider influence in the region will reinforce freedom, openness, and a rules-based order. Although the foreign policies of these three nations inevitably reflect their own domestic concerns, their mutual interests and shared flashpoints in the region make cooperation essential.

On June 7 and 8, 2023, The Asia Foundation (the Foundation) and the Perth USAsia Centre in Australia organized the second Republic of Korea–Australia–United States trilateral dialogue in Seoul to explore opportunities for future trilateral cooperation.

This meeting built on the Foundation's first trilateral dialogue, held virtually in December 2021, which identified energy, critical minerals, and supply chains as promising areas in which the three nations could cooperate to reinforce their trilateral relationship.

The June 2023 workshop brought together specialists from the ROK, Australia, and the United States, representing industry, academia, and the think tank community, for an interdisciplinary dialogue that blended theory and practice. Key discussion points included (1) strategies to secure future energy resources, including batteries; (2) collaborative efforts to support the development and supply of critical minerals such as lithium and hydrogen; and (3) the challenges and risks of supply chain disruptions.

The Asia Foundation and the Perth USAsia Centre wish to thank all the dialogue participants for approaching the discussion in an open, generous spirit and with a passion and enthusiasm for bolstering trilateral relations between the ROK, Australia, and the United States. We also wish to thank Mr. Kees Krul for capturing the exchange and composing the following report. This project could not have been undertaken without the support of Asia Foundation staff in Seoul and Washington, D.C., particularly Kyoungsun Lee and Vanessa Crawford.

Finally, we wish to thank the Australia Korea Foundation and Friends of The Asia Foundation in Korea (FOTAF) for their continued financial support of this trilateral dialogue series.

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# SPEARHEADING THE INDUSTRIAL UPLIFT



The transition to clean energy is one of the most daunting challenges of our times. It will demand a massive industrial uplift to shift energy generation, electrical grids, industrial processes, and transportation networks into renewable and zero-carbon technologies.

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The 'industrial uplift' refers to the collaborative and extensive transformation of global industrial capabilities needed to achieve the clean energy transition. This pivot will require a reliance on new technologies and a reliable supply of critical minerals. Furthermore, the industrial uplift involves significant advancements in various industries, including energy generation, transport, manufacturing, and resource extraction. This transition involves creating new products, technologies, and supply chains that are scalable, secure, and environmentally sustainable to meet the demands of the net-zero transition. Moreover, the industrial uplift necessitates collaboration among countries to develop innovative

solutions, build necessary capacities, and address challenges related to scalability, sustainability, and security to achieve a successful transition to a cleaner and more sustainable future.

Current supply chains cannot support this transformation because they suffer from deficiencies in scalability, security, and sustainability. Scalability poses a challenge due to the need for speedy and affordable upstream and downstream production of a vast array of new products. Security issues arise from the political manipulation of clean energy value chains. Meanwhile, existing supply chains suffer from prominent environmental and social issues.



Governments worldwide are working towards the goal of net-zero carbon emissions. Recognizing the scale of the industrial challenge posed by this energy transition, they have expanded their focus from solely energy generation to include transmission, transport, and storage which are supported by new subsidies and industrial policies.

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The importance of global cooperation in this context is clear, particularly in the form of intergovernmental dialogue and collaboration. The ROK, Australia, and the United States have shown leadership in forming bilateral partnerships with other global players. Australia and the US have even taken their collaboration a notch higher, making energy and critical minerals the third pillar of their alliance.

Despite these strides, some areas still need improvement. National policies tend to overemphasize downstream production and domestic needs, overlooking the global nature of the transition. Many policies seem to take a zero-sum approach, attempting to appropriate clean energy industries from other nations.

These strategies could trigger capital flight and deter local investment as technologies,

resources, and companies move away to other nation's offering larger subsidies or other incentives. They could inadvertently confine a nation's contribution to the global energy transition to simply achieving domestic net-zero emissions goals while failing to provide the essential minerals and technologies required for a collaborative industrial uplift necessary for a global energy transition.

A collaborative approach based on partnerships between government and industry will be crucial to accomplish a successful transition. Nations such as the ROK, Australia, and the United States possess complementary industrial infrastructures that uniquely position them to spearhead the industrial uplift. Together, they can build the scalable, sustainable, and secure supply chains required for one of the greatest challenges of our time.



# DOMESTIC DETERMINANTS

*“While the foreign policies of the ROK, Australia, and the United States mirror their various domestic priorities, the shared stakes and regional tensions in the Indo-Pacific region make their alliance vital. Each of these nations has unique capabilities crucial for spearheading the industrial uplift. With a concerted effort they can dramatically accelerate the global energy transition.”*

## **The view from The Republic of Korea**

The Republic of Korea values its trilateral relationship with Australia and the United States, perceiving them as essential partners due to historical ties and contemporary alignments. A key focus for collaboration is climate change mitigation and environmental conservation, which the ROK is committed to. It has initiated several projects in this regard, such as the Keep Korea Green campaign, which was deemed a significant success.

In addressing global challenges, the ROK puts an emphasis on innovation. It is particularly interested in the economy, technology, and the environment. With their combined contribution to the global economy, the ROK believes that the three nations, working together, can significantly influence global discourse and decisions.

The ROK is particularly concerned with the downstream development and

proliferation of electric vehicles and the wider electric mobility industry. These sectors are considered high-growth areas for the future and are critical for the ROK's economic and environmental goals.

Despite disparities in the entrepreneurial environment among the three nations, ROK believes that entrepreneurship is crucial for future growth and innovation, particularly in the tech sector, and that continued collaboration and shared learning can lead to improvements.

To further their shared objectives and more effectively tackle the pressing global challenges of our time, the ROK supports a strategy of broadening ROK-Australia-US trilateral cooperation to include like-minded nations in Southeast Asia such as Indonesia, Malaysia, and Vietnam.



## *The view from Australia*

Energy transition presents key opportunities for trilateral cooperation among Australia, the United States, and the ROK. These opportunities include enhancing energy security, promoting new industries, and shaping the norms and standards that will guide the transition to a net-zero world.

Australia is well-positioned in this partnership due to its abundance of critical minerals, solar and wind resources, extensive land resources, and the robust domestic political support for renewable energy. The Australian government has adopted the ambitious goal of generating 82 percent of its domestic electricity from renewables by 2030, a remarkable increase from the 32.5 percent recorded in 2021.

Australia's geology has significant potential for carbon sequestration, which could enable the nation to store carbon dioxide that is produced in Australia, as well as carbon dioxide produced and captured from overseas locations that is transported to Australia for permanent sequestration. Australia is also a major global producer of metals and minerals essential for the energy transition. These

include copper, lithium, iron ore, aluminum ores, nickel, copper, cobalt, vanadium, and various rare earth elements.

Australia's domestic demand for clean energy and these critical minerals is relatively modest, but global demand is far greater and will continue to grow as developed markets increasingly penalize high-carbon imports and consumers seek carbon-free alternatives.

However, utilizing Australia's resources for the world's benefit presents a challenge Australia cannot tackle in isolation. Collaboration with the United States and the ROK is crucial, incorporating their technology, capital, and skills to develop the supply chains essential for decarbonization.

Concurrently, international standards must be established that are not only economically compatible but also consider human rights protections and environmental impact. Given their shared democratic values, the three nations have compelling reasons to cooperate in navigating this energy transition.





## *The view from the United States*

The United States recognizes the substantial opportunities presented by cooperation among the three nations in various areas.

Historical military alliances, particularly on the Korean Peninsula, have transformed into a global partnership anchored by shared values: a commitment to human rights, freedom, and the rule of law. These shared values extend to a mutual vision for a free and open Indo-Pacific region.

Key domestic and international challenges that these nations face include the existential threat of climate change, acceleration of the clean energy transition, prevention of supply chain disruptions, and ensuring accessibility of goods and services. Addressing these challenges requires a collective effort.

The United States has initiated and is attempting to strengthen the Indo-Pacific Economic Framework (IPEF). This

partnership aims to stimulate economic growth, job creation, and innovation. Recent IPEF negotiations have achieved substantial progress, particularly on the supply chain pillar.

The three nations are already collaborating on mineral security partnerships, understanding the essential role of minerals in the global economy and the technologies necessary for the clean energy transition. This collaboration aims to catalyze investment in strategic mining, processing, and recycling projects that adhere to high environmental, social, and governance standards.

The United States is aligning its approach to the Indo-Pacific region with Australia and the ROK. This approach supports a peaceful, inclusive, and rules-based order grounded in respect for international law and sovereignty.





## *Trilateral opportunities*

Trilateral cooperation among the ROK, Australia, and the United States promises substantial synergy in supply chain solutions. Each country brings unique strengths that, when combined, can significantly advance the industrial uplift for the global energy transition.

The ROK is a leading industrial engine, a global leader in batteries, electric vehicles, steel, and petrochemicals. Korean companies such as SK, LG, and POSCO have fully integrated supply chains, enabling the nation to decarbonize hard-to-abate industries.

Australia possesses vast natural resources, supplying half the world's lithium, a quarter of its nickel, and the only notable supply of rare earths outside China. Australia is also endowed with multiple renewable energy sources, including solar, wind, and geothermal. These sources exceed

domestic demand, making Australia a potential clean energy exporter.

The United States brings capital, scale, and innovation to the trilateral partnership. It offers a large market that can reduce costs in emerging industries and has the world's largest capital reserves. With an innovative and business-friendly environment, the US is well equipped to catalyze the energy transition, further aided by approximately \$350 billion in subsidies from its Inflation Reduction Act.

Together, the three nations are uniquely positioned to address nearly every facet of the industrial uplift. While this tripartite collaboration has significant strength, including other countries such as Germany, Japan, Canada, Indonesia, and others could further strengthen downstream industrial processes and raw material capacities.



# PROSPECTS FOR TRILATERAL COOPERATION

The monumental task of the global energy transition cannot be achieved by one nation single-handedly. It will require a concerted approach underpinned by solid cooperation and robust supply chain management. Three primary pillars present themselves as focal points for leadership by the Republic of Korea, Australia, and the United States:

1.

Future energy

2.

Critical minerals supply

3.

Secure supply chains

## Future energy



A primary area of cooperation involves future energy opportunities, such as lithium and sodium batteries and other clean energy sources such as hydrogen. Each country has unique challenges and potential strategies for harnessing these opportunities.

The ROK is diversifying its energy sources as part of its broader security strategy. In line with its commitment to carbon neutrality, it focuses on renewable and nuclear energy. The ROK addresses these by promoting market competition, implementing emission trading schemes, and advancing energy-efficient technologies.

Australia, leveraging its abundant critical mineral reserves, is focusing on transforming its position in the global market. Overcoming challenges such as long lead times for the permitting of mining operations, potential market oversupply, and investor risk-aversion will require strategic partnerships and “patient capital” investments.



The United States, focusing on clean energy technologies such as EV batteries and low-carbon fuels, is working to diversify and strengthen global supply chains for energy security. Legislative efforts support these initiatives, aiming to significantly increase low-carbon hydrogen production by 2030.

A common concern for all nations is the economic implications of the energy transition, which could lead to higher costs and possibly prolonged inflation. International cooperation, shared responsibility, and a shift in public discourse to highlight the global nature and potential benefits of the energy transition will be essential.

## Critical minerals supply



Another crucial component of the industrial uplift will be the upstream supply of critical minerals, specifically those required for advanced technologies, renewable energy, and electric vehicles. The global demand for these resources presents the three nations with different challenges and strategic possibilities.

In the ROK, vital industries such as semiconductors, automobiles, and energy depend significantly on rare earth elements, but the environmental and health risks associated with processing these elements, and the country's dependence on China, pose substantial difficulties. The future, especially with emerging technologies such as autonomous vehicles and drones, will require stronger international partnerships.

Australia emphasizes the interconnections of industrial policy, domestic politics, and national security with critical mineral supply chains. Australia is a significant upstream producer of lithium, but most of this lithium ore is processed in China. Given China's dominance in mining and processing of rare earth elements, strategic funding for Australian companies from international partners should be encouraged. A focus on a complete supply chain, technological advances, and transparent disclosures is required that balances domestic and international interests.

Mining in the United States faces a significant challenge due to long permitting timelines and financial constraints. To compete with China, the US must expedite these processes. It must also focus on technological advances such



as direct lithium extraction and sodium-ion batteries to reduce dependence on monopolized resources.

The ROK, Australia, and the US all acknowledge the challenges linked to supplies of critical minerals, and they share concerns about China's dominance in cobalt, nickel, and rare earth minerals. The possibility of China disrupting supply chains by restricting exports causes great apprehension. Although individual countries might be able to reduce their dependence on China, China's size and production efficiency will continue to secure its place in the global supply chain.

A comprehensive strategy is necessary to deal with China's resource dominance. This strategy must include increasing investments to compete with China, considering joint R&D centers for technological innovation, and exploiting domestic strengths like Korea's semiconductor industry. Regulatory hurdles impeding supply chain security in trade agreements must also be addressed.





## Secure supply chains



Secure supply chains for future energy and critical minerals are of paramount importance to the industrial uplift. Recent disruptions, due to both policy and nonpolicy factors, have highlighted the need for more global cooperation.

The ROK, which imports 95 percent of its critical minerals, has a proactive strategy to manage supply chain shocks, emphasizing import reduction, recycling, and intensive management of 33 critical minerals. The ROK's plan also focuses on improving crisis response, enhancing diplomatic ties with mineral-rich nations, and increasing financial backing for mineral investments.

Australia, grappling with various challenges, emphasizes creating sustainable and scalable supply chains and learning from past trilateral collaborations to mitigate similar challenges. The lessons underline the

importance of government-industry partnerships and long-term relationships for effective solutions.

The United States identifies multiple risks related to policy, regulation, market access, price competition, and geopolitical tensions. Concerns about China's consolidation of critical minerals and potential price manipulation are particularly prominent.

Enhanced security of critical mineral supply chains for the ROK, Australia, and the US requires better collaboration, including a shift from country-specific approaches, less reliance on subsidies, and avoiding divisive policies.

Nations that wish to reduce the dependence of their supply chains on China must understand that enhanced security comes at a premium, like insurance. The key challenge is to establish the market value of this "insurance" and rationalize the increased cost.





## RECOMMENDATIONS

The transition to clean energy demands a significant industrial uplift. This uplift involves revamping energy systems, industrial processes, and transportation networks to incorporate renewable and zero-carbon technologies. However, existing energy supply chains, hindered by global disruptions and deficiencies in scalability, security, and sustainability, are ill-equipped for this transformation.

While this industrial uplift presents a significant challenge, however, it also offers new opportunities for trilateral collaboration. Individual countries cannot address these challenges alone: spearheading the industrial uplift will require a comprehensive, cooperative strategy.

With their complementary industrial infrastructures, the Republic of Korea, Australia, and the United States are uniquely positioned to lead this industrial uplift. Together they can build the scalable, sustainable, and secure supply chains needed to tackle one of today's most significant challenges.



The following strategies can guide this endeavor:

***Develop a common understanding and terminology.***

Different nations define “critical minerals” differently. It is vital to establish a common understanding and vocabulary. This is a prerequisite for identifying and forestalling potential upstream and downstream supply deficits and hedging against market fluctuations and geopolitical tensions.

***Share costs and risks among trilateral partners.***

Securing upstream supply chains for critical minerals will be an expensive and risky endeavor. Sharing these costs and risks among the trilateral partners will create a more resilient supply chain. The three nations can also collaborate to identify and jointly fund promising mining projects, which can help “de-risk” investments in early-stage projects.

***Improve regulatory processes.***

Streamlining regulatory processes and expediting the approval of mining permits is vital to ensure a stable supply of critical minerals while respecting environmental and social concerns.

***Create a scholarship program to cultivate a skilled labor force.***

A scholarship program targeting students from the ROK, Australia, the US, and other Indo-Pacific nations would foster education and the exchange of ideas on critical minerals and future energy development. This initiative would also inspire young people to seek employment in the critical minerals and mining sectors.

***Establish a trilateral research and development center.***

A joint R&D center in Seoul, established by the ROK, Australia and the US, could become a hub for collaborative research on shared interests such as future energy, critical minerals, and clean technologies. This effort should be supported by all three countries’ governments as well as the private sector.

***Involve other nations rich in critical minerals.***

Establishing a secure and resilient supply chain that is not excessively dependent on China will require a strategic approach. It is essential to engage nations such as Japan, Indonesia, African nations, and other countries rich in critical minerals. This endeavor will require collaboration not only with friendly countries but also with those sharing common strategic interests.

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