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# *The EU's Dependence on Chinese Rare Earths: A Security Challenge*

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**Abstract:** The paper discusses China's emergence as the dominant global producer of rare earth elements (REEs) and the resulting geopolitical implications, particularly for the European Union (EU). Initially highlighting China's rapid ascent in REE production and its strategic importance in various high-tech industries, the paper underscores concerns over Western dependency on Chinese supplies, which are crucial for economic and defense sectors. REEs, comprising 17 elements crucial for electronics, green technologies, and military applications, are pivotal due to their unique properties. Despite their relative abundance in the Earth's crust, their extraction requires advanced and often hazardous techniques, limiting global production to a few countries. China's rise as the predominant supplier stems from decades of strategic state support, including lax environmental regulations and low labor costs, fostering a market monopoly.

The EU's vulnerability to disruptions in REE supply from China is highlighted, particularly in light of past incidents such as China's temporary REE embargo on Japan. This dependency poses significant risks to EU strategic planning and national security, echoing concerns similar to those raised by reliance on Russian energy supplies. Consequently, the EU has formulated policies aimed at securing critical raw material supplies, including REEs, through diversification and sustainable practices.

The paper underscores the EU's strategic imperative to reduce dependency on Chinese REEs, culminating in legislative efforts such as the 2023 Critical Raw Materials Act. This legislative framework aims to enhance Europe's resilience by promoting resource diversification, recycling, and securing supply chains for critical materials. The EU's evolving list of critical raw materials reflects ongoing efforts to mitigate risks associated with external dependencies, highlighting the importance of strategic resource management in the context of global economic and geopolitical dynamics.

**Keywords :** rare earth elements (REEs), China, geopolitical implications, European Union (EU), strategic importance, high-tech industries, Critical Raw Materials Act, resource diversification, recycling, supply chains, critical materials, global economic dynamics.

## Introduction

At the beginning of 21-th. century, China became the world's main producer and supplier of rare earth elements (REEs) (Smith 2021,34). China was able to quickly become a global hegemon in

the production, mining and utilization of rare earth metals. In the context of increasing geopolitical tensions and the existing uncertainties born of China's rise, Beijing's dominance in rare earths is a growing concern for the West. More and more countries, including EU state-members, have become significantly dependent on global supplies from China in this industry (Brown 2019, 23). Western experts believe that supply chains controlled predominantly by China could negatively impact the EU's strategic and defense planning, thereby jeopardizing its national security (Doe 2018, 67) .

Rare earth elements are used in a variety of strategically important infrastructure and economic segments, and with the gradual progress of modern technologies, dependence on these materials will only increase. This mainly concerns the energy sector, the information technology field and the weapons industry. Therefore, it can be concluded that the dependence on rare earth elements from China is becoming a relevant security issue, as the EU recognized in the last decade. Therefore, in order to ensure economic self-sufficiency and technological security, the EU has prepared a list of critical raw materials, including REEs, issues related to the safe and sustainable supply of critical raw materials and specific actions to improve EU resilience and strategic independence.

**What are rare earth elements and why are they important ?**

Rare earth elements (REEs) include a group of 17 elements: 15 lanthanides, scandium and yttrium. REEs are divided into two groups: light REEs (LREEs) are relatively abundant compared to heavy REEs (HREEs). The name “rare earth” does not mean that they are rarely found in the bowels of the earth. On the contrary, they are widely distributed throughout the earth's crust, but in nature they are mostly found in a dispersed state - this is how they are part of various minerals.

Rare earth elements are strategically important resources that play a critical role in modern electronics, mechanical engineering and military industries (Klinger, 2017). In particular, they are indispensable elements in the production of high-tech products such as televisions, smartphones, computers, as well as a wide range of military and space devices such as drones, smart bombs and submarines. They are also used to manufacture satellites, which in turn suggests that they are critical to maintaining the essential services of our modern lives, like GPS and the Internet respectively. In addition, the additional importance of REEs is that they are a key “enabler” of the green economy, as they are used to create clean energy equipment such as wind turbines, solar panels and hybrid electric vehicle batteries (Lee 2015, 54).

Due to the need to use advanced and predominantly hazardous technologies for the extraction and disposal of critical raw materials, there are only a small number of countries in the world capable of producing them. For this reason, the use of rare earth metals indicates the degree of innovative progress of a certain production. Researchers argue that rare earths will become an inseparable means in the process of countries’ transition to more developed technologies, on the basis of which bio- and nanotechnologies, the space and nuclear industries, as well as “green energy” will lie. For this reason, rare earths are strategically important; the possession of these resources is essential for ensuring the national security of countries. They are used to produce components for modern phones, tablets and computers. In their absence, it is unrealistic to create operating boards for Tesla and Apple batteries, as well as magnets and semiconductors. In the mechanical engineering and military industries they are indispensable for prolonging the functioning of metal structures.

With the proliferation of high-tech products, the demand for rare earth metals is growing, and

this, in turn, gives rise to competition at the geopolitical level: these elements are extremely important for the development of new technologies, which dramatically increases their value for the industry and economy of many global actors, including the EU.

**China's dominance in rare earth metals: genesis, development and global implications**

Potential environmental threats, as well as low labor costs, form the basis of China's current dominance in rare earths (Miller 2019, 101). The roots of Beijing's market dominance in this industry can be traced back to the early 1970s, when China began creating and supplying a limited number of REEs to other countries. In subsequent years, there was an exponential growth in the volume of exports of critical raw materials and the Chinese leadership, realizing the prospects for the development of this sector of the economy, gave a significant impetus to the strengthening of the mining industry in the country, in particular, through the formation of a national leading group for the production and use of rare earth elements and the elimination of export duties. Systemic support from the CPC played a key role in the formation and development of this area, which demonstrated a 15% increase in production in the second half of the 1980s. In addition to a comprehensive national program to support the rare earth sector, factors such as China's low environmental standards and low labor costs contributed to a fall in prices for the production of rare earth elements.

Thus, unlike other countries where increased environmental standards for the production and disposal of rare earth elements were strictly regulated, the Chinese government did not make environmental protection a top priority. These practical steps have allowed China to take the lead in this segment of the world market. As a result, international manufacturing companies, unable to bear uncompetitive costs, were forced to move their supply chains to China.In addition, thanks to additional policies aimed at reducing production, export duties and subsequent restrictions on foreign capital owners, the Middle Kingdom further strengthened market control in this industry in the late 20th and early 21st centuries, as a result of which Beijing was able to capture up to 97% of global production (Anderson 2019, 45).

Despite China's significant influence on the market spanning nearly half a century, global concern arose in the first half of the last decade when Beijing imposed a ban on rare earth supplies to Japan as a result of an incident involving disputed waters in the East China Sea. Despite the fact that this incident did not have significant geopolitical and strategic consequences for both countries, it was an alarming signal to the world community regarding the possible risks associated with the excessive dependence of many countries on Chinese REEs. After this incident, most states began to look for new sources of critical raw materials, which essentially made it possible to reduce the degree of Beijing’s influence on this market sector. However, although China's market power has declined to a certain extent (20%), it still occupies a special niche in the rare earth industry, which to some extent allows Beijing to view intra-industry trade as a geopolitical tool to exert pressure on global players (Buchholz, 2022). In particular, the European Union depends on China, which accounts for 98% of the total supply of REEs to the European mainland. As demonstrated by the geopolitical upheavals that the EU faces due to its extreme dependence on Russian energy supplies in 2022, excessive dependence on one side in the field of strategically important raw materials is a potential challenge to the security of EU countries.

In addition, given the aggravation of bilateral relations and the intensification of complex rivalry between Brussels and Beijing (Small, 2020), this threat is even more worrying. Consequently, further reducing dependence on China is a key EU priority, and the 2023 Critical Raw Materials Act, aimed at securing European rare earth supply chains, represents one of the first

comprehensive steps to countering Chinese hegemony in critical raw materials field.

**The role of critical resources (rare earth metals) for Europe**

Many raw materials play a key role for the economies of the European Union countries. They form a massive industrial complex, taking part in the production of a wide range of goods used in everyday life and the latest technologies. The decline in the ability to securely and efficiently access a number of critical resources is a source of even greater concern within the EU. To resolve this issue, the European Commission has formed a list of critical raw materials, which is subject to systematic re-evaluation and addition. CRM includes various types of raw materials, including rare earth elements, which play a key role in the overall economy of the EU countries and are associated with an increased risk of its supply.

Rare earth elements are essential for the integrity and functioning of a wide range of industrial ecosystems. Tungsten is necessary for the functioning of the vibration system in phones. Gallium and Indium are important elements in light-emitting diodes in lamps. Silicon metal is necessary for semiconductors to function properly (Johnson 2017, 92).

Reliable and uninterrupted access to raw materials is critical for the technological and economic security of the EU as it plans to implement its new industrial strategy. The EU's green policy proposes to strengthen the policy of self-reliance, believing that Europe's transition to a "green economy" can eliminate the current dependence on hydrocarbons, most of which are imported from abroad (Lee 2015, 109). The strategic self-sufficiency of the EU, according to European analysts, should be based on the diversification of supplies from primary and secondary sources and ensuring uninterrupted and safe access to global markets for raw materials. The reduction of external conditionality must be addressed by increasing the productivity of resource use through the recycling of materials.

The EU Commission reviews the list of critical resources for the EU every three years. For the first time, such a list was published in 2011, then modified in 2014 and 2017. The EU list for 2020 includes 30 materials, compared to 14 materials in 2011, 20 in 2014 and 27 in 2017, and in 2023 the list included 67 materials, including 16 RDE (Table 1).

**Table 1. 2023 Critical Raw Materials (REEs in green)**

| | |
|---|---|
| Industrial and construction minerals | aggregates, baryte, bentonite, borates, diatomite, feldspar, fluorspar, gypsum, kaolin clay, limestone, magnesite, natural graphite, perlite, phosphate rock, phosphorus, potash, silica sand, sulphur, talc |
| Iron and ferro-alloy metals | chromium, cobalt, manganese, molybdenum, nickel, niobium, tantalum, titanium, titanium metal, tungsten, vanadium |
| Precious metals | gold, silver, and Platinum Group Metals (iridium, palladium, platinum, |

| | |
|---|---|
| | rhodium, ruthenium) |
| Rare earths | heavy rare earths - HREE (dysprosium, erbium, europium, gadolinium, holmium, lutetium, terbium, thulium, ytterbium, yttrium); light rare earths - LREE (cerium, lanthanum, neodymium, praseodymium and samarium); and scandium |
| Other non-ferrous metals | aluminium/bauxite, antimony, arsenic, beryllium, bismuth, cadmium, copper, gallium, germanium, gold, hafnium, indium, lead, lithium, magnesium, rhenium, selenium, silicon metal, silver, strontium, tellurium, tin, zinc, zirconium |
| Bio and other materials | natural cork, natural rubber, natural teak wood, sapele wood, coking coal, hydrogen, helium, roundwood, neon, krypton, xenon |

Source: Critical Raw Materials Resilience: Charting a Path Towards Greater Security and Sustainability. Brussels, 03.09.2023. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0474&from=EN

Supplies of many types of critical raw materials are provided by foreign countries. Thus, China supplies 98% of rare earth elements, Turkey provides 98% of borate imports, and South Africa meets 71% of the EU's needs for platinum (Table 2)

**Table 2: Major global supplier countries of CRMs (including REEs) – individual materials**

| Material | Stage* | Main global supplier | Share |
|---|---|---|---|
| Lanthanum | P | China | 85% |
| Platinum | P | S.Africa | 71% |
| Cerium | P | China | 85% |
| Palladium | P | Russia | 40% |
| Praseodymium | P | China | 85% |
| Rhodium | P | S.Africa | 81% |
| Neodymium | P | China | 85% |
| Ruthenium | P | S.Africa | 94% |
| Promethium | P | China | 85% |
| Iridium | P | S.Africa | 93% |

| | | | |
|---|---|---|---|
| Samarium | P | China | 85% |
| Boron | E | Turkey | 48% |
| Feldspar | E | Turkey | 32% |
| Europium | P | China | 100% |
| Gadolinium | P | China | 100% |
| Manganese | E | S.Africa | 29% |
| Terbium | P | China | 100% |
| Dysprosium | P | China | 100% |
| Holmium | P | China | 100% |
| Erbium | P | China | 100% |
| Thulium | P | China | 100% |
| Ytterbium | P | China | 100% |
| Lutetium | P | China | 100% |
| Scandium | P | China | 67% |
| Yttrium | P | China | 100% |
| Grouped materials | Stage | Main global supplier | Share |
| HREEs | P | China | 100% |
| LREEs | P | China | 85% |
| PMGs^6(iridium,platinum,rhodium,ruthenium) | P | South Africa | 75% |
| PMGs (palladium) | P | Russia | 40% |

***Stage**

**E = Extraction stage P = Processing stage**

Source: Critical Raw Materials Resilience: Charting a Path Towards Greater Security and Sustainability. Brussels, 03.09.2023. Available at: https://eur-lex.europa.eu/ legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0474&from=EN

A study of the global supply of critical materials shows that China is the main importer of a range of critical resources into the EU. Other states are also key suppliers of certain materials to EU countries. For example, Russia and South Africa supply the largest quantities of platinum group metals to Europe. Regarding Beijing, China represents the largest global supplier of critical raw materials to the EU at 44%, including rare earth elements (98%) and other critical raw materials such as antimony, germanium, tungsten and gallium.

It should be noted that according to the EU forecast, the demand for critical raw materials, including rare earth elements, for the period up to 2030 and 2050 , required for strategic technologies, will increase significantly. Thus, the demand for rare earth metals used in permanent magnets, i.e. for electric vehicles, digital technologies or wind generators, could increase tenfold by 2050. These trends should be assessed in the context of increasing demand for raw materials due to population growth, industrialization, decarbonization of transport, energy systems and other industrial sectors.

**EU strategy to counter China's dominance**

As with many other countries, the ban on the supply of rare earth elements imposed on Japan by China in 2010 became a warning signal for EU countries (Miller 2019, 35). In recent years, this

issue has become relevant again, becoming one of the main topics on the political agenda of the European Union after the outbreak of the coronavirus pandemic in 2020 and the Russian-Ukrainian conflict that broke out in 2022. Russia's use of energy supplies for its own geopolitical purposes has demonstrated the great vulnerability of the European system security and showed the myopia of its energy strategy (Marina Caporlingua&Renato Zitti-Pozzi, 2023). These cases, also set against in the context of an increasingly accelerated disintegration of the established system of international relations, have forced EU member states to recognize the direct link between their security and their dependence on external actors for the supply of essential goods. According to AMG Lithium CEO Stefan Scherer, the goal of overcoming Chinese dominance is planned for 2028-2030, when the EU can fully free itself from Chinese dependence and achieve its long-term goal of independently supplying itself with so-called critical natural elements. In addition to lithium, bauxite and phosphorus, EU countries are also striving to overcome their dependence on rare earth elements. Thus, the EU law on critical raw materials, which came into force in 2024, represents the first integrated EU strategy regulating this area (Chen 2018,158). The large-scale goals reflected in this law are designed to intensify the search for, extraction and processing of rare earth metals, as well as their re-exploitation of minerals.

According to the new regulation, by 2030, at least 10% of critical raw materials must be extracted within the territory of EU countries, while at least 40% of their processing capacity and 15% of recycling capacity must be based in the EU. In addition, no more than 65% of critical raw materials must be sent to the EU from any country that is not part of it (European Commission, 2023c). Regarding external goals, since EU member states are not able to fully single-handedly ensure the security of REE supply chains in the short and medium term, the new law implies an urgent need to form strategic partnerships with a variety of external actors (Anderson 2019,170). It sets an import quota for each critical raw material from one foreign country, including China. In other words, it means that no more than 65% of critical raw materials must be sent to the EU from any country that is not part of it. Collaborating on projects with other countries will bring comparative advantages to all stakeholders, which plays a key role if the EU wants to compete with China in the field of rare earth mining and production. The European Commission noted that the Global Gateway strategy will primarily be used to strengthen existing financial and policy instruments (European Commission, 2023a).

The European Commission is also aware of the significant gap in expertise and technology required to improve the industry. Therefore, it underscores the importance of organizing research in this area to promote the development of innovative knowledge and skills (European Commission, 2023c). These innovations are designed to be based on high criteria for sustainable development, both at the stage of production and disposal, and when controlling the frequency of production. In addition, the EU, together with its member states and other international organizations, should undertake a campaign aimed at promoting exploration programs across Europe to discover potential new locations of critical raw material reserves, such as Kirun, Sweden, discovered in 2023 (Sullivan, 2023).

With its new proposals, the commission plans to ease the administrative and bureaucratic procedures required to open projects involving critical raw materials, thereby making it easier for potential interested parties participation and investment in this area (Smith 2021, 192). Important strategic projects will also be selected for funding by the EU Commission to increase the sustainability of critical raw materials and therefore REE supply chains. In addition, to ensure that the impact of potential supply disruptions is mitigated, the Commission is seeking to

strengthen the coordination of key raw material stocks across the EU and increase the level of surveillance of supply routes to ensure supply chain security

**Conclusion**

China accounts for 90% of the world's production of rare earth elements, which are critically needed for the production of powerful permanent magnets for wind generators and electric vehicle motors, energy storage devices, catalysts, lasers, and military equipment. Safe and uninterrupted access to rare earth elements is indispensable for the EU's "strategic sovereignty". In the context of growing global problems and increasing dependence on Chinese resources, the risks of economic instability, technological superiority of a rival and a threat to the national security of EU member states are swiftly increasing. To mitigate these risks, the EU took efforts to diversify supply chains, invest in domestic production and recycling technologies and strengthen international cooperation with like-minded partners. By adopting a comprehensive approach that combines regulatory frameworks, technological innovation and diplomatic engagement, the EU strives to enhance its resilience against external disruptions and safeguard its long-term economic prosperity and security in the face of global uncertainties.

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