

Elevating the Role of Critical Minerals for Development and Security

By Daniel F. Runde and Austin Hardman

Introduction

Over the next few decades, the role that copper and critical minerals play in achieving the energy transition, spurring economic development, and strengthening national security will continue to grow. The world is slowly shifting its energy mix to one that is greener, but this transition will require significant mining resources. This may seem counterintuitive, but many low-carbon technology components consist of key minerals and metals. According to the **International Energy Agency**, within 20 years, the energy sector's demand for minerals may increase by as much as six times, and demand from the low-carbon energy generation sector will triple. One estimate by **S&P Global** suggests that more copper will need to be mined in the next few decades than has been extracted in the past several thousand years of human history.

Mining and the processing of minerals are also crucial in maintaining the military's technological edge, securing manufacturing supply chains, and pursuing sustainable development practices. The United States Geological Survey (USGS) has **designated** 50 critical minerals "essential to the economic and national security of the U.S.," and the Department of Defense (DOD) has **identified** more than 250 "strategic and critical materials," defined as those "those that support military and essential civilian industry." Yet unlike some strategic allies, such as **Canada**, the United States does not consider copper to be a critical mineral (see Box 1 for more on these definitions).

Mining will also become increasingly important for economic development. The top 40 mining companies had a combined revenue of **\$711 billion in 2022**. The global mining market had a compound annual growth rate of **6.1 percent** between 2022 and 2023, reaching \$2.15 trillion, and is expected to grow to \$2.78 trillion by 2027. In the United States alone, mining accounted for **1.9 percent** of GDP and employed over half a million people.

In this regard, the Western Hemisphere is emerging as a key source of some of these minerals. With their considerable reserves of copper and other critical minerals such as lithium and nickel, countries in the Western Hemisphere have attracted significant investment in mining projects. Latin America, for example, currently supplies **40 percent of the world's copper and 35 percent of the world's lithium**. Mining offers an opportunity for economic development, but the region needs to adjust policies to better steward these resources in order for the sector to continue to play a development role.

Mining's Implications for U.S. National Security and Defense

Even though these minerals and materials are integral to national security, the United States has lost its mining dominance and is not as involved or invested in their extraction or production as it should be. Since the early 2000s, for example, the United States has become **import dependent** for its supply of rare earth oxides.

Recent trends suggest the sustainability of a mineral-dependent national defense is in jeopardy. The **DOD's Strategic and Critical Materials 100-day Sector Review** identified several **risks** in this sector, including the concentration of supply, single-source suppliers, price shocks, human-capital gaps, forced labor, and conflict minerals and organized crime. The National Defense Stockpile (NDS) previously held about 14,000 metric tons of rare-earth materials—roughly 7 percent of current international market holdings—but much of the stock was **liquidated after the Cold War**.

Moreover, the U.S. government has also missed numerous opportunities to protect the interests of U.S. mining firms, for example during the renegotiation of the North American Free Trade Agreement and other free trade agreements. This oversight has threatened U.S. foreign direct investment in countries such as Mexico, where leaders have sought to nationalize several mines.

BOX 1: DEFINITIONS

The **definitions** of “critical minerals” and “strategic and critical materials” are derived from prior executive orders and the **Strategic and Critical Materials Stock Piling Revision Act of 1979**. The United States has designated **50** “critical minerals” and more than 250 commodities and minerals as “strategic and critical materials.”

- A **critical mineral** is defined as “a non-fuel mineral or mineral material essential to the economic and national security of the U.S. and which has a supply chain vulnerable to disruption. Critical minerals are also characterized as serving an essential function in the manufacturing of a product, the absence of which would have significant consequences for the economy or national security.” Examples include aluminum, used across many sectors; lithium, a metal common to all rechargeable batteries; and germanium, which has fiberoptic and night-vision uses.
- “**Strategic and critical materials**” is a broader concept that includes “downstream products and materials produced outside of mining activities (e.g., carbon fibers).” The Strategic and Critical Materials Stock Piling Revision Act of 1979 defines them as any materials that “(A) would be needed to supply the military, industrial, and essential

civilian needs of the United States during a national emergency; and (B) are not found or produced in the United States in sufficient quantities to meet such need.” Strategic and critical minerals are particularly essential to the semiconductor, large-capacity battery, and pharmaceutical industries.

- Rare earth elements (REEs) are a group of 17 metals—lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, scandium, and yttrium—that are also **essential ingredients** in many industries, including defense technology. REEs are used in high-tech consumer products such as cellphones, computer hard drives, electric and hybrid vehicles, and flatscreen monitors and televisions. In the defense sphere, they are used in electronic displays, guidance systems, lasers, and radar and sonar systems. For example, each Virginia-class nuclear-powered submarine needs about **9,200 pounds of rare earth materials to produce**, and the F-35 multipurpose fighter jet requires over **900 pounds**.

China and its state-owned enterprises are **significantly ahead of the United States** in production and ownership of smelting, refining, and mining assets, thereby giving it a leg up with respect to global processing. After making a shrewd bet in the 2000s by running operations at a loss with state subsidies making up the difference, China now dominates the industry. China **accounts** for 63 percent of the world’s rare earth mining and has the most reserves of REEs in the world with **44 million** metric tons of as of 2022. Meanwhile, the United States ranks sixth with 2.3 million metric tons. As of 2019, **China** was processing 65 percent of the world’s cobalt, an important component of permanent magnets used in military technologies such as **smart bombs, aircraft, and precision-guided missiles**. What is most concerning is that China has already demonstrated its willingness to exploit supply-chain vulnerabilities by imposing sanctions against **U.S. defense contractors** and limiting exports of germanium and gallium; a Chinese trade policy official **warned in July 2023** that such export controls are “just the start.”

The United States has too little production capacity and possesses too few of the world’s reserves to entertain the idea of self-sufficiency. It will need the support of partners and allies. Fortunately, countries in the Western Hemisphere are promising sources for many critical minerals, including REEs. Chile and Peru lead the world’s **copper production**, while Mexico and Peru lead in **silver production**. **Colombia** is positioning itself to become a leading copper and gold producer. Moreover, Argentina, Bolivia, and Chile together possess roughly half of the world’s current lithium reserves. Brazil has the third-largest reserves of REEs (tied with Russia) at 21 million metric tons.

Latin America’s emergence as a source of some of these critical minerals is gaining attention, and competition for investment is increasing in the region. China is investing heavily in mining and energy projects throughout Latin America. State-owned enterprise PowerChina has more than **50 current energy projects** across at least **15 countries** in Latin America, including in Argentina, Brazil, Bolivia, Chile, and Peru. China has invested over **\$10 billion** in Peru’s mining industry, “controlling seven

of Peru’s largest mines, 100% of Peru’s iron production, and 25% of their copper output.” In 2021, Chinese company Ganfeng Lithium **partially purchased** one of Argentina’s leading lithium mining projects, and Chinese company Zijin Mining plans to invest \$380 million in a lithium carbonate plant in Argentina. The United States cannot afford for China to carry on without contest.

Broaden the Definition of Which Minerals Are ‘Critical’

First, the U.S. government needs to reassess its current mineral-related definitions since rigid lists can stifle innovation, limit manufacturing capacity, and create future bottlenecks. For example, copper is the DOD’s **second-most utilized material**, making it central to national security. Copper is an **ideal material** for building a sustainable world due to its resistance to corrosion, high ductility, malleability, recyclability, and **thermal and electrical conductivity**. Yet unlike some strategic allies, the U.S. **government** does not consider copper to be a critical mineral. **The Canadian Critical Minerals Strategy**, for example, recognizes copper’s significance, and Canada has proposed a Critical Minerals Exploration Tax Credit of 30 percent to companies that support the exploration of copper and other minerals. In February 2023, a bipartisan group of U.S. senators wrote an open **letter** questioning the USGS’s **rejection** of copper as an official critical mineral. The USGS’s **response** acknowledged copper’s importance and the possibility of reevaluation but ultimately dismissed its concerns.

Rather than overlooking what is not deemed “critical” or “strategic,” the mineral security strategy should be more expansive. It is impossible to know which minerals future generations of cutting-edge technology will require. Disfavoring certain minerals could inhibit innovation and create shortages down the line. The validity of a mining operation should not be contingent on lists that fail to update at a satisfactory rate or rely on limited data. Rather, the U.S. mineral strategy should seek to be as nimble as possible.

Designate a Lead Agency and Craft a Comprehensive Strategy

Second, the U.S. government should designate a lead agency to spearhead a comprehensive mining strategy and harmonized federal regulations. **Since 2010**, U.S. policymakers have been refocusing attention on critical mineral supply chains by forming interagency working groups, issuing executive orders, and publishing white papers. However, the U.S. government has a fragmented approach in which several agencies and bureaus—including the **Department of Energy**, the **Department of Labor**, the **Department of the Interior**, the **Department of Agriculture**, the **Army Corps of Engineers**, and the **Environmental Protection Agency**—are involved in drafting mining regulation. Consolidating the development, management, and execution of mining policy would allow all branches of government to carry out a singular, comprehensive, and well-coordinated mining strategy that weaves this central sector into the economic, energy, environmental, and national security of the United States. Harmonizing U.S. agencies’ efforts would benefit mining-related activities by preventing duplicative or clashing domestic and foreign policy agendas.

This is yet another way in which China is clearly outpacing the United States. Mining is a priority for China’s economic diplomacy, especially through its Belt and Road Initiative—to which 22 Latin American countries have **signed on** since its launch in 2013. Beijing has free trade agreements with Chile, Costa Rica, Ecuador, and Peru, granting it easier access to their exports of minerals such as lithium, copper, gold, and iron ore. Nicaragua has also reportedly **completed** negotiations for a free

trade agreement with China, and **Honduras** began its own negotiations in July. By contrast, U.S. engagement on mining issues in its backyard is woefully behind.

Increase Extraction and Processing at Home to Signal Commitment Abroad

Third, increasing mining operations domestically would signal to potential partners in the Western Hemisphere that the United States is not merely a buyer and is invested in developing its own mining capacity. In other words, the United States needs to overcome a firmly held “not in my backyard” attitude and start **digging** at home.

One main challenge is the cumbersome permitting process that stifles the level of domestic extraction. The U.S. permitting process is headed by the Department of Interior, which has timelines that are unfeasible for investors. In addition, it is not unheard of for the government to retroactively revoke permits, further disincentivizing firms from establishing domestic operations. In 2023, for example, the Army Corps of Engineers, at the Environmental Protection Agency’s behest, **retroactively revoked a permit** to expand nickel and copper mining operations in Minnesota after Indigenous groups protested that the mine would fail to comply with more stringent tribal environmental standards.

Overhauling the permitting process has been dismissed as too daunting a task, but reforming the 151-year-old Mining Law of 1872 would not take much time—especially compared to the **7 to 10 years** the average U.S. mining company waits to obtain a permit. For perspective, obtaining a mine permit takes 2 to 3 years in Australia and Canada.

Develop a More Compelling Narrative

Fourth, the United States needs to develop a more compelling narrative on the need to invest in mining abroad. China is central to U.S. supply chain vulnerabilities, but many developing nations see this as irrelevant. More captivating messaging could make potential partners in the Western Hemisphere view the United States as more attractive than China.

Similarly, the argument for U.S. defense needs falls flat with many Latin American countries, many of which already view expanded cooperation with the United States with a certain degree of suspicion. Some Latin American countries have raised concerns that U.S. attempts to spur greater collaboration on exploring, extracting, and processing critical minerals may not be mutually beneficial. For example, the establishment of the **Minerals Security Partnership (MSP)** in 2022, which does not include any Latin American countries, has reinforced worries that the United States is merely interested in extracting resources, not developing local industry. The United States should identify the areas in which it has comparative advantage and showcase its competitive strengths (including transferring technology and know-how, employing local professionals, and applying quality standards in mining and processing) to deter these countries from doing business with China.

At the same time, U.S. foreign policy is sometimes at odds with its domestic agenda. The Inflation Reduction Act of 2022 seeks to prioritize domestic production of minerals, yet few such operations exist. The Clean Vehicle Tax Credit and the Advanced Manufacturing Production Tax Credit of 2022 privilege domestically sourced critical materials over most foreign-sourced products—conflicting with other U.S. requirements for obtaining minerals from partners and coming as a shock to

countries such as Brazil, with whom the United States had **established** a Critical Minerals Working Group in 2020.

Conclusion

Mining's strategic importance in ensuring decarbonization, strengthening national security, and contributing to economic development is understated, and the U.S. government currently lacks a coherent approach to it. The mineral-related imbalance in which the United States finds itself will only worsen if it does not adopt a comprehensive and bipartisan strategy. As the Department of Defense has articulated, correcting course will require a **whole-of-government** approach that includes companies, nongovernmental organizations, and government agencies. Mining's centrality to an effective, green transition and to military readiness makes reaching a consensus on this issue dire. ■

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