



# ILZSG Insight

**ILZSG SECRETARIAT BRIEFING PAPER**

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## **Global Critical Minerals Initiatives**

### **Introduction**

This insight paper has been developed to assist readers in understanding the complex prevailing policies, regulations, strategies, and initiatives in various jurisdictions and countries to secure a sustainable, affordable, adequate, and reliable supply of critical and strategic minerals that are crucial in combating the climate change, transitioning to a green economy, revitalizing the industrial strength, diversifying supply chains, and gaining strategic independence.

To address the triple planetary crisis comprising climate change, biodiversity loss, and pollution pinpointed by UNEP, and to achieve the UN Sustainable Development Goals (SDGs) while meeting the Paris Climate Agreement targets, a global transition to renewable energy and a green economy is imperative. This transition necessitates a substantial increase in the extraction and use of various minerals indispensable in developing clean energy technologies and sustainable practices.

Production of solar panels requires aluminum, copper, zinc silicon, silver, and critical rare earth elements such as indium and tellurium. Wind turbines utilize rare earth elements including neodymium and dysprosium. Lithium, cobalt, nickel, and manganese are essential for lithium-ion batteries in electric vehicles (EVs) and energy storage systems. Significant quantities of copper are also needed for batteries, motors, and wiring in EVs. Electric grids have to be upgraded for transmitting and distributing renewable energy and this will use large amounts of copper and aluminum. Buildings need retrofitting and energy-efficient appliances need to be developed to improve the energy efficiency which involves metals including copper and various alloys. Smart grids, EVs, data centers, and other electronic and digital technologies depend on semiconductors that use critical minerals such as germanium and gallium.

Extracting minerals has a significant environmental impact, including habitat destruction, water pollution, and high carbon emissions. Responsible mining practices and advances in recycling and circular economy principles are essential to mitigate these effects.

Many critical minerals are sourced from a small number of countries, making the supply chain vulnerable to geopolitical tensions and market fluctuations. Diversifying supply sources and investing in alternative materials are necessary strategies.

Developing technologies and systems for efficient recycling of key metals, especially from electronic waste and end-of-life products to promote a circular economy can reduce the need for virgin materials and minimize waste.

Stringent environmental and social governance (ESG) standards in mining operations must be implemented to reduce ecological and social impacts. Investing in cleaner mining technologies and rehabilitation of mining sites is also essential.

These global critical minerals initiatives are also aligned with SDGs and Paris Climate Targets.

SDG 7 (Affordable and Clean Energy): Increasing the adoption of renewable energy sources while ensuring they are sustainably sourced and deployed.

SDG 12 (Responsible Consumption and Production): Promoting resource efficiency and sustainable practices across the supply chain, from extraction to end-of-life product management.

SDG 13 (Climate Action): Reducing greenhouse gas emissions through cleaner energy technologies and improved resource efficiency.

SDG 15 (Life on Land): Minimizing the ecological footprint of mining and protecting biodiversity by adopting responsible land use practices.

The triple crisis is planetary, the SDGs and the goals of the Paris Agreement are global ambitions. A globalized crisis can't be solved in a deglobalizing world, an aggravated crisis can't be tackled in a confrontational environment, and an aggregated task can't be fulfilled in a segregated manner. Efforts to address these challenges need to be concerted and coordinated globally so that the transition to a green economy is both sustainable and equitable, and the UN SDGs and the goals of the Paris Agreement are achievable and attainable.

These principles must be embedded in rolling out and implementing policies, regulations, strategies, and initiatives concerning critical minerals.

### **Comments or Questions**

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## Analysis of Principal Critical Minerals Initiatives

Countries and regions worldwide have recognized the crucial role of critical minerals in transitioning to renewable energy and a green economy. In response, a slew of acts, regulations, policies, and initiatives have been promulgated and implemented to secure and manage the supply of these essential resources. These acts, regulations, policies, and initiatives aim to promote the exploration, extraction, processing, and utilization of the defined critical minerals as well as to secure resilient, diversified, sustainable, and responsible supply chains of identified critical minerals.

Below is a summary of key players' prevailing efforts, including the United States, the European Union, China, and other significant contributors.

### UNITED STATES

The U.S. policies on critical minerals have been developed based on five pillars bolstering domestic production, fortifying supply chains, advancing sustainability, encouraging innovation, and safeguarding economic and national security. These policies collectively aim to ramp up the extraction and processing of critical minerals within the United States to decrease dependence on international sources, develop resilient and secure supply chains for critical minerals by making strategic investments and diversifying sources, promote sustainable and responsible practices in the mining, processing, and the recycling of critical minerals, stimulate technological and process innovations related to critical minerals to enhance efficiency and sustainability and ensure a reliable supply of critical minerals essential for the economic stability and defense capabilities of the U.S.

#### **1. *The Critical Mineral Consistency Act of 2024 (HR 8446)***

The Act aims to align the definitions and benefits associated with critical minerals and critical materials as managed by the Department of Energy (DOE) and the United States Geological Survey (USGS).

It also seeks to integrate the DOE's list of "critical materials" with the USGS's list of "critical minerals." This effort aims to resolve inconsistencies between how the two lists are used and defined by these agencies. It will enable minerals on both lists to be eligible for the same federal benefits, including clean energy tax credits, financing support, and expedited permitting processes. It is a strategic move to streamline the management of critical resources in the U.S., ensuring that all critical materials receive equal support and benefits, thus enhancing the nation's resource security and economic resilience.

#### **2. *Inflation Reduction Act (IRA) (2022):***

This comprehensive legislation aims to curb inflation, reduce the deficit, and invest in domestic energy production and manufacturing, including critical minerals. Key Provisions include tax credits and incentives for the production and use of critical minerals in renewable energy technologies and electric vehicles (EVs). The IRA also encourages the sourcing and processing of critical minerals within the U.S. to reduce dependency on imports. Substantial funding for developing clean energy technologies and investing in the associated critical mineral supply chains will be appropriated for qualified projects.

#### Key Points:

##### a. Critical Minerals

The Act incentivizes domestic sourcing and processing of critical minerals to reduce reliance on imports, particularly from regions that pose geopolitical risks. Tax credits and grants are offered to companies investing in the development of critical mineral supply chains within the U.S., promoting self-sufficiency and resilience. Funds are allocated to support the responsible mining of critical minerals in the U.S., including measures to ensure environmental protection and community engagement. The Act promotes the recycling and recovery of critical minerals from existing products, reducing the need for new mining operations and minimizing environmental impact. To stabilize the market and secure a consistent supply for U.S. industries involved in clean energy and technology manufacturing, the IRA provides for the establishment or expansion of strategic stockpiles of critical minerals to buffer against supply chain disruptions and price volatility.

b. Electric Vehicles

Electric vehicles are a cornerstone of reducing greenhouse gas emissions from the transportation sector, which is a significant contributor to overall emissions. The IRA extends and modifies the existing tax credit to encourage the adoption of new electric vehicles by offering up to \$7,500 per vehicle. To qualify, vehicles must meet certain criteria, including price caps and manufacturing standards that favor North American production and assembly. A new credit of up to \$4,000 is introduced for used EVs, making electric vehicles more accessible to a broader range of consumers. The Act incentivizes the domestic production of EVs and their components through manufacturing credits and grants aimed at U.S.-based companies. Emphasis is placed on the entire supply chain, from battery production to vehicle assembly, to foster a robust domestic EV industry. Significant funding is allocated to expand the national network of EV charging stations, addressing one of the major barriers to widespread EV adoption. This includes grants for building new chargers and modernizing existing infrastructure to ensure accessibility and reliability.

c. Renewable Energy:

Renewable energy sources like solar, wind, and geothermal are essential for reducing reliance on fossil fuels and cutting carbon emissions. The IRA extends existing tax credits for wind, solar, and other renewable energy projects, providing long-term financial certainty for developers. These credits are designed to support both large-scale utility projects and smaller community-based initiatives. The Act includes provisions to support the development and deployment of energy storage technologies, which are critical for integrating renewable energy into the grid. This includes standalone storage systems and integrated solutions that can store excess renewable energy for use during periods of low production. Manufacturing tax credits and grants are provided to stimulate the domestic production of clean energy technologies, such as solar panels, wind turbines, and advanced energy storage systems. The goal is to establish a strong domestic supply chain and reduce dependency on foreign-made components. The IRA offers rebates and grants to support the installation of renewable energy systems and energy efficiency improvements in residential and commercial buildings. These incentives aim to reduce energy consumption and promote the adoption of clean energy at the grassroots level.

The Inflation Reduction Act is a transformative piece of legislation with significant implications for the U.S. clean energy landscape. By focusing on critical minerals, EV subsidies, and renewable energy incentives, the IRA addresses the foundational elements required for a sustainable and resilient clean energy economy.

**3. Infrastructure Investment and Jobs Act (2021)**

Also known as the Bipartisan Infrastructure Law, this act provides significant funding for various infrastructure projects, including those related to critical minerals. Key Provisions include allocating resources to develop and secure critical mineral supply chains, supporting the establishment and expansion of mining and processing facilities for critical minerals, and promoting the development of recycling technologies and facilities to recover critical minerals from used products.

Key Points

a. Funding for Critical Mineral Research and Development:

Allocation of \$320 million for the U.S. Geological Survey (USGS) to accelerate mapping and assessment of critical minerals; supports research and development (R&D) initiatives to enhance the extraction, processing, recycling, and reprocessing of critical minerals; provides grants for pilot projects that focus on innovative technologies to reduce the environmental impact and cost of mining and processing critical minerals.

b. Domestic Supply Chain Enhancement:

Emphasizes the development of a secure and resilient domestic supply chain for critical minerals to decrease dependency on foreign sources; Facilitates the establishment and expansion of domestic capabilities in mining, refining, and processing critical minerals; ensures that infrastructure projects supported by the Act prioritize the use of domestically sourced critical minerals whenever possible.

c. Environmental and Regulatory Reforms:

Streamlines the federal permitting process to facilitate faster development and approval of critical mineral projects; promotes sustainable and environmentally responsible mining practices through stricter regulatory oversight and community engagement; encourages the reprocessing of waste from existing mining operations to extract valuable critical minerals, reducing the need for new mining activities.

- d. **Critical Mineral Recycling and Reuse:**  
Allocates funds to advance technologies for the recycling and recovery of critical minerals from end-of-life products, such as batteries and electronics; supports the development of a national recycling infrastructure for critical minerals to reduce waste and improve supply chain sustainability; promotes collaborations between the government, private sector, and research institutions to enhance recycling and reuse capabilities.
- e. **Strategic Reserves and Stockpiling:**  
Expands the U.S. strategic stockpile of critical minerals to ensure availability during supply chain disruptions; updates and modernizes the management and use of strategic reserves, focusing on the most critical minerals for economic and national security.
- f. **Education and Workforce Development:**  
Funds programs to train workers in critical mineral mining, processing, and recycling, addressing the skills gap in the industry; supports educational initiatives at universities and technical schools to develop expertise in critical minerals and related technologies.
- g. **International Cooperation and Strategic Partnerships:**  
Encourages partnerships with allied countries to secure and diversify critical mineral supply chains; supports trade agreements that facilitate the import of critical minerals from reliable international partners while fostering domestic capabilities.

The Infrastructure Investment and Jobs Act of 2021 addresses critical minerals through a comprehensive strategy aimed at strengthening the U.S. supply chain, promoting sustainability, and ensuring economic and national security. Key initiatives under the Act include significant investments in research and development, enhancements in domestic mining and processing capabilities, regulatory reforms to streamline project approvals, and substantial support for recycling and reuse technologies. Additionally, the Act emphasizes building a resilient infrastructure that leverages domestic resources, developing a skilled workforce, and fostering international cooperation to secure critical mineral supplies. Together, these measures position the U.S. to better meet the growing demand for critical minerals essential for modern technologies and clean energy solutions.

#### **4. *Executive Order 14017: America's Supply Chains (2021)***

This executive order directs a comprehensive review of U.S. supply chains, including those for critical minerals, to ensure resilience and security. The 100-Day Review mandates a review of supply chain vulnerabilities for critical minerals. It asks to develop long-term strategies to address identified risks, including increasing domestic production and recycling. It also requires enhanced interagency coordination among federal agencies to support the secure supply of critical minerals.

##### Key Points

- a. **Comprehensive Review and Assessment:**  
Conducts detailed reviews to understand vulnerabilities and dependencies in critical mineral supply chains; identifies essential materials and maps their supply chains to find weak points and potential disruptions.
- b. **Strengthening Domestic Capabilities:**  
Recommends increasing domestic mining, processing, and recycling to build a more resilient supply chain; encourages the development of alternative materials and diversification of supply sources.
- c. **Promoting Sustainability and Ethical Sourcing:**  
Supports sustainable and responsible mining practices; enhances recycling programs to reduce reliance on new extractions.
- d. **Developing a Skilled Workforce:**  
Focuses on training and education programs to develop expertise in the critical minerals sector.

- e. Expanding Strategic Stockpiles:  
Expands and modernizes strategic reserves to secure supplies during emergencies.
- f. Fostering International Cooperation:  
Promotes collaboration with allies to secure and diversify critical mineral supplies and supports trade agreements to enhance global supply chain stability.
- g. Public-Private Partnerships:  
Encourages collaboration between the government and private industry to address supply chain challenges and foster innovation.

The order requests a holistic approach to securing critical minerals essential for national security, economic stability, and technological advancement, ensuring that the U.S. can meet future demands and remain competitive in the global market.

#### **5. Executive Order 13817: A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals (2017)**

This executive order sets the foundation for a federal strategy to secure the supply of critical minerals. It directs the development of a list of minerals deemed critical to U.S. economic and national security and requires the development of a comprehensive strategy at the Federal Government level to reduce vulnerabilities and dependencies in critical mineral supply chains through encouraging exploration, mining, and processing of critical minerals within the U.S.

##### Key Points:

- a. Identification of Critical Minerals:  
The Executive Order directs the Secretary of the Interior, in coordination with the Secretaries of Defense, Commerce, and Energy, to publish a list of critical minerals. These are defined as non-fuel minerals essential to the economic and national security of the U.S., the supply of which is vulnerable to disruption. The list is to be reviewed periodically to ensure it remains current and responsive to changing economic and geopolitical conditions.
- b. Assessment of U.S. Dependency and Vulnerabilities:  
The order mandates a comprehensive assessment of the U.S. dependency on foreign sources for critical minerals and identifies key vulnerabilities in the supply chain. It emphasizes the need to understand and mitigate the risks associated with relying heavily on imports for critical minerals, particularly from adversarial nations.
- c. Strategies for Enhancing Domestic Supply:  
The Order recommends measures to increase domestic exploration, mining, and processing of critical minerals to reduce foreign dependency. It calls for the federal government to streamline regulatory and permitting processes to expedite the development of domestic critical mineral projects.
- d. Encourage R&D  
The Order supports the development of new technologies and practices that can enhance the efficiency and sustainability of critical mineral extraction and processing in the U.S.
- e. Recycling and Reprocessing:  
It encourages the recycling of critical minerals from end-of-life products and industrial waste as a means to reduce the need for new extraction and to create a more sustainable supply chain. It also supports initiatives to recover critical minerals from existing mine waste and tailings.
- f. Development of Alternatives:  
The Order promotes research and development of alternative materials that can substitute for critical minerals, thereby reducing demand pressure on existing supply chains. It encourages the development of innovative technologies that can reduce the reliance on critical minerals or improve their efficient use.
- g. Strengthening International Trade and Cooperation:  
The Order advocates for trade policies and international agreements that enhance the reliability and security of critical mineral supplies. It emphasizes collaboration with allies and partners to diversify and secure global supply chains, reducing risks from geopolitical tensions.
- h. Strategic Stockpiles:

The Order recommends evaluating and potentially expanding the U.S. National Defense Stockpile of critical minerals to ensure readiness in times of supply disruption or national emergency. It focuses on maintaining adequate and strategically managed inventories of critical minerals essential for national security and economic stability.

i. **Cross-Agency Collaboration:**

The Order directs federal agencies to work together to achieve a coordinated approach to securing critical mineral supplies, involving the Departments of the Interior, Defense, Commerce, and Energy, among others. It supports the creation of task forces or working groups to oversee and implement the federal strategy for critical minerals.

j. **Economic and Workforce Development:**

The Order encourages economic and workforce development initiatives in mining communities to support the domestic critical mineral industry. It focuses on creating jobs and training programs in the critical minerals sector to build a skilled workforce capable of supporting domestic supply chain resilience.

Executive Order 13817 establishes a comprehensive federal strategy to ensure secure and reliable supplies of critical minerals, essential for national security, economic stability, and technological advancement.

**6. Executive Order 13953: Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries (2020):**

Issued on September 30, 2020, by President Trump, this order builds on EO 13817, declaring a national emergency to address the threat posed by the U.S. dependency on foreign adversaries for critical minerals.

Key Actions:

- a. Directed the Department of the Interior to use the Defense Production Act to fund the development of critical minerals production in the U.S.
- b. Instructed the Secretary of Energy to develop and implement a program to encourage the development of commercially viable critical minerals mining and processing.
- c. Encouraged the development of new technologies to reduce the U.S. reliance on critical minerals from foreign adversaries and to promote the recycling and reuse of these materials.
- d. Urged federal agencies to streamline the permitting process for critical mineral projects.

**7. Federal Strategy for Ensuring Secure and Reliable Supplies of Critical Minerals (2019):**

Published in June 2019, this strategy report by the Department of Commerce responds directly to EO 13817.

Key Recommendations:

- a. Increase domestic exploration, production, and processing of critical minerals.
- b. Strengthen International Trade: Enhance trade relationships and promote diversified supply sources.
- c. Focus on developing new technologies for extraction, processing, and recycling of critical minerals.
- d. Improve Data and Supply Chain Knowledge: Enhance geological mapping and analysis to better understand mineral resources.

**8. National Defense Authorization Act (NDAA) Provisions on Critical Minerals (Various Years)**

The NDAA is an annual federal law that specifies the budget and expenditures for the U.S. Department of Defense. Recent versions have included provisions related to critical minerals. Key Provisions include measures to secure the supply of critical minerals necessary for defense technologies, incentives to provide support for domestic mining and processing of critical minerals to ensure availability for defense needs, and authorization to stockpile critical minerals for national defense purposes.

**9. Energy Act of 2020**

This act addresses various aspects of energy policy, including provisions to support critical mineral

supply chains. It allocates funding for R&D on critical mineral extraction, processing, and recycling technologies, supports training and education programs to develop a skilled workforce for the critical minerals sector, and encourages collaboration with allies and partners to secure global critical mineral supply chains.

Key Actions:

- a. **Funding and Support for Critical Minerals Research and Development:**  
Authorizes substantial funding for research and development in advanced critical minerals technologies; focuses on improving the efficiency and reducing the environmental impact of mining, processing, and recycling critical minerals; encourages innovation in the extraction and processing of critical minerals from unconventional and secondary sources, including mine waste and recycled materials.  
Allocates over \$800 million across five years for critical minerals and related technology research. Funds programs aimed at developing alternative materials that can replace critical minerals in energy technologies.
- b. **Enhancing Domestic Supply Chains:**  
Supports efforts to increase domestic production and processing of critical minerals to reduce reliance on foreign sources; encourages the development of new domestic mining and processing facilities and the expansion of existing ones; directs federal agencies to streamline the permitting process for critical mineral projects to accelerate their development; seeks to reduce regulatory barriers and improve the efficiency of the approval process for mining and processing operations.
- c. **Establishing Critical Minerals Consortia and Partnerships:**  
Establishes a National Critical Materials Consortium to coordinate efforts across academia, industry, and government; fosters collaboration and shares resources and expertise to advance critical minerals research and development.
- d. **Public-Private Partnerships:**  
Encourages the formation of public-private partnerships to leverage industry expertise and investment in critical minerals initiatives; supports collaborations between the federal government and private sector to enhance the domestic supply chain for critical minerals.
- e. **Critical Minerals Mapping and Resource Assessments:**  
Authorizes the U.S. Geological Survey (USGS) to conduct comprehensive mapping and resource assessments for critical minerals; expands efforts to identify and evaluate domestic and international critical mineral resources, including unconventional sources; promotes the use of advanced geospatial data and technologies to improve the understanding of critical mineral deposits and their potential for development.
- f. **Promoting Recycling and Reuse of Critical Minerals:**  
Allocates funding for research and development programs focused on the recycling and reuse of critical minerals from end-of-life products; encourages the development of technologies and processes to recover critical minerals from waste streams and recycled materials; supports innovation in recycling technologies to increase the recovery rates of critical minerals from used products and industrial waste.
- g. **Workforce Development and Education:**  
Establishes programs to train and educate a workforce skilled in the critical minerals sector, including mining, processing, and recycling; collaborates with educational institutions to develop curricula and training programs tailored to the needs of the critical minerals industry; provides funding for initiatives that promote job creation and skills development in critical minerals-related fields.
- h. **International Cooperation and Strategic Alliances:**  
Promotes international cooperation and strategic alliances to secure and diversify the global supply chain for critical minerals; supports partnerships with allied nations to develop and share best practices in mining, processing, and recycling critical minerals; encourages trade policies and investment initiatives that enhance access to critical minerals from reliable international partners; reduces the vulnerability of the U.S. supply chain by fostering diversified and secure international sources.
- i. **Environmental and Safety Standards:**



Emphasizes the importance of sustainable and environmentally responsible mining practices; supports the development of technologies and methods that minimize the environmental impact of critical mineral extraction and processing; encourages adherence to high safety and environmental standards in all critical mineral activities, from mining to processing and recycling.

These provisions collectively aim to reduce U.S. dependence on foreign sources for critical minerals, strengthen the domestic supply chain, and ensure a secure and resilient supply of these essential materials for future energy needs and technological advancements.

#### **10. Department of Energy's Critical Minerals Strategy (2021)**

The Department of Energy (DOE) released a strategy focused on critical minerals necessary for energy technologies. Key provisions include Technology Innovation which promotes innovation in mining, processing, and recycling technologies to secure critical mineral supplies; Supply Chain Resilience which supports initiatives to diversify and strengthen the supply chains for critical minerals used in energy applications; and Sustainable Practices which encourage environmentally and socially responsible practices in the critical minerals sector.

##### Key Points:

- a. Identifying Critical Minerals: The strategy identifies critical minerals based on their importance to the U.S. economy and national security. These include minerals like lithium, cobalt, rare earth elements, and others critical for technologies such as batteries, magnets, and energy production.
- b. Diversifying Supply Sources: There is a strong emphasis on reducing dependence on foreign sources by diversifying supply chains. This involves supporting domestic production where feasible and developing partnerships with allies and friendly nations for secure access to critical minerals.
- c. Research and Development: The strategy highlights the importance of research and development (R&D) to advance technologies for extracting, processing, recycling, and substituting critical minerals. This includes funding R&D initiatives to enhance efficiency and sustainability in mineral extraction and processing.
- d. Recycling and Reuse: Emphasis is placed on promoting recycling and reuse of critical minerals from end-of-life products to reduce dependence on primary mineral sources and mitigate environmental impacts.
- e. Strengthening International Cooperation: The strategy advocates for international cooperation and partnerships to secure access to critical minerals, promote responsible mining practices globally, and develop transparent supply chains.
- f. Supply Chain Resilience: Ensuring resilience of the critical mineral supply chain against disruptions, whether due to geopolitical tensions, natural disasters, or other factors, is a key goal of the strategy. This includes stockpiling critical minerals and developing contingency plans.
- g. Regulatory and Policy Support: The strategy calls for regulatory and policy measures to streamline permitting processes for mining and processing critical minerals, encourage investment in domestic production, and support sustainable practices.
- h. Public and Private Sector Collaboration: Collaboration between government agencies, private sector companies, research institutions, and academia is essential to achieving the goals of the strategy, including advancing technology and ensuring supply chain security.

In general, the Department of Energy's Critical Minerals Strategy aims to strengthen America's position in the global critical minerals market while ensuring national security, economic prosperity, and environmental sustainability.

#### **11. Department of the Interior's Critical Minerals List (2022)**

The U.S. Geological Survey (USGS) under the Department of the Interior updates a list of critical minerals crucial to U.S. economic and national security. It requires regular reviews and updates of the list of critical minerals based on evolving economic and strategic needs. The supply chains of critical minerals have to be monitored with the support of data and analysis on the supply and demand of critical minerals. The list also aims to encourage domestic exploration and development of critical mineral resources.

The Department of the Interior's Critical Minerals List for 2022 represents a strategic compilation of minerals essential to the economic prosperity and national security of the United States. This list, developed under Executive Order 13817, reflects the evolving landscape of global mineral supply chains and the imperative to reduce dependence on foreign sources vulnerable to geopolitical disruptions.

Key Points:

- i. **Background and Purpose**

The Critical Minerals List serves as a foundational document to guide policy decisions aimed at securing reliable access to critical minerals. These minerals are crucial for a wide array of industries, including defense technologies, clean energy production, electronics manufacturing, and infrastructure development. The list undergoes periodic updates to reflect changing market dynamics, technological advancements, and emerging geopolitical considerations.
- j. **Identification of Critical Minerals**

The 2022 list identifies minerals based on their strategic importance and supply chain vulnerabilities. Key minerals include rare earth elements (REEs), lithium, cobalt, nickel, zinc, lead, and copper. These minerals are indispensable for modern technologies such as electric vehicle batteries, renewable energy systems (solar panels, wind turbines), and advanced defense applications (missiles, radar systems).
- k. **Strategic Importance**

The strategic importance of these minerals lies in their critical role in maintaining U.S. competitiveness, national security, and economic resilience. For instance, REEs are essential for permanent magnets used in electric vehicle motors and wind turbines, while lithium and cobalt are crucial components of lithium-ion batteries powering portable electronics and electric vehicles. Zinc, lead, and copper are fundamental for infrastructure development, telecommunications, and industrial machinery.
- l. **Supply Chain Diversification and Security**

A core objective of the Critical Minerals List is to diversify supply chains to mitigate risks associated with reliance on single or limited foreign sources. This entails promoting domestic production through streamlined permitting processes, incentivizing investment in mineral exploration and mining, and fostering partnerships with allied nations sharing similar strategic interests. By diversifying sources, the U.S. aims to enhance supply chain resilience against disruptions caused by geopolitical tensions, natural disasters, or market fluctuations.
- m. **Environmental and Social Responsibility**

The Department emphasizes the importance of responsible mining practices and sustainable development of critical mineral resources. This includes adherence to environmental regulations, mitigation of environmental impacts through advanced technologies and best practices, and consideration of social and community impacts in mining operations. Efforts are also directed towards promoting recycling and reuse of critical minerals to reduce reliance on primary production and minimize environmental footprint.
- n. **Research and Development (R&D)**

Investment in R&D is pivotal to advancing technologies for efficient extraction, processing, recycling, and substitution of critical minerals. The Department supports collaborative efforts between government agencies, industry stakeholders, research institutions, and academia to drive innovation in mineral resource management. This includes developing new extraction techniques, improving material efficiency, and exploring alternative materials to reduce dependence on critical minerals.
- o. **Policy and Regulatory Support**

The Critical Minerals List advocates for policy and regulatory measures that facilitate responsible development of domestic mineral resources while ensuring environmental stewardship and community engagement. These measures aim to create a conducive regulatory environment for investment in critical mineral projects, promote transparency in supply chains, and strengthen regulatory frameworks governing mineral exploration and mining activities.

In conclusion, the Department of the Interior's Critical Minerals List for 2022 serves as a strategic

blueprint for enhancing the security, sustainability, and resilience of critical mineral supply chains in the United States. By identifying key minerals, promoting domestic production, fostering international partnerships, and advancing technological innovation, the U.S. aims to safeguard its economic and national security interests in an increasingly interconnected global economy.

## **12. American Critical Mineral Independence Act**

The American Critical Mineral Independence Act (ACMIA) is a legislative proposal designed to bolster the United States' independence and security in sourcing critical minerals, essential for various high-tech industries, defense applications, and infrastructure development. Introduced to Congress, ACMIA addresses concerns over the nation's heavy reliance on foreign suppliers, aiming to stimulate domestic production, enhance supply chain resilience, and promote technological innovation in the critical minerals sector.

### Key Points:

#### a. Background and Context

The rationale behind ACMIA stems from growing recognition of vulnerabilities in global supply chains, particularly for minerals like rare earth elements (REEs), lithium, cobalt, and others crucial for advanced technologies. Historically, the U.S. has depended heavily on imports, often from countries with geopolitical tensions or unreliable supply chains. ACMIA seeks to mitigate these risks by fostering a robust domestic supply of critical minerals.

#### b. Key Provisions and Objectives

Identification of Critical Minerals: ACMIA mandates the identification and periodic assessment of critical minerals vital to national security and economic competitiveness. This process ensures that resources are directed towards securing the supply chains of minerals most critical to U.S. interests.

#### c. Promotion of Domestic Production

A cornerstone of ACMIA is to incentivize and streamline regulations for domestic mining and processing of critical minerals. This includes expediting permitting processes, providing financial incentives for exploration and development, and facilitating public-private partnerships to accelerate projects.

#### d. Research and Technological Innovation

The Act emphasizes investment in research and development (R&D) to advance technologies for more efficient extraction, processing, recycling, and substitution of critical minerals. By supporting innovation, ACMIA aims to reduce reliance on scarce resources and improve environmental sustainability in mining practices.

#### e. Supply Chain Security

ACMIA advocates for diversifying supply chains to reduce dependence on single foreign sources. It encourages partnerships with allies and friendly nations to ensure stable access to critical minerals and mitigate risks associated with supply disruptions.

#### f. Environmental and Social Responsibility

Recognizing the environmental impact of mining activities, ACMIA promotes responsible mining practices that comply with stringent environmental regulations and prioritize community engagement. This includes measures to mitigate environmental impacts and ensure sustainable development of mineral resources.

#### g. Strategic Stockpiling and Resilience

In response to potential disruptions, ACMIA supports the establishment of strategic mineral reserves to maintain adequate supplies for national defense and emergencies. This proactive approach aims to enhance resilience against unforeseen events impacting global supply chains.

#### h. Collaboration and Coordination

ACMIA encourages collaboration between federal agencies, industry stakeholders, research institutions, and academia to address challenges and opportunities in the critical minerals sector. By fostering cooperation and information sharing, the Act aims to spur innovation and enhance competitiveness.

The American Critical Mineral Independence Act represents a comprehensive legislative framework aimed at reducing U.S. dependency on foreign sources of critical minerals. By promoting domestic

production, enhancing supply chain security, supporting technological innovation, and ensuring environmental responsibility, ACMIA seeks to strengthen national security, economic resilience, and technological leadership. Through strategic initiatives and regulatory reforms, the Act aims to secure a stable and sustainable supply of critical minerals essential for driving innovation and maintaining U.S. competitiveness in the global economy.

### **13. International Collaboration**

The United States has engaged in several international partnerships and initiatives aimed at securing access to critical raw materials (CRMs) and fostering cooperation in this strategic area.

#### Key Activities:

- a. Energy Resource Governance Initiative (ERGI): Launched by the United States, ERGI aims to promote sound mining sector governance, sustainable development, and resilient supply chains for critical minerals. It involves cooperation with countries such as Australia, Botswana, Canada, and Peru to improve transparency, regulatory frameworks, and responsible mining practices.
- b. Quad Partnership (Australia, India, Japan, United States): The Quad countries have expressed interest in collaborating on critical minerals supply chain resilience. This partnership seeks to diversify sources of critical minerals, enhance supply chain security, and promote sustainable mining and processing practices.
- c. U.S.-EU Dialogue on Raw Materials: The United States and the European Union engage in discussions and cooperation on raw materials, including critical minerals. This dialogue focuses on regulatory alignment, responsible sourcing, and fostering investment in critical mineral supply chains.
- d. International Energy Agency (IEA): The U.S. collaborates with the IEA on energy security and clean energy transitions, which includes addressing critical mineral supply chain vulnerabilities and promoting sustainable mining practices.
- e. Canada: The U.S. and Canada have a longstanding partnership on critical minerals, focusing on securing North American supply chains. Both countries collaborate on regulatory alignment, investment promotion in mining and processing infrastructure, and research and development in critical mineral technologies.
- f. Australia: Australia is a key partner for the United States in critical minerals cooperation. The U.S. and Australia collaborate on diversifying critical mineral supply chains, promoting responsible mining practices, and advancing technology for mineral extraction, processing, and recycling.
- g. Japan: The U.S. and Japan have a strategic partnership on critical minerals to enhance supply chain resilience and reduce dependency on single sources. Cooperation includes joint research and development projects, technology exchange, and policy dialogue on critical mineral security.
- h. South Korea: The U.S. and South Korea collaborate on critical minerals through bilateral dialogues and agreements. This partnership focuses on securing supply chains, promoting sustainable mining practices, and fostering technological innovation in critical mineral industries.
- i. African Countries: The U.S. has partnerships with various African countries rich in critical minerals. These partnerships aim to promote responsible mining practices, infrastructure development, and capacity building to enhance mineral resource governance and supply chain security. These include the Partnership for Economic Growth and Opportunity (PEGO), the U.S.-South Africa Strategic Dialogue on Trade and Investment, and the Bilateral Technical Assistance Programs. These partnerships are essential for leveraging Africa's rich mineral resources to support the security of the US supply chains for critical minerals.

### **EUROPEAN UNION**

The European Union (EU) has established a comprehensive framework of policies, regulations, and initiatives to secure the supply of critical minerals essential for the green transition. These measures focus on enhancing domestic production, diversifying supply sources, promoting sustainability, and fostering innovation.

## **1. European Critical Raw Materials Act (CRMA) (2023)**

Recognizing that Critical raw materials are essential for its green and digital transitions, the EU passed a landmark and pivotal regulation, the CRMA, to ensure a secure and sustainable supply of critical raw materials within the EU. These materials are crucial for manufacturing technologies like batteries, electric vehicles, wind turbines, and other renewable energy systems. The act outlines a comprehensive strategy to reduce dependency on non-EU sources, enhance supply chain resilience, and promote sustainable resource use.

### Key Points:

- a. *Strategic Autonomy and Supply Chain Resilience:* The CRMA seeks to reduce the EU's dependency on non-EU countries, especially those with high supply risks. This includes diversifying sources and building strategic partnerships with other countries. It encourages the diversification of supply sources by developing partnerships with reliable third countries and investing in sustainable mining projects within and outside the EU.
- b. *Development of Domestic Capabilities:* The CRMA aims to promote sustainable domestic exploration, extraction, and processing of CRMs within the EU. The EU will identify and support strategic projects that can significantly contribute to the EU's CRM supply security, with streamlined permitting processes and financing support.
- c. *Circular Economy and Recycling:* The Act sets ambitious targets for recycling and reusing CRMs to reduce waste and improve resource efficiency through enhancing the recovery of CRMs from waste streams, and promoting technologies and practices that support the circular economy.
- d. *Sustainable and Responsible Sourcing:* The Act emphasizes adherence to high environmental, social, and governance (ESG) standards in CRM sourcing and processing. It mandates transparency and due diligence in the supply chains of CRMs, ensuring ethical sourcing and reducing the environmental impact.
- e. *Innovation and Technological Advancement:* The Act aims to boost R&D investments in new technologies for CRM extraction, processing, recycling, and substitution to foster innovation and improve efficiency. At the same time, it promotes the development and adoption of alternatives to CRMs to decrease reliance on specific critical materials.
- f. *Strategic Stockpiling and Emergency Response:* The Act requires the establishment of mechanisms for strategic stockpiling of key CRMs to buffer against supply disruptions. Frameworks for a coordinated EU response to CRM supply crises to ensure rapid and effective mitigation measures are asked to be developed.
- g. *Support for SMEs and Competitiveness:* The EU and its members should provide specific support mechanisms for small and medium-sized enterprises (SMEs) involved in the CRM supply chain, enhancing their competitiveness and integration into the market. Investment in training and upskilling programs to build a workforce capable of supporting the CRM sector will be boosted too.
- h. *Regulatory and Financial Framework:* The Act asks for streamlined permitting processes for CRM projects and provides access to financial instruments and incentives to support investment in CRM supply chains. It encourages partnerships between the public and private sectors to mobilize resources and expertise for CRM development.

### Targets of the EU Critical Raw Materials Act:

- i. *Extraction Targets:* By 2030, aim to produce at least 10% of the EU's annual consumption of CRMs from domestic extraction.
- j. *Processing Targets:* By 2030, ensure that at least 40% of the EU's annual consumption of CRMs is processed within the EU.
- k. *Recycling Targets:* By 2030, the target is to recycle at least 15% of the EU's annual consumption of CRMs from waste streams.
- l. *Strategic Dependency:* Reduce the dependency on any single non-EU country for the supply of critical raw materials to less than 65% of the EU's annual consumption for each material.
- m. *Strategic Projects:* Designate specific projects as "Strategic Projects" to fast-track their development and secure funding and support.
- n. *Investment in R&D:* Significantly increase investments in research and innovation for CRM technologies, aiming to be a global leader in sustainable raw materials management and

technology by 2030.

## **2. European Green Deal (2019)**

The EU Green Deal is a comprehensive plan aiming to transform the European Union into a modern, resource-efficient, and competitive economy. Critical Raw Materials (CRMs) play a significant role in this transformation, as they are essential for technologies that support green and digital transitions. The EU Green Deal integrates critical raw materials as a cornerstone of Europe's transition towards sustainability and digital leadership. By focusing on sustainable supply, resource efficiency, and resilient supply chains, the Green Deal aims to secure the raw materials necessary for the EU's green and digital transformation. This comprehensive approach underscores the importance of CRMs in achieving the EU's climate neutrality and economic goals, while also promoting responsible and innovative practices in raw material management.

Key Provisions in the Deal that are relevant to critical raw materials cover a wide range of issues including Sustainable Supply and Resource Efficiency, Green and Digital Transformation, Reduction of Dependency and Supply Chain Resilience, Innovation and Technological Advancements, Regulatory and Financial Support, and International Cooperation and Trade.

## **3. EU Action Plan on Critical Raw Materials (2020)**

The EU Action Plan on Critical Raw Materials was adopted in September 2020 and is a strategic initiative to secure the EU's supply of critical raw materials (CRMs) essential for its industries and for meeting its climate and digital targets. The plan outlines measures to reduce dependency on non-EU countries, enhance supply chain resilience, and promote sustainable and efficient use of resources.

Key Points of the EU Action Plan on Critical Raw Materials include Diversification of Supply and Reduction of Dependency, Enhancement of Domestic Production, Promotion of Circular Economy and Recycling, Innovation and Alternative Materials, Improvement of Supply Chain Resilience, Regulatory and Financial Frameworks, and International Cooperation and Standards.

Key Actions of the EU Action Plan on Critical Raw Materials include Establishment of Strategic Partnerships, Development of a European CRM Network, Mapping and Assessing Resources, Promotion of R&D and Innovation, Implementation of Circular Economy Principles, Improving Access to Finance, and Enhancing Strategic Stockpiling.

The EU Action Plan on Critical Raw Materials is a multifaceted strategy designed to secure the EU's access to the raw materials essential for its economic and technological development. This initiative is critical for supporting the EU's ambitions under the Green Deal and for maintaining its competitiveness in the global market.

## **4. Battery Regulation**

The EU Battery Regulation, proposed in December 2020 and part of the broader EU Green Deal framework, aims to create a sustainable battery lifecycle, encompassing production, use, recycling, and disposal. It directly addresses the management and use of critical raw materials (CRMs), which are essential for battery production. The regulation sets ambitious targets to ensure that battery use aligns with the EU's environmental, economic, and strategic objectives. The EU Battery Regulation was formally adopted by the European Parliament and the Council of the EU on July 12, 2023. It officially entered into force on August 17, 2023. The regulation introduces a phased approach to implementing its various provisions. Key dates include: February 18, 2024: Initial provisions, including due diligence obligations and end-of-life management, begin to apply (electrify.com). August 18, 2024: Rules on conformity assessment procedures come into force. August 18, 2025: Full compliance with end-of-life management rules is required, and Member States must establish penalties for non-compliance. February 18, 2027: Requirements for the removability and replaceability of portable batteries are enforced.

### Key Points:

*Sustainable Sourcing and Ethical Supply Chains:* Batteries placed on the EU market must adhere to strict requirements regarding the responsible sourcing of raw materials. This includes mandatory due diligence to ensure that materials are sourced ethically, concerning environmental and social standards. Producers must ensure the traceability of CRMs used in batteries. This involves documenting the supply chain and demonstrating compliance with due diligence standards to prevent human rights abuses and environmental harm in the supply chain.

*Recycling and Reuse Targets:* The regulation sets specific targets for the recycling efficiency of CRMs from spent batteries. For example, by 2025, recycling efficiencies of at least 90% for cobalt, nickel, lithium, and copper are required, increasing to 95% by 2030. The regulation mandates minimum levels of recycled content in new batteries. By 2030, new industrial, SLI, and EV batteries must contain at least 6% recycled lithium and nickel, 16% recycled cobalt, and 85% recycled lead. These targets increase significantly by 2035. All batteries are required to have a digital "battery passport" and a QR code for transparency regarding their composition and lifecycle. These labeling requirements will be implemented from 2026, with QR codes mandated from 2027.

- a. **Circular Economy and Lifecycle Management:** Producers are responsible for the entire lifecycle of batteries, including the end-of-life phase. This encourages the design of batteries for easier disassembly, recycling, and recovery of CRMs.
- b. **Carbon Footprint and Environmental Impact:** Batteries must have a carbon footprint declaration, which includes emissions associated with the extraction and processing of CRMs.
- c. **Innovation and Technological Development:** It encourages R&D in battery technologies that minimize the use of CRMs or utilize more sustainable and abundant alternatives. This also includes innovations in recycling processes to increase the efficiency and effectiveness of CRM recovery. The Regulation promotes the development of advanced battery technologies that reduce dependency on critical raw materials and improve overall sustainability.
- d. **Market Access and Compliance:** Batteries must comply with strict EU regulatory requirements related to CRM sourcing, recycling, and environmental impact to access the EU market. This includes meeting standards for material content and recovery, and adhering to due diligence and traceability obligations. Batteries must be certified and labeled to indicate compliance with CRM sourcing and recycling standards, providing transparency for consumers and stakeholders.
- e. **Strategic Stockpiling and Supply Security:** The Regulation explores strategies for the strategic stockpiling of CRMs critical for battery production to enhance supply security and buffer against potential disruptions. It also strengthens supply chain resilience for CRMs by diversifying sources, supporting domestic production, and developing partnerships with CRM-rich countries.
- f. **Economic and Industrial Competitiveness:** The Regulation fosters the development of a competitive EU battery industry by ensuring a stable and sustainable supply of CRMs. This includes supporting domestic mining, processing, and recycling industries to promote job creation and economic growth within the EU.

### **5. European Raw Materials Alliance (ERMA) (2020)**

The European Raw Materials Alliance (ERMA) is a strategic initiative established by the European Union to enhance the resilience and security of raw material supply chains critical to the EU's economy and green transition. ERMA is coordinated by EIT RawMaterials, a body under the European Institute of Innovation and Technology (EIT), which facilitates collaboration among over 300 stakeholders including industry players, research institutions, and governments. It works to mobilize investment in the raw materials sector and fosters innovation. It facilitates collaboration among stakeholders, including industry, academia, and governments. Through the promotion of strategic projects and partnerships, the alliance aims to secure the supply of critical raw materials.

ERMA targets a range of critical raw materials essential for sectors like renewable energy, automotive, aerospace, defense, and electronics. This includes rare earth elements, lithium, cobalt, and other materials crucial for technologies such as electric vehicles and renewable energy systems. ERMA works through task forces and project consortia, bringing together various stakeholders to address specific

challenges and opportunities within the raw materials sector.

## **6. EU Industrial Strategy (2020)**

The strategy outlines the EU's approach to strengthening its industrial base. Since 2020, it has placed a significant focus on critical raw materials (CRMs) due to their essential role in the EU's industrial and technological future.

### Key Points:

- a. *Ensuring Security of Supply for Critical Raw Materials:* The strategy emphasizes the need to diversify the sources of critical raw materials to reduce the EU's dependency on non-EU countries. This includes fostering international partnerships and alliances to secure supply chains from varied geographical sources. It aims to reduce risks associated with supply disruptions by building strategic reserves and encouraging investment in domestic and European sources of raw materials. It requests increasing the EU's capability to extract, process, and recycle critical raw materials within its borders as a priority. This includes promoting sustainable mining practices and supporting the development of new mining projects within the EU. Enhancements in processing and refining capacities within the EU are encouraged to ensure that critical materials can be transformed into usable forms domestically.
- b. *Promoting Sustainability and Circular Economy:* The strategy highlights the importance of recycling and reusing critical raw materials to foster a circular economy. This reduces dependency on new extraction and minimizes environmental impact. There are specific initiatives aimed at improving the collection, dismantling, and recycling of products containing CRMs, such as batteries and electronic waste.
- c. *Strategic Partnerships and Alliances:* The EU Industrial Strategy emphasizes building strategic partnerships with third countries rich in critical raw materials, such as Canada, Australia, and various African nations.
- d. *Innovation and Technological Development:* The strategy calls for increased investment in research and development to find alternatives to critical raw materials and improve their efficiency in use. This includes supporting new technologies that can reduce or eliminate the need for certain CRMs. Funding programs like Horizon Europe are targeted at fostering innovation in the raw materials sector, supporting projects that explore new methods of extraction, processing, and recycling.
- e. *Regulatory Framework and Policy Support:* The strategy includes measures to streamline regulatory processes for mining and raw materials projects within the EU. This aims to reduce bureaucratic hurdles and accelerate the development of sustainable raw materials supply chains.

## **7. Circular Economy Action Plan (2020)**

The EU Circular Economy Action Plan (CEAP), a key component of the European Green Deal, lays out comprehensive strategies to foster a sustainable economy by transitioning from a linear to a circular model. The plan addresses the lifecycle of products, from design and production to consumption, and aims to reduce waste while maximizing the use of resources. Critical Raw Materials (CRMs) are central to this strategy due to their importance in many high-tech and green technologies, and the CEAP includes specific measures to secure and optimize their use. *It encourages the efficient use of resources throughout the lifecycle of products and sets targets and standards for recycling critical minerals from electronic waste and other products. It also promotes the design of products that are easier to recycle and disassemble.*

## **8. Sustainable Finance Taxonomy (2020)**

This classification system defines what constitutes environmentally sustainable economic activities, including those related to critical minerals. It guides investments toward activities that contribute to environmental objectives, including the sustainable supply of critical minerals, and sets criteria for the sustainable extraction and processing of critical minerals. It requires companies to disclose how their activities align with the taxonomy's sustainability criteria.

## **9. Horizon Europe (2021-2027)**

The EU's research and innovation framework program includes funding for projects related to the sustainable supply and use of critical minerals. It provides significant funding for research on critical



minerals, including exploration, mining, and recycling technologies, as well as supports partnerships between research institutions and industry to develop innovative solutions for critical minerals supply chains. The program encourages the alignment of research projects with the EU's sustainable development and climate goals.

#### **10. European Innovation Partnership on Raw Materials (EIP-RM)**

The European Innovation Partnership (EIP) on Raw Materials is an initiative launched by the European Commission to promote sustainable access to raw materials, enhance resource efficiency, and foster innovation across the raw materials value chain.

##### Key Points:

- a. *Strategic Importance:* The EIP recognizes the strategic significance of critical raw materials (CRMs) for Europe's economy, industry, and technological advancement. CRMs are essential for various high-tech applications, including renewable energy, electric vehicles, and digital technologies.
- b. *Secure Supply:* One of the primary goals of the EIP is to ensure a secure and sustainable supply of raw materials, including CRMs, to meet Europe's industrial needs. This involves reducing dependency on imports and enhancing Europe's self-sufficiency through responsible sourcing, recycling, and substitution strategies.
- c. *Innovation and Technology:* The EIP promotes research and innovation activities aimed at developing new technologies, processes, and products that reduce the use of CRMs, improve recycling rates, and enhance the efficiency of CRM extraction and processing.
- d. *Circular Economy:* Emphasizing the circular economy approach, the EIP encourages practices that support the sustainable use and recycling of CRMs. This includes promoting eco-design principles, enhancing resource efficiency, and developing innovative recycling technologies.
- e. *Policy Coordination:* The EIP facilitates collaboration between industry, academia, and policymakers to align strategies and policies that support the sustainable management of raw materials, including CRMs. This includes providing a platform for dialogue and cooperation on issues related to raw materials supply and innovation.
- f. *International Cooperation:* Recognizing the global nature of raw materials supply chains, the EIP engages in international cooperation to promote responsible sourcing practices, support sustainable mining in third countries, and address global challenges related to CRMs.

#### **9. REPowerEU Plan (2022)**

The REPowerEU Plan, introduced in 2022 by the European Commission, aims to accelerate the transition to renewable energy while addressing energy security and resilience. Critical raw materials (CRMs) play a significant role in this plan, particularly in the development and deployment of renewable energy technologies.

##### Key Points:

- a. *Dependency Reduction:* The plan addresses Europe's dependency on imported CRMs by promoting strategies to diversify supply sources, enhance recycling capabilities, and develop substitutes where feasible. This is crucial for ensuring the sustainability and security of CRM supply chains for renewable energy technologies.
- b. *Research and Innovation:* The REPowerEU Plan includes funding and support for research and innovation projects focused on CRM substitution, recycling, and sustainable sourcing. These efforts aim to develop technologies and processes that reduce the reliance on CRMs and improve the circularity of CRM use in renewable energy infrastructure.
- c. *Regulatory Framework:* The plan proposes regulatory measures to facilitate responsible sourcing of CRMs, including transparency requirements and certification schemes to ensure ethical and sustainable practices throughout the CRM supply chain.
- d. *Industrial Strategy:* Aligning with the EU Industrial Strategy, the REPowerEU Plan seeks to strengthen Europe's industrial competitiveness in renewable energy sectors that depend on CRMs. This includes fostering a competitive European CRM recycling industry and promoting innovation in CRM-efficient technologies.
- e. *International Cooperation:* Recognizing the global nature of CRM supply chains, the plan emphasizes international cooperation to promote sustainable sourcing practices and responsible

mining standards globally. This collaboration aims to mitigate the environmental and social impacts associated with CRM extraction and processing.

#### **10. International Collaboration**

The EU engages in various trade agreements and international partnerships to secure a stable supply of critical minerals. These include provisions in trade agreements that ensure access to critical minerals and partnerships with resource-rich countries to secure supplies and promote sustainable mining practices. The EU also participates in global forums and initiatives to enhance the global governance of critical mineral supply chains. The European Union has established various partnerships with countries and regions around the world to secure a stable and sustainable supply of critical raw materials

a. *EU-Canada Strategic Partnership on Raw Materials*

Launched: June 2021.

Focus: Collaboration in the mining, refining, and recycling of critical raw materials, especially those essential for green technologies and energy transitions such as cobalt, lithium, and rare earth elements.

Goals: Enhance investment in the raw materials sector, streamline regulatory frameworks, and support research and development.

b. *EU-Ukraine Strategic Partnership on Raw Materials and Batteries*

Launched: July 2021.

Focus: Development of a value chain for critical raw materials and batteries. Collaboration on exploration, extraction, processing, and recycling.

Goals: Integration of Ukrainian resources into the EU supply chain and support for Ukraine's economic development.

c. *EU-Australia Partnership on Raw Materials*

Launched: September 2021.

Focus: Cooperation in the exploration, extraction, processing, and recycling of critical raw materials.

Goals: Secure supply chains for critical raw materials such as rare earth elements, lithium, and cobalt, which are vital for renewable energy and advanced technologies.

d. *EU-Namibia Partnership on Sustainable Raw Materials and Renewable Hydrogen*

Launched: November 2022.

Focus: Sustainable extraction and processing of critical raw materials, and development of renewable hydrogen projects.

Goals: Strengthen Namibia's raw material sector and support EU's demand for clean energy and CRMs.

e. *EU-Chile Partnership on Sustainable Raw Materials:*

Launched: December 2022.

Focus: Cooperation on sustainable and responsible mining practices, focusing on materials critical for the green transition such as lithium.

Goals: Promote joint investments and ensure sustainable supply chains.

f. *EU-Kazakhstan Partnership on Sustainable Raw Materials:*

Launched: November 2022.

Focus: Sustainable extraction and processing of critical raw materials, including rare earth elements.

Goals: Develop new value chains for critical materials and support Kazakhstan's integration into global markets.

g. *EU-Namibia and Zambia Partnerships:*

Launched: June 2023.

Focus: Enhancing value chains for critical raw materials like copper and cobalt, which are essential for electric vehicles and renewable energy technologies.

Goals: Support local development and secure sustainable supply chains for the EU.

h. *Partnerships with African Countries*

Focus: General partnerships aimed at enhancing raw materials supply and supporting sustainable development across various African nations rich in critical raw materials.

Goals: Secure supply chains for CRMs and promote investment and development in the raw

materials sectors of partner countries.

i. *International Raw Materials Observatories and Dialogues*

Global Partnerships: Through platforms like the Raw Materials Information System (RMIS) and dialogues such as the EU-US Trade and Technology Council (TTC) and the EU-Japan Industrial Dialogue, the EU collaborates with multiple countries to address supply chain challenges and promote sustainable sourcing.

These partnerships are integral to the EU's strategy to secure its supply of critical raw materials and support the development of sustainable, resilient supply chains. They reflect the EU's proactive approach to fostering international cooperation and ensuring that it can meet the demands of its green and digital transitions.

## **CHINA**

China has established itself as a global leader in the critical minerals sector through a comprehensive framework of policies, regulations, and initiatives. These efforts are aimed at securing the supply of critical minerals essential for the country's industrial and technological development, economic stability, and global competitiveness. China's approach to critical minerals is characterized by a blend of domestic resource development, strategic stockpiling, international partnerships, and regulatory control to ensure a secure supply chain for its industries.

### **1. Made in China 2025 (2015)**

"Made in China 2025" is a strategic initiative launched by the Chinese government aimed at transforming China into a global manufacturing leader through innovation and technology-driven industrial upgrading. Critical raw materials (CRMs) play a significant role in this initiative, particularly in sectors crucial for high-tech manufacturing and innovation.

#### Key Points:

- a. **Resource Security:** "Made in China 2025" emphasizes the importance of ensuring a stable and sustainable supply of CRMs. This includes reducing dependency on imported raw materials and enhancing domestic capabilities in CRM extraction, processing, and recycling.
- b. **Strategic Planning for CRMs:** The initiative includes strategic planning to prioritize the development and utilization of key CRMs essential for advanced manufacturing sectors. This involves identifying critical materials and fostering technological innovation to improve their extraction efficiency and reduce environmental impact.
- c. **Technology Development and Innovation:** "Made in China 2025" encourages research and development (R&D) efforts focused on CRM technologies. This includes developing advanced materials, improving processing techniques, and enhancing recycling technologies to secure a stable supply chain and support high-tech industries.
- d. **Industrial Integration:** The initiative promotes integration across industrial sectors that rely on CRMs, such as electronics, renewable energy, automotive, and aerospace. This integration aims to optimize supply chains, enhance production efficiency, and foster synergies in CRM utilization across different manufacturing domains.
- e. **Environmental Considerations:** While focusing on industrial advancement, "Made in China 2025" also emphasizes sustainable development principles. Efforts are made to minimize environmental impacts associated with CRM extraction and processing through stricter regulations, cleaner production methods, and increased emphasis on recycling and circular economy practices.
- f. **International Cooperation:** The initiative includes aspects of international cooperation to secure access to CRMs globally. This involves partnerships with resource-rich countries, investments in overseas mining projects, and participation in international agreements and organizations related to mineral resources.

### **2. 13th and 14th Five-Year Plans (2016-2020, 2021-2025)**

China's Five-Year Plans are comprehensive policy blueprints that outline economic and social

development goals. Critical minerals are addressed within the context of resource security and technological advancement. The 13th and 14th Five-Year Plans in China outline strategic objectives and priorities for economic and social development over their respective periods. Critical raw materials (CRMs) are integral to these plans, particularly in sectors crucial for industrialization, technological advancement, and sustainability.

Key Points:

*13th Five-Year Plan (2016-2020):*

- a. **Resource Security and Supply Chain Optimization:** The 13th Five-Year Plan emphasized the importance of ensuring a stable and sustainable supply of CRMs. It aimed to reduce dependency on imported raw materials and enhance domestic capabilities in CRM extraction, processing, and recycling.
- b. **Strategic Planning and Prioritization:** The plan identified key CRMs essential for strategic industries such as electronics, renewable energy, automotive, and aerospace. It included measures to prioritize the development and utilization of these materials, fostering technological innovation and efficiency improvements in their extraction and processing.
- c. **Industrial Integration and Upgrading:** There was a focus on integrating CRM utilization across various industrial sectors to optimize supply chains, enhance production efficiency, and promote industrial upgrading. This integration aimed to strengthen China's competitiveness in high-tech manufacturing and innovation.
- d. **Environmental Sustainability:** The 13th Five-Year Plan incorporated environmental considerations into CRM-related policies and strategies. Efforts were made to mitigate environmental impacts associated with CRM extraction and processing through stricter regulations, cleaner production methods, and promotion of recycling and circular economy practices.

*14th Five-Year Plan (2021-2025):*

- e. **Continued Emphasis on Resource Security:** The 14th Five-Year Plan maintains a focus on securing a stable and sustainable supply of CRMs to support economic growth and technological development. It includes measures to enhance domestic capabilities in CRM production and reduce reliance on imported materials.
- f. **Technological Innovation and R&D:** There is a strong emphasis on advancing technology and innovation in CRM-related industries. The plan encourages research and development in advanced materials, processing technologies, and recycling methods to improve efficiency and sustainability in CRM utilization.
- g. **Integration with National Strategies:** CRMs are integrated into broader national strategies such as technological self-reliance, dual circulation (domestic and international economic cycles), and green development. This integration aims to strengthen China's industrial resilience and competitiveness in global markets.
- h. **International Cooperation:** The 14th Five-Year Plan includes aspects of international cooperation to secure access to CRMs globally. This involves partnerships with resource-rich countries, investments in overseas mining projects, and participation in international agreements and organizations related to mineral resources.
- i. **Environmental Protection and Green Development:** Building upon previous plans, the 14th Five-Year Plan continues to prioritize environmental protection and sustainable development in CRM-related industries. It promotes the adoption of cleaner production technologies, stricter environmental regulations, and the promotion of circular economy principles.

**3. Rare Earth Industry Development Plan (2016-2020)**

This plan specifically targets the rare earth sector, crucial for various high-tech and green technologies. The Rare Earth Industry Development Plan of China outlines strategic initiatives and objectives for the development and management of the country's rare earth resources.

Key points:

- a. **Resource Consolidation and Management:** The plan emphasizes consolidating and managing rare earth resources to ensure sustainable supply and reduce environmental impacts associated with extraction and processing.

- b. **Technological Innovation:** There is a strong focus on advancing technological capabilities in rare earth mining, processing, refining, and recycling. This includes research and development initiatives aimed at improving efficiency, reducing costs, and minimizing environmental harm.
- c. **Industrial Integration and Application:** China aims to integrate rare earth elements into various industrial sectors such as electronics, renewable energy, automotive, and defense. The plan promotes the application of rare earth materials in high-tech products and strategic industries to enhance economic competitiveness.
- d. **Environmental Protection:** Environmental considerations are integrated into rare earth mining and processing operations. The plan includes measures to enforce stricter environmental regulations, promote cleaner production technologies, and encourage recycling of rare earth materials to minimize environmental impact.

Rare earth elements (REEs) are crucial for many high-tech and defense applications, making their export a matter of national security and economic strategy.

Key points regarding export control in the plan

- a. *Regulated Export Quotas and Licenses*
  - Quota Systems: China's REIDP often imposes strict export quotas to control the volume of rare earths leaving the country. These quotas limit the amounts of rare earths that can be exported annually.
  - Licensing Requirements: Only approved companies can export rare earths, and they must obtain specific export licenses. This restricts and monitors the entities involved in the trade.
- b. *Priority to Domestic Demand*
  - Domestic Prioritization: The plan emphasizes meeting domestic demand first before considering exports. This ensures that China's own industries have adequate access to rare earths for their development.
  - Strategic Reserves: Establishing and maintaining strategic reserves of rare earths is prioritized to safeguard against global market volatility and ensure long-term availability for domestic industries.
  - Export Standards and Specifications*
    - Quality Control: Exports must meet stringent quality standards to ensure the integrity of China's supply and its strategic value on the global market.
    - Value-Added Products: There's a push to export higher-value-added products rather than raw materials, to maximize economic benefits and reduce the strategic vulnerability of raw material exports.
- c. *Monitoring and Compliance*
  - Strict Monitoring: The government closely monitors rare earth exports to ensure compliance with quotas and licensing conditions.
  - Penalties for Non-Compliance: Companies that violate export regulations face severe penalties, including the loss of their export licenses and legal consequences.
- d. *Export Destinations and Strategic Partnerships*
  - Controlled Destinations: The plan often outlines specific countries or regions where exports are permitted or restricted, based on geopolitical and economic considerations.
  - Bilateral Agreements: Export controls can be adjusted based on strategic partnerships and bilateral trade agreements, allowing flexibility in how exports are managed.
- e. *Environmental and Sustainable Practices*
  - Environmental Regulations: Exporters must comply with strict environmental standards to mitigate the ecological impact of rare earth mining and processing. This includes ensuring that practices are sustainable and do not harm the environment.
  - Promotion of Sustainable Practices: Export control policies are also linked to the promotion of sustainable and eco-friendly mining practices, encouraging companies to adopt greener technologies and methods.
- f. *Impact on Global Supply Chains*
  - Influencing Global Markets: By controlling exports, China can influence global rare earth prices and availability, maintaining its leverage over international markets.
  - Reducing Overdependence: The plan aims to reduce global dependence on Chinese rare earths by

- fostering domestic innovation and vertical integration in high-value industries.
- g. *Technology Transfer and Intellectual Property Protection*  
 Preventing Technology Leakage: Export controls are designed to prevent the transfer of critical technologies and intellectual property associated with rare earth processing and applications.  
 Encouraging Domestic Innovation: Policies encourage the development of advanced processing technologies domestically, reducing the need to export raw materials.
  - h. *International Compliance and Diplomacy*  
 Adhering to International Norms: While exercising export control, the plan ensures compliance with international trade regulations and agreements, maintaining China's reputation as a reliable supplier.  
 Negotiating Export Terms: Diplomatic engagements and negotiations often accompany export controls, as China seeks favorable terms and conditions in its trade relations involving rare earths.
  - i. *Economic and Strategic Objectives*  
 Economic Goals: Export controls align with broader economic goals, including maintaining price stability, supporting high-tech industries, and promoting balanced regional development.  
 Strategic Autonomy: By controlling rare earth exports, China aims to secure strategic autonomy and reduce the potential for external pressures or dependencies.
  - j. *Export Control Adjustments*  
 Dynamic Adjustments: The plan allows for dynamic adjustments in export controls based on market conditions, geopolitical developments, and strategic needs.  
 Adaptive Policy Framework: Policies are reviewed and adapted regularly to respond to changes in the global and domestic landscape, ensuring that export controls remain effective and aligned with national interests.

The Rare Earth Industry Development Plan's export control measures are crucial for managing the strategic, economic, and environmental aspects of rare earth resources. These measures ensure that China's rare earth industry remains competitive, sustainable, and aligned with its broader economic and geopolitical goals.

#### **4. National Mineral Resources Plan (2021-2025)**

The National Mineral Resources Plan (2021-2025), part of China's broader 14th Five-Year Plan, lays out a strategic vision for managing the country's mineral resources, with a special focus on critical minerals like rare earth elements, lithium, cobalt, and others essential for high-tech and green industries. Here are the key points related to critical minerals in the plan:

##### Key Points:

- a. *Strategic Importance of Critical Minerals*  
 Identification and Classification: The plan identifies and classifies critical minerals vital for national security, economic growth, and technological advancement. This includes rare earth elements, lithium, cobalt, nickel, and others essential for manufacturing and energy sectors.  
 Securing Supply Chains: Ensuring a stable and secure supply of these minerals is emphasized to reduce dependence on foreign sources and mitigate risks associated with global supply chain disruptions.
- b. *Expansion and Optimization of Domestic Supply*  
 Resource Exploration and Development: There is a strong focus on intensifying domestic exploration and development of critical mineral resources. This includes increasing geological surveys, supporting new mining projects, and optimizing existing operations to boost domestic output.  
 Innovative Mining Techniques: The plan advocates for the adoption of advanced mining technologies and techniques to increase efficiency, reduce environmental impact, and enhance the extraction of critical minerals from lower-grade ores.
- c. *Enhancement of Recycling and Reuse*  
 Circular Economy for Minerals: Promoting the recycling and reuse of critical minerals is a key component, aimed at establishing a circular economy. This includes developing technologies and infrastructure to reclaim critical minerals from end-of-life products and industrial waste.

- Support for Secondary Resources: The plan encourages the recovery of critical minerals from secondary resources, such as urban mining of e-waste and industrial by-products, to complement primary resource extraction.
- d. *Environmental Sustainability and Green Development*  
Eco-Friendly Mining Practices: Strict environmental regulations and the promotion of sustainable mining practices are prioritized to minimize the ecological footprint of mineral extraction and processing. This involves reducing pollution, managing waste, and rehabilitating mining sites.  
Low-Carbon Technologies: Emphasis is placed on the development and adoption of low-carbon technologies and processes in the mining and processing of critical minerals to align with China's broader goals for carbon neutrality and environmental sustainability.
- e. *Technological Innovation and Research*  
R&D Investment: The plan calls for significant investment in research and development to advance technologies for the exploration, extraction, and processing of critical minerals. This includes breakthroughs in metallurgy, material science, and mineral processing.  
Advanced Processing Techniques: Developing advanced processing techniques to improve the purity and yield of critical minerals is highlighted, aiming to add value domestically and reduce reliance on foreign processing capabilities.
- f. *Strengthening International Cooperation*  
Global Partnerships: Enhancing international cooperation and forming strategic partnerships with other countries for the exploration and development of critical mineral resources are key strategies. This includes investments in overseas mining projects and securing long-term supply agreements.  
Multilateral Engagements: The plan encourages active participation in international forums and multilateral organizations to influence global policies and standards for critical minerals.
- g. *Market and Regulatory Frameworks*  
Stable Policy Environment: Establishing a stable and predictable policy and regulatory environment to support the critical minerals industry is emphasized. This includes clear guidelines on mining rights, environmental standards, and investment policies.  
Market Mechanisms: Encouraging the development of efficient market mechanisms and financial instruments to facilitate investment and trade in critical minerals is also highlighted, aiming to foster a competitive and transparent market environment.
- h. *Building Strategic Reserves*  
Strategic Stockpiling: The plan outlines the need to build and maintain strategic reserves of critical minerals to buffer against market volatility and supply disruptions. This involves not only stockpiling raw minerals but also processed and semi-processed materials.  
Resource Security Strategies: Developing comprehensive strategies for resource security that include both domestic and international dimensions, ensuring a reliable long-term supply of critical minerals.
- i. *Integration with National Industrial Policy*  
Alignment with High-Tech Sectors: The development of critical minerals is closely integrated with national policies for high-tech sectors, such as electronics, renewable energy, and electric vehicles, to support the advancement of these industries.  
Support for New Energy Technologies: There is a strong linkage between critical mineral development and the promotion of new energy technologies, including batteries for electric vehicles and renewable energy systems, positioning critical minerals as a cornerstone of the green economy.
- j. *Socioeconomic Development and Regional Balance*  
Boosting Regional Economies: The plan highlights the role of critical mineral development in boosting regional economies, especially in resource-rich but underdeveloped areas. It aims to create jobs, improve infrastructure, and foster economic growth in these regions.  
Community Engagement and Benefits: Ensuring that local communities benefit from mineral development through fair compensation, employment opportunities, and social investment is also a key focus.

## 5. China Standards 2035 (2020)

This initiative focuses on setting global standards in technology and manufacturing, which includes the use and processing of critical minerals. Within this context, critical minerals play a vital role due to their essential application in advanced technologies and manufacturing.

### Key Points:

- a. *Establishing International Standards for Critical Minerals*  
Standardization Leadership: China aims to take a leading role in setting international standards for the mining, processing, and utilization of critical minerals. This involves establishing norms for quality, extraction methods, environmental protection, and safety.  
Participation in Global Forums: Actively participating in international standard-setting bodies, such as the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC), to influence global standards related to critical minerals.
- b. *Enhancing Technological Standards for Extraction and Processing*  
Advanced Mining Technologies: Developing and promoting standards for the use of advanced technologies in the extraction of critical minerals, such as automation, robotics, and AI in mining operations.  
Processing and Refining Efficiency: Creating standards for refining and processing technologies that enhance the efficiency and quality of critical minerals, ensuring they meet the highest international benchmarks.
- c. *Sustainability and Environmental Standards*  
Green Mining Practices: Establishing rigorous standards for sustainable and environmentally friendly mining practices to minimize the ecological impact of extracting critical minerals.  
Lifecycle Assessment: Implementing standards for lifecycle assessment of critical minerals from extraction to disposal, encouraging practices that reduce environmental footprints and promote recycling and reuse.
- d. *Supply Chain Transparency and Traceability*  
Traceability Systems: Developing standards for supply chain transparency and traceability to ensure the responsible sourcing of critical minerals and to combat issues like illegal mining and conflict minerals.  
Blockchain and Digital Technologies: Leveraging blockchain and other digital technologies to create transparent, secure systems for tracking the origin and movement of critical minerals throughout the supply chain.
- e. *Quality and Safety Standards*  
Product Quality Assurance: Setting standards to ensure that critical minerals used in manufacturing meet stringent quality requirements, supporting the reliability and performance of end products.  
Safety Protocols: Establishing safety standards for handling, storage, and transportation of critical minerals to protect workers and communities and to prevent accidents.
- f. *Promoting Innovation and Intellectual Property (IP)*  
R&D and Standard Innovation: Encouraging research and development in critical minerals to foster innovation in mining, processing, and application technologies, and integrating these innovations into international standards.  
IP Protection: Strengthening intellectual property protections for innovations related to critical minerals to safeguard and capitalize on technological advancements.
- g. *Collaboration and Capacity Building*  
International Collaborations: Fostering collaborations with international partners to harmonize standards for critical minerals, facilitating smoother trade and mutual recognition of standards.  
Capacity Building: Building domestic and global capacity for the adoption and implementation of new standards through training, partnerships, and technical assistance.
- h. *Support for Emerging Technologies and Industries*  
New Energy Technologies: Creating standards that support the use of critical minerals in emerging technologies, such as electric vehicles (EVs), renewable energy systems, and high-performance electronics.  
High-Tech Manufacturing: Developing standards that align with the needs of high-tech manufacturing sectors, ensuring that critical minerals meet the specific requirements of advanced



industries.

i. *Geopolitical and Economic Influence*

**Strategic Standards Setting:** Using standards to exert geopolitical and economic influence, positioning China as a key player in the global market for critical minerals and the technologies they enable.

**Economic Competitiveness:** Enhancing China's competitiveness in global markets by setting standards that ensure high-quality, cost-effective production and utilization of critical minerals.

**6. China's Belt and Road Initiative (BRI) (2013-Present)**

China's Belt and Road Initiative (BRI) is a massive global development strategy that aims to enhance trade and investment connectivity across Asia, Africa, and Europe through infrastructure projects and economic partnerships. Within this framework, critical minerals play a pivotal role due to their importance in the manufacturing, technology, and energy sectors.

Key Actions:

a. *Investment in Overseas Mining Projects*

**Strategic Acquisitions:** China actively invests in mining projects across BRI countries to secure access to critical minerals such as lithium, cobalt, and rare earth elements. These investments often involve direct ownership, joint ventures, and partnerships with local companies.

**Infrastructure Development:** BRI funds are used to build infrastructure like roads, railways, and ports in resource-rich regions, facilitating the efficient extraction and transport of critical minerals to China.

b. *Establishment of Processing Facilities Abroad*

**Local Processing and Refining:** To add value and support local economies, China establishes processing and refining facilities in BRI partner countries. This reduces the need to export raw minerals and helps streamline the supply chain.

**Technology Transfer:** China provides technological assistance and expertise to BRI countries to enhance their capacity for processing and refining critical minerals, often involving the transfer of advanced technologies and knowledge.

c. *Long-Term Supply Agreements and Strategic Partnerships*

**Securing Supply Chains:** Through long-term supply agreements, China ensures a steady flow of critical minerals from BRI countries. These agreements often come with favorable terms for Chinese companies and may include clauses that prioritize China in times of scarcity.

**Strategic Bilateral Agreements:** China forms strategic partnerships with BRI countries, focusing on the mutual benefits of critical minerals development. These partnerships often extend beyond mining to include infrastructure development, technology sharing, and capacity building.

d. *Creation of Special Economic Zones and Industrial Parks*

**Resource-Based Industrial Parks:** Special Economic Zones (SEZs) and industrial parks dedicated to the processing and manufacturing of critical minerals are established in BRI countries. These zones offer incentives like tax breaks and simplified regulations to attract investments.

**Integration with Local Economies:** These zones are designed to integrate with local economies, providing employment opportunities, fostering economic development, and creating a hub for related industries.

e. *Promotion of Sustainable and Responsible Mining Practices*

**Environmental Standards and Compliance:** China promotes the adoption of sustainable and responsible mining practices in BRI countries, aligning with global standards and environmental compliance to minimize ecological impacts.

**Corporate Social Responsibility (CSR):** Chinese companies are encouraged to engage in CSR activities, ensuring that local communities benefit from mining projects through social investments, infrastructure development, and job creation.

f. *Enhancement of Trade Routes for Critical Minerals*

**Transportation and Logistics Infrastructure:** BRI projects include the development of transportation and logistics infrastructure that facilitates the efficient movement of critical minerals. This includes building and upgrading roads, railways, ports, and pipelines.

**Streamlined Customs and Trade Procedures:** China works with BRI countries to streamline customs

and trade procedures, reducing barriers and costs associated with the import and export of critical minerals.

g. *Development of Financing and Investment Mechanisms*

Financial Support and Loans: China provides financial support, including low-interest loans and investments, to BRI countries for the development of critical mineral projects. This financing helps lower the entry barriers and risks for these projects.

Joint Investment Funds: Establishing joint investment funds with BRI countries to co-finance critical mineral projects, fostering shared interests and reducing financial risks for both parties.

h. *Research, Development, and Innovation Cooperation*

Joint R&D Initiatives: China collaborates with BRI countries on research and development (R&D) initiatives focused on critical minerals. This includes exploration technologies, processing methods, and new applications for these minerals.

Innovation Hubs and Technology Centers: Establishing innovation hubs and technology centers in BRI countries to promote the development and application of new technologies in the critical minerals sector.

i. *Building a Network of Strategic Reserves*

Regional Stockpiling Facilities: China supports the establishment of regional stockpiling facilities for critical minerals in BRI countries. These reserves help stabilize supply chains and provide a buffer against market fluctuations.

Strategic Reserve Coordination: Coordinating with BRI countries to develop strategic reserves that can be utilized during periods of supply disruption, ensuring a reliable supply of critical minerals.

j. *Geopolitical and Economic Leverage*

Influencing Global Markets: By securing significant sources of critical minerals through the BRI, China enhances its geopolitical and economic leverage, influencing global markets and supply chains.

Negotiating Power in International Arenas: Control over critical mineral supply chains strengthens China's negotiating power in international trade and political arenas, giving it a strategic advantage in shaping global policies and standards.

## **7. China's Strategic Mineral Reserve Program**

This program involves the stockpiling of critical minerals to buffer against market volatility and ensure long-term supply security. China's Strategic Mineral Reserve Program is a key component of the country's efforts to ensure the stability and security of its supply of critical minerals, which are essential for its industrial and technological development. This program involves the creation and management of reserves of key minerals that are vital for high-tech industries, defense, and economic growth.

### Key Actions and Objectives:

a. *Purpose and Objectives*

Supply Security: The primary goal is to safeguard against supply disruptions caused by geopolitical tensions, market volatility, or trade restrictions. This ensures a steady supply of critical minerals for domestic industries.

Price Stabilization: By maintaining strategic reserves, China can influence market supply and prices, mitigating the impact of price spikes or shortages that could affect its economy.

Economic and Industrial Policy Support: The reserves support China's broader economic and industrial strategies, including its push for leadership in high-tech and green technologies.

b. *Critical Minerals Covered*

Rare Earth Elements (REEs): These include neodymium, praseodymium, dysprosium, and terbium, which are essential for electronics, renewable energy, and defense applications.

Lithium and Cobalt: Critical for battery production, particularly in electric vehicles and energy storage systems.

Nickel: Important for stainless steel and battery production, especially in high-energy-density batteries for electric vehicles.

Graphite: Used in the production of anodes for lithium-ion batteries.

Other Minerals: Including tungsten, antimony, and titanium, which are vital for aerospace, electronics, and various industrial processes.

- c. *Acquisition and Management Strategies*  
 Domestic Stockpiling: China accumulates large quantities of critical minerals through domestic production and importation, stored in state-controlled facilities.  
 Overseas Acquisitions: The program also involves securing resources through overseas investments and partnerships, ensuring long-term supply contracts with foreign producers.  
 Government and Corporate Reserves: The reserves are maintained by both government agencies and state-owned enterprises, with strategic coordination to manage and utilize these stocks effectively.
- d. *Integration with Domestic Policies*  
 Support for National Strategies: The reserve program is closely integrated with national strategies such as the Made in China 2025 plan and China Standards 2035, which aim to boost China's capabilities in high-tech and manufacturing sectors.  
 Environmental and Sustainability Goals: The program supports the development of technologies and processes that align with China's goals for environmental sustainability and carbon neutrality.
- e. *Impact on Global Markets*  
 Market Influence: China's stockpiling activities can have significant effects on global supply and prices of critical minerals, given its substantial demand and dominant position in many of these markets.  
 Strategic Leverage: The reserves provide China with strategic leverage in international trade and negotiations, allowing it to exert influence over global supply chains and market dynamics.
- f. *Technological and Innovation Support*  
 Advancement of Processing Technologies: The program encourages the development and adoption of advanced technologies for the efficient extraction and processing of critical minerals.  
 Recycling and Resource Efficiency: It also promotes initiatives to enhance recycling and the efficient use of resources, reducing dependency on raw material imports.
- g. *International Partnerships and Collaboration*  
 Global Supply Chain Integration: China engages in partnerships and collaborations with countries rich in critical minerals, facilitating integration into global supply chains and ensuring access to essential resources.  
 Belt and Road Initiative (BRI): The Strategic Mineral Reserve Program is complemented by the BRI, which helps secure critical minerals through infrastructure investments and economic ties with participating countries.
- h. *Strategic Reserve Development and Storage*  
 Infrastructure for Storage: Development of specialized infrastructure for the storage of critical minerals, ensuring that they are safely and effectively managed.  
 Inventory Management Systems: Advanced systems for tracking and managing inventory, ensuring the availability of critical minerals when needed.
- i. *Geopolitical and National Security Considerations*  
 National Security: The reserves are a critical component of China's national security strategy, ensuring that essential minerals are available for defense and strategic industries.  
 Geopolitical Stability: By maintaining robust reserves, China aims to mitigate risks associated with geopolitical instability or trade disputes that could affect critical mineral supplies.
- j. *Economic Competitiveness and Technological Leadership*  
 Support for High-Tech Industries: Ensuring a stable supply of critical minerals supports the growth of high-tech industries, such as electronics, renewable energy, and electric vehicles, where China seeks to establish or maintain a leadership position.  
 Technological Development: The program underpins technological development and innovation by providing the necessary materials for research and production in cutting-edge sectors.

## **8. Guidelines for the Protection and Utilization of Critical Minerals (2023)**

The Guidelines, released by China's National Development and Reform Commission (NDRC) and Ministry of Industry and Information Technology (MIIT), outline a strategic framework to ensure the sustainable and secure supply of critical minerals, which are essential for the nation's technological and industrial development. These guidelines aim to balance the exploitation of critical minerals with environmental protection, technological advancement, and economic security. The Guidelines for the

Protection and Utilization of Critical Minerals (2023) are a comprehensive policy framework designed to secure and manage China's critical mineral resources effectively. The guidelines emphasize resource security, technological innovation, environmental sustainability, and international cooperation. They reflect China's commitment to balancing economic growth with environmental stewardship and ensuring a stable supply of critical minerals essential for its strategic industries.

Key Objectives and Focus Areas:

- a. *Ensuring Resource Security*
  - Strategic Planning: Develop comprehensive plans for the exploration, extraction, and management of critical minerals to ensure a stable and long-term supply.
  - Diversification: Reduce reliance on foreign sources by exploring and developing domestic mineral resources and securing international partnerships.
  - Stockpiling: Establish and maintain reserves of critical minerals to mitigate risks associated with supply disruptions.
- b. *Promoting Technological Innovation*
  - Advanced Mining and Processing Technologies: Encourage the development and adoption of cutting-edge technologies for efficient and environmentally friendly extraction and processing of critical minerals.
  - R&D Investment: Increase investments in research and development (R&D) to improve the quality and efficiency of critical minerals production.
  - Recycling and Reuse: Innovate in the recycling and reuse of critical minerals to reduce dependence on primary sources and enhance sustainability.
- c. *Enhancing Environmental Protection*
  - Green Mining Practices: Implement stringent environmental standards and promote green mining practices to minimize the ecological impact of critical minerals extraction.
  - Pollution Control: Strengthen measures to prevent and control pollution resulting from mining and processing activities.
  - Ecological Restoration: Ensure that mining operations include plans for ecological restoration and rehabilitation of affected areas.
- d. *Improving Resource Utilization Efficiency*
  - Optimization of Resource Use: Maximize the utilization efficiency of critical minerals through advanced technologies and innovative management practices.
  - Waste Reduction: Minimize waste generation in mining and processing operations and promote the comprehensive utilization of by-products and waste materials.
  - Circular Economy: Foster a circular economy approach where critical minerals are reused and recycled, reducing the need for new extraction.
- e. *Strengthening Policy and Regulatory Framework*
  - Policy Support: Develop supportive policies, including financial incentives, to encourage the sustainable development and utilization of critical minerals.
  - Regulatory Oversight: Enhance regulatory oversight to ensure compliance with environmental standards and resource management requirements.
  - Standards and Certification: Establish and enforce technical standards and certification systems for critical minerals production and processing.
- f. *Encouraging International Cooperation*
  - Global Partnerships: Foster international cooperation in the exploration, development, and supply of critical minerals through strategic partnerships and trade agreements.
  - Investment Abroad: Support domestic companies in investing in critical minerals projects overseas to diversify supply sources.
  - International Standards: Align with international standards and best practices in the sustainable management and utilization of critical minerals.
- g. *Implementation Measures*
  - Monitoring and Evaluation: Set up systems for the continuous monitoring and evaluation of critical minerals resources and the effectiveness of protection and utilization measures.
  - Data and Information Systems: Develop comprehensive data and information systems to track critical minerals resources, production, and supply chains.

Public Awareness and Engagement: Increase public awareness and engagement in the sustainable management and utilization of critical minerals, promoting responsible consumption and recycling practices.

### **9. National Plan for Developing New Materials (2021-2025)**

The National Plan for Developing New Materials (2021-2025) is a strategic framework released by China to advance its capabilities in the production and innovation of new materials, which are crucial for a wide range of high-tech and industrial applications. Given the essential role of critical minerals in these materials, the plan outlines several key points relevant to their development and utilization.

#### **a. Strategic Emphasis on Critical Minerals**

**Focus on Key Materials:** The plan highlights the importance of developing materials that are critical for national security and technological leadership. These include advanced materials for aerospace, electronics, energy, and other strategic industries, many of which rely on critical minerals such as rare earth elements, lithium, cobalt, and others.

**Resource Security:** Emphasizing the need to secure stable supplies of critical minerals, the plan promotes the exploration and development of domestic and international sources to reduce dependence on foreign supplies and mitigate supply chain risks.

#### **b. Technological Innovation and R&D**

**Advanced Processing Technologies:** The plan calls for the development of advanced processing technologies to improve the extraction and refinement of critical minerals. This includes enhancing the efficiency and environmental sustainability of mining and processing operations.

**Material Innovation:** Invest in research and development (R&D) to create new materials with superior properties, performance, and lower environmental impact. This includes developing new alloys, composites, and functional materials that utilize critical minerals.

**Recycling and Substitution:** Encourage innovation in the recycling and reuse of critical minerals to extend their lifecycle and reduce the need for new extraction. Additionally, research into alternative materials that can substitute for critical minerals in certain applications is supported.

#### **c. Environmental Sustainability**

**Green Production Technologies:** Promote the adoption of green technologies in the mining and processing of critical minerals to minimize environmental degradation. This includes reducing emissions, waste, and energy consumption in production processes.

**Circular Economy Practices:** Support the development of a circular economy approach, where critical minerals are recycled and reused. This aims to reduce waste and the environmental footprint of critical minerals production and consumption.

**Ecological Rehabilitation:** Ensure that mining activities include plans for ecological rehabilitation and restoration of affected areas to preserve biodiversity and natural ecosystems.

#### **d. Supply Chain Security and Optimization**

**Diversification of Supply Chains:** Strengthen the supply chains for critical minerals by diversifying sources, including developing domestic resources and securing strategic international partnerships.

**Supply Chain Transparency and Traceability:** Enhance the transparency and traceability of critical minerals supply chains to ensure reliable and ethically sourced materials. Implementing systems for tracking and managing supply chains from extraction to end-use.

**Stockpiling and Strategic Reserves:** Develop strategic reserves and stockpiling mechanisms for critical minerals to buffer against market volatility and supply disruptions.

#### **e. Support for Strategic Industries**

**High-Tech and Emerging Industries:** Provide targeted support for industries that are heavily dependent on critical minerals, such as electric vehicles (EVs), renewable energy technologies, advanced electronics, and defense. These industries are prioritized for receiving critical materials and technological advancements.

**Integration with Advanced Manufacturing:** Align the development of critical materials with the needs of advanced manufacturing sectors. This includes ensuring that the materials produced meet the high standards required for next-generation technologies and products.

#### **f. Policy and Regulatory Support**

Incentives for Innovation and Production: Establish financial incentives and support mechanisms for companies engaged in the development and production of critical minerals and new materials. This includes grants, tax incentives, and subsidies for R&D and sustainable practices.

Strengthened Regulatory Framework: Implement and enforce regulations to ensure sustainable and responsible extraction, processing, and utilization of critical minerals. This includes environmental regulations and standards for industry practices.

International Cooperation: Encourage international cooperation and partnerships to secure critical mineral supplies, share technological innovations, and align with global standards for sustainable development and environmental protection.

g. *Human Resources and Skills Development*

Talent Development: Invest in the education and training of professionals and skilled workers in fields related to critical minerals and new materials. This aims to build a robust talent pool to support the industry's growth and innovation.

Collaboration with Academia and Research Institutes: Foster collaboration between industry, academia, and research institutes to drive innovation and develop new technologies for critical minerals and materials.

The National Plan for Developing New Materials (2021-2025) emphasizes the crucial role of critical minerals in advancing China's new materials sector. Key focus areas include ensuring resource security, promoting technological innovation, enhancing environmental sustainability, and strengthening supply chain resilience. The plan supports the integration of critical minerals into strategic industries and encourages sustainable practices and international cooperation to maintain China's leadership in the new materials field.

### **10. New Energy Vehicle (NEV) Industry Development Plan (2021-2035)**

The New Energy Vehicle (NEV) Industry Development Plan (2021-2035) is a strategic framework developed by China to guide the growth of its NEV sector. This plan focuses on fostering innovation, enhancing competitiveness, and ensuring sustainable development in the industry. Given the NEV sector's heavy reliance on critical materials, such as lithium, cobalt, nickel, and rare earth elements, the plan includes several clauses related to the management, utilization, and security of these materials.

Critical minerals are covered in the following clauses of the plan:

- a. Resource Security and Supply Chain Management
- b. Technological Innovation and Development
- c. Sustainability and Environmental Protection
- d. Support for Strategic Industries
- e. International Cooperation and Global Competitiveness
- f. Regulatory and Standards Framework

The New Energy Vehicle Industry Development Plan (2021-2035) incorporates comprehensive measures to address the challenges and opportunities associated with critical materials. It focuses on securing supply chains, fostering technological innovation, promoting sustainability, supporting strategic industries, enhancing international cooperation, and establishing a robust regulatory framework. These efforts are crucial for supporting the sustainable growth and competitiveness of China's NEV industry in the global market.

### **11. International Collaboration**

China has been actively engaging in bilateral agreements with various countries to secure the supply of critical minerals essential for its industrial and technological growth. These agreements are part of China's broader strategy to diversify its sources, ensure resource security, and strengthen its position in the global supply chain of key minerals such as lithium, cobalt, rare earth elements, and others.

- a. China-Australia agreements include the Memorandum of Understanding (MoU) on Cooperation in the Development of Critical Minerals signed in January 2019 between the Australian Government's Department of Industry, Innovation, and Science and China's National Development and Reform

Commission (NDRC). The primary objective is to enhance cooperation in the exploration and development of critical minerals to meet the growing demand in both countries for materials essential in high-tech and renewable energy industries. Discussions have continued to enhance cooperation in critical minerals despite broader diplomatic tensions. Both nations recognize the mutual benefits of maintaining cooperation in this area.

- b. China also formed various governmental-level and corporate-level agreements with DRC, Chile, Argentina, Indonesia, the Russian Federation, and other countries for the mining and trade of critical minerals including cobalt, copper, lithium, nickel, rare earth elements, etc. under Belt and Road Initiative, Free Trade Agreement, Comprehensive Economic Partnership Agreement, Strategic Alliances, Offtake Agreement, etc.

## **AUSTRALIA**

Australia's Critical Minerals Strategy (2023-2030) focuses on diversifying global supply chains, expanding domestic critical mineral production, and fostering partnerships with other nations.

The Australian Critical Minerals Research and Development Hub 2022

Joint Statement by Canada and Australia on Cooperation on Critical Minerals 2024

Australia's Critical Minerals List and Strategic Materials List 2023, updated in 2024

The economic potential of Australia's critical minerals and energy transition minerals 2023

Joint declaration of intent between Australia and Germany on a critical minerals value chain feasibility study 2023

Joint Statement of Intent between Australia and the United Kingdom on collaboration on critical minerals 2023

## **CANADA**

Canada's Critical Minerals Strategy (2022) aims to position Canada as a leading supplier of critical minerals to support the green economy. It highlights initiatives to attract investment, enhance sustainability, and improve Indigenous participation in the mining sector.

Canada's critical minerals list, updated in 2024

The Canada-U.S. Joint Action Plan on Critical Minerals 2020

The Canada-EU Strategic Partnership on Raw Materials

The Canada-Japan Sectoral Working Group on Critical Minerals

## **JAPAN**

Japan's Strategic Energy Plan (2021) focuses on securing stable supplies of critical minerals through domestic development and international cooperation. It emphasizes the importance of recycling and alternative materials to reduce dependency on imported critical minerals.

Japan's Critical Minerals List (2023)

U.S.-Japan Critical Minerals Agreement, updated in 2024

EU-Japan Administrative Arrangement on Cooperation in Critical Raw Materials Supply Chains 2023

UK-Japan Memorandum of Cooperation (MoC) on Critical Minerals

## **UNITED KINGDOM**

The UK's Critical Minerals Strategy (2022) seeks to diversify supply chains and reduce reliance on imports for critical minerals. It includes plans to develop domestic resources and promote international partnerships for secure mineral supplies.

## **MULTILATERAL COLLABORATIONS**

The UN Secretary-General's Panel on Critical Energy Transition Minerals seeks to support a just and equitable transition to renewable energies while harnessing critical energy transition minerals for sustainable development, to ensure countries and local communities endowed with these minerals fully benefit economically, including through local value addition, while safeguarding social and environmental protections for affected communities and ecosystems, and to strengthen international cooperation including through the alignment and harmonization of existing norms, standards and initiatives and agree on areas for enhanced multilateral action.

The Minerals Security Partnership (MSP) is a coalition of countries including the U.S., EU members, Canada, Japan, and others to enhance the security of critical mineral supply chains. It focuses on developing shared frameworks for sustainable mining, processing, and recycling practices.

The Global Battery Alliance is an initiative under the World Economic Forum to promote sustainable and ethical sourcing of materials used in batteries. It aims to foster a circular economy for battery production and end-of-life management.

The Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF) supports 85 member countries in developing policies and practices for sustainable mineral resource development. It provides a platform for international collaboration on issues such as environmental protection, community development, and governance in the mining sector.



## **Summary**

The global landscape of critical minerals management is shaped by a myriad of policies and strategies aimed at ensuring a secure, sustainable, and ethical supply of these essential resources. Major economies are focusing on:

**Enhancing Domestic Production:** Increasing mining and processing capabilities within their own borders to reduce reliance on imports.

**Fostering International Cooperation:** Building alliances and partnerships to secure stable and diversified supply chains.

**Promoting Sustainability and Innovation:** Encouraging responsible mining practices, advancing recycling technologies, and exploring alternative materials.

**Securing Ethical Sourcing:** Ensuring that the supply chains for critical minerals adhere to high standards of social and environmental responsibility.

These efforts are crucial for supporting the transition to a green economy, meeting climate goals, and achieving sustainable development worldwide.

As mentioned at the beginning of this paper, concerted and synchronised global efforts are essential to effectively tackle the climate crisis, propel the green transition, and accomplish the ambitious targets set in the Paris Agreement and UN SDGs. A climate crisis for one is a climate crisis for all, the whole of humanity shares in the problems brought about by climate change, biodiversity loss, and pollution as a consequence of inaction and a fragmented and inadequate approach.