

China's Role in Energy Transition

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Critical minerals is the dominating factor in the new geoeconomics of energy transition. This essay analyzes how China became the global powerhouse of critical minerals and its effects on the economics of energy transition.

I. Introduction

News articles showcase increasing tensions on critical minerals, especially with China's role in the center:

1. China proposes further export curbs on battery, critical minerals tech- Reuters, Jan 2, 2025¹
2. China's Critical Minerals Embargo Is Even Tougher Than Expected- New York Times, Dec. 9, 2024²

These developments underscore a growing concern: consolidation of critical mineral market power in China and the influence it has. As society progresses forward in this digital age coupled with the push for decarbonization globally, access and refinement of these materials have become a major security and economic concern.

II. Definition

Minerals are critical components in electronic devices and clean energy technologies. In the US, the Energy Act of 2020 has defined critical minerals as minerals that have economic or national security importance (USGS, 2025). Key examples of these minerals include:

- Cobalt and lithium- used in electronic devices such as batteries
- Silicon- used in solar panels and semiconductors

As the global economy transitions to advanced electronics—including electric vehicles (EVs), renewable energy, and advanced electronics—the demand for minerals such as lithium, cobalt, nickel, and rare earth elements is increasing dramatically. These minerals are essential components of high-capacity batteries, semiconductors, solar panels, and wind turbines.

Deposits of critical minerals, however, is geographically limited. Some of these minerals are in limited supply and the cost of extracting them can be expensive, both financially and environmentally. According to Center for Sustainable Systems, global demand for these materials are rising exponentially every year due to energy transition³.

Countries with rich resources include:

- i. Democratic Republic of Congo (DRC) with 70% of world cobalt share,
- ii. Australia and Chile with more than 70% share of lithium globally
- iii. Indonesia with 30% share of nickel globally
- iv. Chile and Peru with more than 40% share of copper worldwide

Despite China lacking these resources, it still has an almost monopoly over the market.

III. Stages in Critical Mineral Mining

Critical minerals undergo transformations in various stages of production until they are ready to be used in final products.

The first stage of production, known as upstream activity, is mining raw minerals from the ground which occurs in mineral- rich countries. China has comparative advantage of the upstream industry through the Belt and Road Initiative investments in mining and transportation overseas (Bian et al. 2024).

The next stage is called midstream activities where the minerals are refined and processed so they can be used in the final products. Majority of the refinement firms are located in China. The U.S. Department of Energy observed that China refines 60% of lithium and 80% of cobalt, both of which are core inputs for making high-capacity batteries. In late- midstream stage, firms in China make anodes, cathodes, and collectors with these materials.

These products are then assembled by the downstream industry to make electric vehicles (EVs) among other things (Castillo and Purdy 2022). Thus, even if China does not have deposits, majority of the extracted resources have to be sent to the country for refinement.

China's dominance in midstream and downstream industries hark back to the 1980s when the government prioritized developing rare earth (part of the critical mineral) market. It issued export tax rebates for domestic producers and in the 1990s rare earth minerals as strategic and prohibited foreign investments on it. It cultivated its own market by controlling production and exports of minerals. The growth of midstream and downstream industries was made possible by the support of the upstream sector, enabling them to refine not only rare earth elements but also a broader range of critical minerals. Thus, the government's foresight in the past decades propelled the country forward globally (Foss and Koelsch 2022).

IV. BRI's Influence on Upstream Industry

Despite having limited resources, China has upstream access due to the Belt and Road Initiative (BRI):

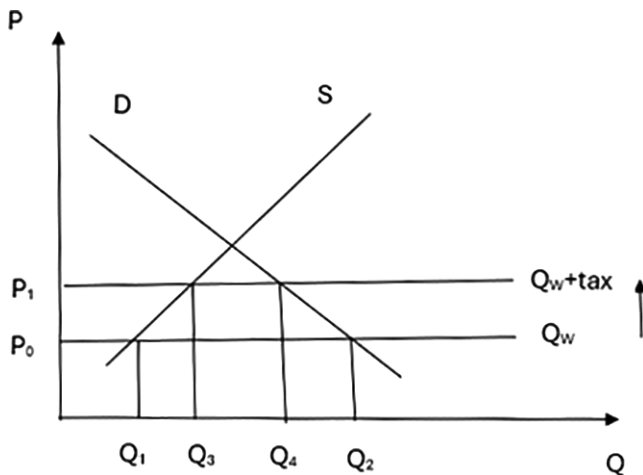
1. China has built a vast trade network for critical minerals. Through the BRI, China has built infrastructure for mining these minerals across countries with vast deposits.
2. This way they got control and ownership of all the minerals. Chinese financing facilitates conditions that prefer China, thus, getting preferential access to mining projects and mining.
3. Through these ties, China has also transferred technological innovations to these developing countries.
4. It has established long-term trade relationships under favorable terms for Chinese firms

With all these moves, China has been able to forge a deep relationship with the resource rich developing countries, extending its influence from mines to markets.

V. The economics behind it

Goeconomics is the study of economics and political science that focuses on the government's use of economic strength on foreign entities (Clayton et al. 2025). As stated earlier, China is the global economic powerhouse in critical minerals. The market can have an adverse impact if China has any dispute with another country- whether economic, trade, or political. The examples below will illustrate the consequences facing an almost monopoly power with disputes.

Australia has significant resources and still, has to depend on China for majority of the stock of minerals. If for any reason, Australia decides to impose additional taxes on imports from China due to any disagreement, then it will gravely impact the local clean energy industry. Let's look at the graph below which shows the Australian mineral market:



The demand curve is marked D and supply curve as S. It should be noted that D and S refer to Australia's demand and supply. The international price of minerals will not be affected by the country's demand and hence, the international supply curve is completely elastic. It is given by Q_w , the horizontal line. In the initial setting, the price is at P_0 . The quantity supplied is Q_1 and the quantity demanded is Q_2 . Demand is greater than supply and that difference is met by importing the goods. After adding taxes, the price increases to P_1 . The quantity supplied locally is Q_3 and the demand has fallen to Q_4 . The difference is now met by importing goods. Locally, the suppliers sell at a higher price that is set at the international level. Due to taxes, the prices have increased, and the quantity demanded has fallen. Of course, this is a highly simplified example of the way domestic policies can affect the market. In addition, it is assumed that Australia has the necessary midstream and downstream industry to process the minerals to be used in the final products. This situation would be more complicated in real life.

Now consider a country with minimal resources: Switzerland. If Switzerland has a trade or political dispute with China and it restricts exports of critical minerals, then Switzerland will be left without any supply.

Further, recent events have shown that China has shown tendencies to use this chokepoint as an upper hand while negotiating with other countries or in coercing uncooperative countries. It has declared export controls on critical minerals on several occasions (Jackson 2025; Shivakumar 2025). All of these issues considerably delays progress in transition to clean energy. In the interest of advancement of civilization and progressing towards decarbonization, it is crucial that diplomatic ties are maintained.

VI. Possible Solutions

In response to China's control over the chokepoints, it is imperative that the countries form an alliance and make progress in development of the industry. Other countries need to diversify their source of critical minerals and need to invest in extraction and refining of the minerals. Some countries have started planning and investing. The United States has passed policies in the past that encouraged more production of critical minerals in both US and Canada (IEA 2022). The Inflation Reduction Act of 2022 made provisions for processing, manufacturing, and recycling of these minerals (U.S. DOE 2023). Australia has started building its first mineral refinery as part of its domestic plan to drive the clean energy transition (Chater 2025).

Actions such as these are required, however, it should be noted that these projects will take years to develop. Till then we will be dependent on China.

References

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Notes

¹ Link: <https://www.reuters.com/technology/china-proposes-further-export-curbs-battery-critical-minerals-tech-2025-01-02/>

² Link: <https://www.nytimes.com/2024/12/09/business/china-critical-minerals.html>

³ Link: https://css.umich.edu/sites/default/files/2023-10/Critical%20Materials_CSS14-15_0.pdf