About the Article

Europe's green and defence ambitions are built on a fragile foundation of foreign-controlled raw materials. Lenín Navas García investigates the EU's deep dependence on rivals like China for critical raw materials essential to both the energy transition and military production. The article assesses recent EU policies and warns that fragmented investment and limited financial tools risk leaving Europe exposed. Without bolder coordination and smarter partnerships, supply chain resilience will remain an elusive goal.

About the Author

Lenin is a Master's candidate in Peace and Conflict Studies with five years of experience working in global environments. He has conducted research on sustainability, security, and geoeconomics, and managed projects in conflict zones in Latin America. His interests include geoeconomics and international security, focusing on critical raw materials and the European defense industry.

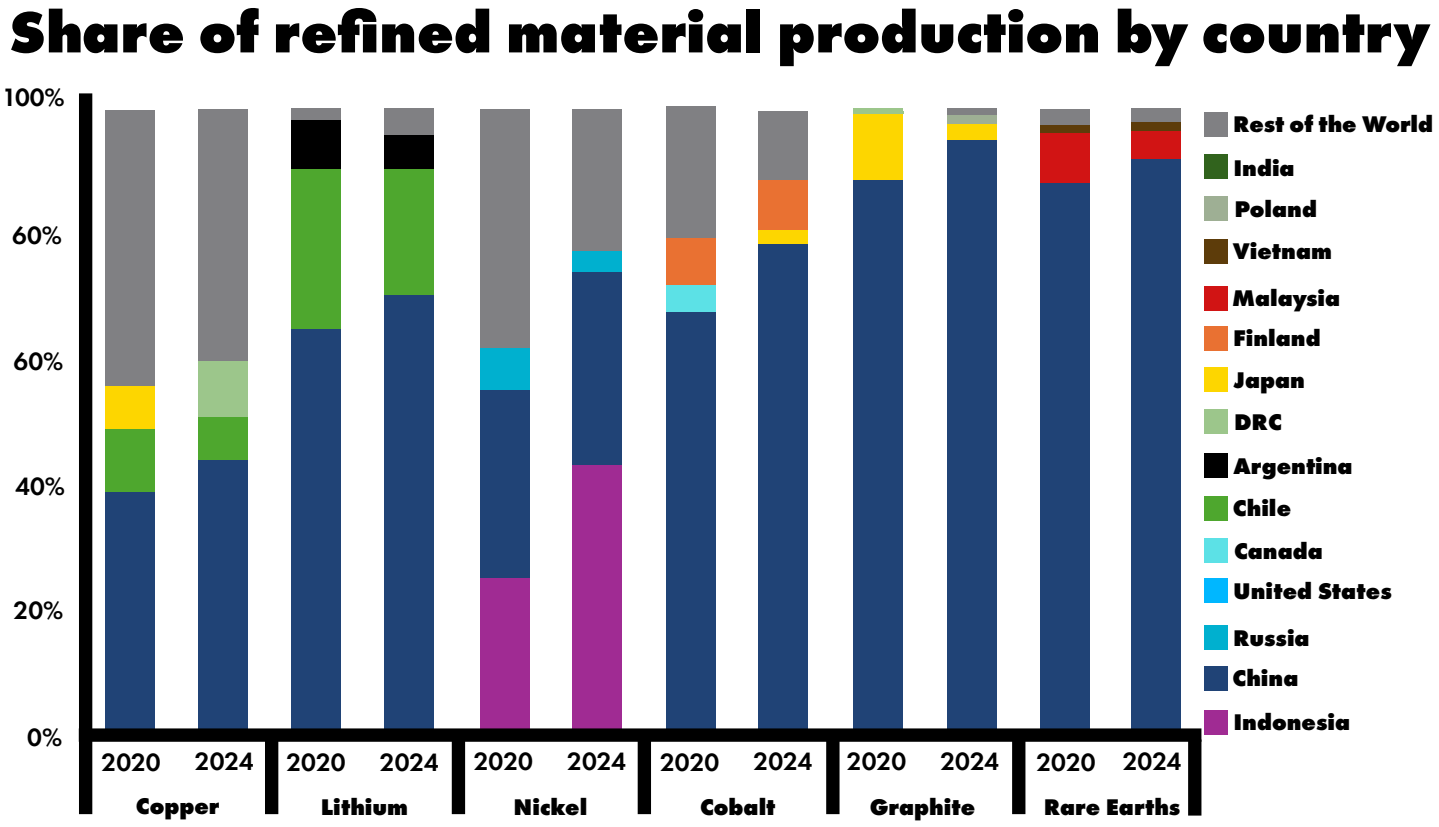
1. Introduction

In September 2024, the European Union received a new wake-up call in the form of the Draghi Report (2024). This document, produced by the former Italian Prime Minister, analysed the EU's weaknesses in areas that affect its economic competitiveness and revealed the terrible truth that the EU must act soon if it wants to ensure its security and prosperity. Although the report drew attention to many sectors, one stands out because of its central importance to the European economy: the security of the critical raw materials (CRMs) supply chain. Therefore, this paper answers the question "how Europe can make its supply chain more resilient?"In order to answer that question, this essay analyses the EU's vulnerabilities in the supply of CRMs needed for energy transition technologies and the defence industry. It begins by summarising the current situation of these sectors, then looks at the measures the EU has taken to improve their resilience, and concludes by identifying three areas where more can be done: Financing, Foreign Investment and Risk Guarantees.

Critical Raw Materials:
minerals vital for high-tech industries, defence, and energy transition.

2. There is no security without CRMs

Since the beginning of the war in Ukraine, defence has been at the centre of European political debates. The war has highlighted the weaknesses of the EU defence industry, including an over-reliance on US equipment and a lack of manufacturing capacity for materials ranging from ammunition to strategic enablers (George et al., 2025). The EU and its member states are trying to reduce this dependency through new investment in the defence industry. In this sense, the "ReArm Europe/Readiness 2030" initiative (Clapp et al., 2025) and Germany's pledge to drastically increase its defence budget (Ford, 2025), are steps in the right direction to create a truly autonomous European Defence Technology Industrial Base (EDTIB).However, it is not enough to invest in new industrial capacity. Even if European countries solve major problems in creating this industrial base, such as the lack of coordination in procurement, that leads to market fragmentation and therefore hinders the possibility of economies of scale (Rensbergen, 2024), there is a major weakness in the base of the defence industry: the supply of CRMs. Raw materials such as aluminium, tungsten, nickel and gallium are used in the manufacture of military equipment, including weapons, sensors and communication systems. The problem here is that "Western states' potential adversaries have, in some cases, a near-monopoly on the supply of vital materials that (...) are used in current defence platforms" (Hackett et al., 2025, p. 2). For example, rare earth elements (REE) are used extensively in the manufacture of electronic systems that are central to the combat capabilities of the F-35 Lighting II, an aircraft purchased by many European countries. According to the US Department of Defence, more than 400 kilogrammes of REE are required to manufacture an F-35 Lighting II (Lopez, 2024). This use of REE can be found to a greater or lesser extent in virtually all modern war equipment that Europe needs. Currently, China accounts for 60% of REE extraction and 85% of processing capacity in the world, supplying 46.3% of European imports of these materials, while Russia is in second place with 28.4% (Eurostat, 2025). In other words: Western rivals can use Europe's dependence on rare earth supply to force political concessions, disrupt the supply chain and affect Europe's capacity to produce technologically advanced military equipment. This is not a fictional scenario, as China has already done so after the start of the trade war with the US, imposing export controls on 7 rare earths in response to the Trump administration's tariffs (Baskaran & Schwartz, 2025).



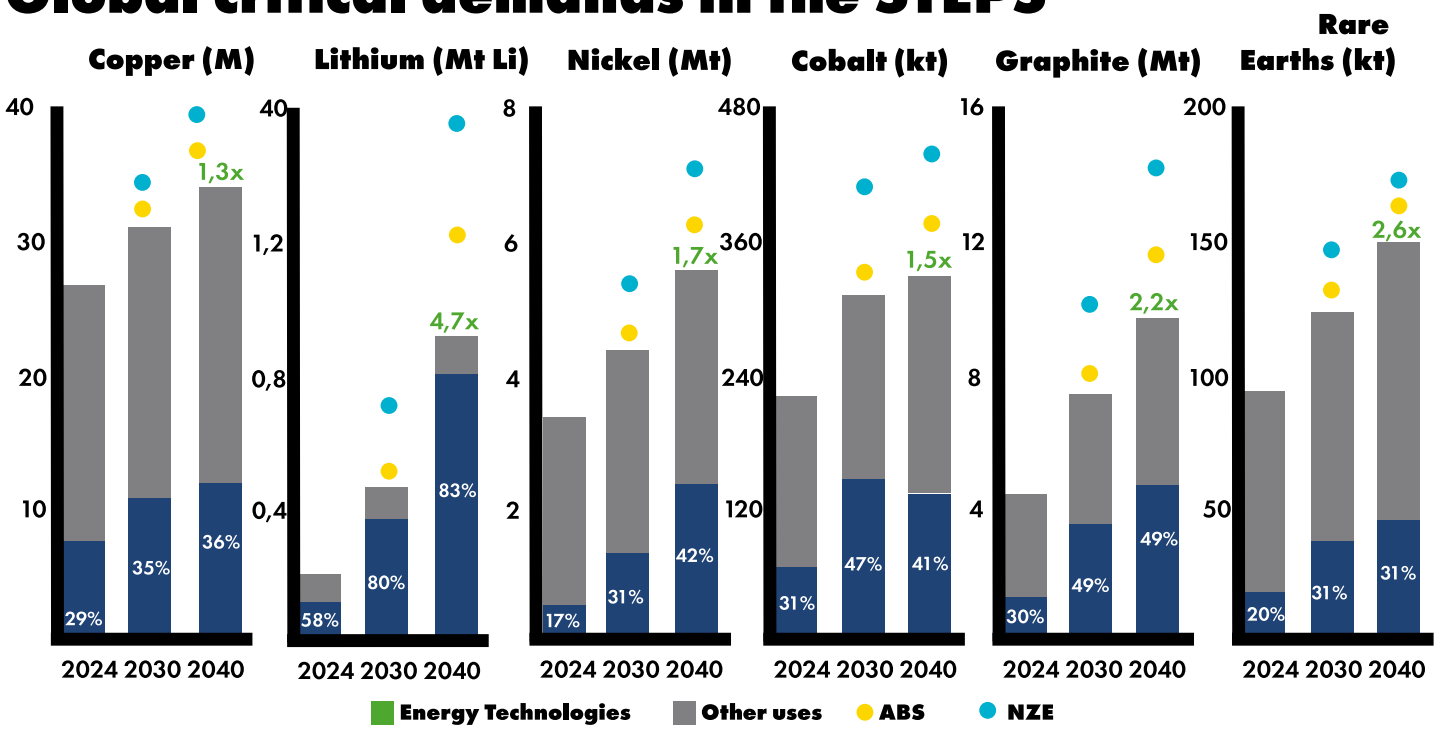
Notes: DRC = Democratic Republic of the Congo. Graphite is based on battery grade spherical and synthetic graphite. Rare earths are magnet rare earths only.

Figure 1: Table showing the Share of refined material production by country, Source: IEA, "Critical Materials Outlook 2025"

This vulnerability in the rare earth supply chain is present in almost all materials classified by NATO as critical for defence (NATO, 2024) and has its origins in the European model of raw materials procurement. Due to the environmental costs and risks associated with the mining of REEs, these activities have been relocated to third countries in recent decades. This model, in which mining has been concentrated in resource-rich countries, mostly in the Global South, and processing in countries such as China, has created a major vulnerability in the overall defence supply chain (Draghi, 2024, p. 50). This can be disrupted at any time by European rivals exploiting their geoeconomic advantage or simply by governance failures in resource-rich countries, such as the Democratic Republic of Congo (Rolley & Njini, 2025).

3. The material base of the energy transition

The dependence on external powers for the supply of CRMs is even greater in the case of energy transition technologies. Although large quantities of CRMs are required for military purposes, they only account for a small proportion of total European consumption. The EU could therefore protect itself, at least temporarily, against the risk of disruption to its supply chain by building up strategic stocks of the most important materials for the manufacture of core systems and weapons (Carrara et al., 2023, p. 189). However, for energy transition technologies such as EVs, photovoltaics and wind turbines, the use of CRMs is massive and unavoidable. The Stated Policies Scenario (STEPS) of the International Energy Agency (IEA) assumes a significant increase in demand for CRMs. This growth will be fuelled primarily by the increasing adoption of energy transition technologies whose production is highly dependent on these materials. Demand for cobalt and REE is expected to increase by 50-60% by 2040. Meanwhile lithium demand would surge fivefold, and even copper will experience a rise of at least 30% (IEA, 2025, p. 89). These figures could be even higher if countries take action to meet their emissions targets or do enough to reach net zero emissions by 2050.



Notes: STEPS = Stated Policies Scenario; Mt = Million tonnes; kt = kilotonnes; APS = Announced Pledges Scenario; NZE =NetZero Emissions by 2025 Scenario
The figures for copper are based on refined copper (extending direct-use scrap). Those for rare earth elements are for magnet rare earth elements only.
Growth rates (in green) are between 2024 and 2025)

Figure2: Table showing the Share of refined material production by country, Source: IEA, "Critical Materials Outlook 2025"

In the case of the EU, the adoption of renewable energies and the electrification of the transport system is seen as a security issue. Especially after the Ukraine war disrupted the supply of cheap gas from Russia and caused an energy price shock (Jan Christoph Steckel et al., 2022, pp. 19–21). Therefore, creating clean, reliable and secure energy sources is a political priority set out in the revised Renewable Energy Directive (Renewable Energy Directive, 2023), which requires at least 42.5 % of the EU's energy consumption to come from renewable sources by 2030. This means that in order to achieve its goals, the EU must invest heavily in the production and mass procurement of solar panels, wind turbines, electric cars and lithium. Currently, the production of these technologies is heavily concentrated in China. This country dominates both the upstream (extraction, processing and refining) and downstream (manufacturing) segments of the global CRMs supply chain. This dominance has been built up in recent decades through a combination of incentives and direct investment (Carrara et al., 2023, p. 149). In a group of strategic energy-related minerals analysed by the IEA, "China is the dominant refiner for 19 of the 20 minerals analysed, holding an average market share of around 70%" (IEA, 2025, p. 8), while the country also accounts for 80% of global solar PV production capacity (Pacheco, 2024) and 75% and 75% of EV batteries (IEA, 2025, p. 53). These examples show how dependent Europe is on China for the energy transition. With the exception of the recycling of CRMs, the opportunities to establish an independent supply chain are limited. The development of production capacities for the energy transition would require expertise in the hands of Chinese companies. Once these factories are established, they would be dependent on CRMs processed in China and mined by Chinese companies in resource-rich countries. This creates a scenario where European policymakers need to act wisely to make supply chains resilient and the industry competitive vis-à-vis China.

4. European actions to achieve resilience

Faced with this clear diagnosis of the threats to the CRMs

supply chain, European policymakers have launched a series of measures to strengthen resilience. The cornerstone of European policy in this context is the Critical Raw Materials Act (Critical Raw Materials Act, 2024). Under the Critical Raw Materials Act (CRMA), the EU stipulates that by 2030, at least 10% of CRMs consumed, 40% of CRMs processed and 25% of CRMs recycled must originate from the EU. In addition, no more than 65% of the supply of a material may originate from a single country outside the Union. These targets are intended to reduce dependence on China and strengthen the EU's control over its supply chain. In concrete terms, this initiative has resulted in two important measures. Firstly, the signing of "Strategic Partnerships" with resource-rich countries, particularly in Africa, to create the framework for accelerating European investment in the extraction and processing of CRMs. Secondly, the approval of 47 "Strategic Projects" in Europe under the CRMA, supported by the European institutions and Member States to obtain funding, with streamlined approval timelines of a maximum of 27 months for CRMs extraction projects and 15 months for other projects. Permitting in the EU can normally take up to 10 years (European Commission, 2025). These two aspects of the European strategy are important, but not sufficient. On the one hand, the strategic partnerships have not been as effective as Brussels expected. Some, such as the partnership with Norway and Serbia, have been useful for the development of projects related to CRM, but most of them have not produced concrete results after their signing, lacking effective coordination tools for new investments (Gherasim, 2024, pp. 20–25). The risks associated with investing in countries with low levels of governance, the low profitability and the lack of financial support and incentives from the EU drive private capital away from investing sufficiently (Karkare, 2025), leaving the market to Chinese companies supported by their government with subsidies and loans (Escobar et al., 2025, p. 6). On the other hand, the selected strategic projects will avoid the obstacle of lengthy approval periods for CRM-related permits. However, this in itself does not constitute a business case for investment in new projects. As the example of China shows, both upstream and downstream aspects must be taken into account when building CRM supply chains. Otherwise, Europe will have extracted and processed materials, but without a military or energy transition technologies industry that can utilise them. The result would be that the materials would go back to China and be used there for the production of electric cars, photovoltaic systems and batteries.

CRMs and the cost of producing all raw materials in Europe would make it a self-defeating policy

5. What to do? Europe's path to resilience

Given this scenario, there are two aspects of the European CRMs strategy that have the potential to greatly improve its effectiveness in building resilience in the supply chain. These are, firstly, the expansion and coordination of financial support for CRMs projects within and outside Europe, secondly, the creation of investment frameworks that encourage the participation of European private capital in extraction and processing projects in resource-rich countries.

5.1 Financial Support for European Companies

The first step would be to improve access to funding for European CRMs projects. Due to the institutional set-up of the EU, it lacks the financial power that countries like China and the United States can mobilise through fiscal policy and direct subsidies. Therefore, some Member States have taken responsibility for providing funding through instruments such as the €1 billion Made in Italy Fund (Fonte & Amante, 2023) and the €1.1 billion fund set up by Germany through its development bank KfW (Kowalcze, 2024). However, these types of uncoordinated efforts pale in comparison to the $387 billion provided for the energy transition through the US Inflation Reduction Act, which includes tax credits and loan guarantees (Lazen-

by, 2023). Therefore, if the EU wants to be competitive in the CRMs supply chain, it should start coordinating its financial capacity to offer concrete benefits to its companies. Tax credits and loans are a good start to support the Capital and Operational Expenditures of mining and processing companies. Also, "a joint funding scheme able to support those companies which are deploying projects in countries where there is no national support scheme" (Gherasim, 2024, p. 31) would complement national and European efforts. Finally, to reduce uncertainties in the industry due to price volatility or dumping attempts by rival countries, the EU could create contracts for difference (CFDs) that guarantee producers a minimum price and sales volume (Sørensen, 2024, p. 13). All these measures would require a more proactive involvement of the EU institutions and the use of its budget to fund them, as well as the integration of initiatives such as Global Gateway and the Team Europe approach.

5.2 Promotion of Overseas Investments

It is now clear that Europe "will never be entirely self-sufficient in supplying the critical raw materials it requires and will always rely on CRM imports" (Sørensen, 2024, p. 4). Although policies such as the CRMA can help to increase resilience, they will never achieve full autonomy as the geographical distribution of CRMs and the cost of producing all raw materials in Europe would make it a self-defeating policy. Furthermore, the current trend for resource-rich countries is to use them as a tool for industrialisation by restricting the export of raw materials forcing the creation of more complex processing operations within their borders (Gherasim, 2024, pp. 13–14). However, it is possible to de-risk the supply chain and increase the competitiveness of European industry through European investment in mining and processing projects in resource-rich countries.This strategy will follow the example of China, that, even if it cannot mine strategic raw materials directly on its territory, nevertheless has access to mining and processing abroad through direct investment in resource-rich countries as part of the Belt and Road Initiative (BRI). In this way, China invested 22 billion dollars in overseas metal and mining companies in 2023 alone (Wang, 2025), eclipsing Europe's national initiatives. To reverse this situation, Europe should focus on two areas. First, providing follow-up to the Strategic Partnerships for Critical Raw Materials, including dispute settlement procedures and concrete measures to facilitate and protect European investment in resource-rich countries. Second, international financial institutions should be utilised to provide risk insurance to European capital, as extractive industries are very long-term ventures that are vulnerable to disruption in countries with low levels of governance (Sørensen, 2024, pp. 11–12). Finally, and perhaps more crucially, we need to understand and recognise the objectives of resource-rich countries and their governments. Most of these countries are unwilling to revive extractivist dynamics that has not brought real social and economic improvement to their societies. Therefore, EU efforts should honour the word "partnership" and take an "ecosystem view" (Gherasim, 2024, p. 32) that offers benefits in other areas such as energy and transport infrastructure, sanitation and education for the population.

6. Conclusion

Achieving resilience in the CRMs supply chain is not an easy task. The geographical distribution of materials, the fierce competition of rival powers and the fragmented nature of the initiatives taken so far are all factors that hinder European objectives. However, as with many other challenges facing the continent, the key in this case lies in the coordination and mobilisation of resources at the European level. European efforts should focus on all parts of the supply chain simultaneously. Without the direct involvement of European companies in the extraction of critical raw materials in resource-rich countries, it is impossible to secure supply for processing facilities on the EU. If Europe does not create enough processing capacity, the mined materials will end up in China even if they are extracted by European businesses. And if there are not industries in energy transition technologies or defence that can absorb the supply of processed materials, we will not be able to create the demand that would make a business case for the huge investment that the CRMs sector needs.

Therefore, neglecting one part of the supply chain would threaten the efforts made in the other parts.

The good news is that Europe has the financial and technological resources to secure its supply chain. This can be achieved through financial incentives, investment guarantees and risk insurances that allow private capital to flow into the sector and create value for both Europe and resource-rich countries. However, without the political willingness to mobilise these resources, the result could be that the continent is left with a defence industry that can easily be disrupted by potential rivals, and an energy transition dependent on third countries.

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