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Securing critical raw material (CRM) value chains – a prerequisite for Europe's technological resilience

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At the heart of economic security, technological resilience is a backbone of the European Union's (EU) competitiveness. The EU's energy and digital transitions depend on critical raw materials (CRM). However, their supply is hampered by export restrictions challenging EU industries. CRM is a geopolitical issue, highlighting Sino-American technological rivalry. While China is pulling the strings, constraining exports of CRM, the US is doing so by limiting high-end technological products.

China did not refrain from displaying its coercive power related to its dominance on CRM in the past, and Donald Trump's interest in Greenland and Ukraine regarding their (alleged) mining resources hardly conceals the fact that the US is growing increasingly nervous about its own mineral dependence on China. US export controls released in December 2024 are aimed at restricting China's capability to produce advanced semiconductors for military applications, and rules put in place in January 2025 are tightening export controls to limit China's ability to obtain advanced computing semiconductors. Measures introduced by the US by ricochet also constrain the EU insofar as its goods contain "critical" US inputs. Furthermore, US pressure on its allies in this regard is showcased through export restrictions of advanced chip-manufacturing equipment to China, the US, Japan and the Netherlands adopted in February 2023.

In response to a comprehensive package of global US import duties, China introduced export restrictions on rare earths and magnetic materials on 4 April 2025. This led to massive shortages in Western industries. Automotive, semiconductor and defence sectors in the EU have been particularly affected. These examples show that the EU cannot possibly elude the Sino-American rivalry that constitutes the geopolitical backdrop in which states are likely to evolve in the decades to come. France and Germany, Europe's main economies, share this diagnosis, but while France prioritises a state-geared industrial policy, Germany follows a market-driven path. This publication is based on a workshop at the Genshagen Forum 2025 that tackled economic security with a focus on CRM. Discussions concluded that, in order to "de-risk" by reducing one-sided dependencies, the EU needs to build its own value chains, further innovation and diversify its suppliers.

Building up European CRM value chains

CRM are contained in wind turbines, semiconductors and precision-guided ammunition. They are thus a prerequisite for the EU's industrial competitiveness and sovereignty, yet at the same time they are geopolitical choke points. In particular, shortages affect the car industry, energy and storage technology, the defence industry and the high-tech and chemical sectors. It is noteworthy that the EU imports over 90% of its critical raw materials often from a small number of politically unstable or strategically rival countries of origin such as China (where, among others, 100% of the rare earth elements (REE) used in permanent magnets are refined), the Democratic Republic of Congo (where 63% of the world's cobalt is extracted) and Turkey (the origin of 98% of the EU's supply of borate).

Against this backdrop, the development of its own CRM value chains is becoming central for Europe's resilience. The EU's Critical Raw Materials Act (CRMA), adopted in

2024, addresses this issue. It sets specific targets for the year 2030: 10% domestic production, 40% processing in the EU and 25% recycling. These targets – which concern strategic raw materials (those most crucial for strategic technologies used for green, digital, defence and aerospace applications) – are ambitious, but politically necessary. Only through a targeted European CRM policy can the EU reduce one-sided dependencies, counteract geopolitical blackmailing and thus increase its own capacity to act.

As already called for in the Draghi Report in September 2024, without the creation of common European raw materials industries, from exploration and refining to end processing, the EU remains geopolitically vulnerable. The establishment of continental supply and value chains is a geostrategic imperative. New political, economic and financial instruments need to be made available as global CRM markets no longer operate according to market economy criteria. Instead, the state is called upon to act as a strategic investor if Europe wants to reduce its dependencies. State actions include, for example, the introduction of price caps and stockpiling. China extracts 70% and processes 90% of the world's rare earths. It uses this advantage as leverage for geoeconomic purposes. Every three years, the EU conducts a CRM assessment to evaluate the supply risks and economic importance of raw materials used in Europe. From 2020 to 2023, the EU's share of supply from China of Heavy Rare Earth Elements (HREEs) increased from 86% to 100%, and the EU's share of supply from China of Light Rare Earth Elements (LREEs) increased from 85% to 86%, according to this assessment. This is why the EU is striving to eliminate CRM dependencies on China. Japan can be cited as a role model in this regard, having reduced its import dependence on Chinese rare earth elements from 90% in 2010 to 60% in 2023.

Gaining leverage through innovation

A second focus lies on greater CRM sovereignty through research and innovation. The global CRM landscape is changing, and Europe could benefit from this. While China is tied to traditional extraction and processing technologies due to existing lock-in effects, Europe can develop alternative technologies, more efficient production processes and new materials through breakthrough innovations.

Whether new recycling methods, biohydrometallurgical processes using microorganisms to extract metals from ores, waste streams and end-of-life products, or the use of artificial intelligence (AI) to optimise deposit exploration and processing, technological innovations offer real opportunities to increase security of supply while pursuing environmental and social sustainability goals. The political focus on technological sovereignty must also include upstream value creation.

While initiatives such as the European Raw Materials Alliance (ERMA), the EU Chips Act, the EU Battery Regulation and financial support in the context of the Horizon Europe programme for respective research (e.g. for REE and magnets such as the REMHub) already exist, new clusters of excellence for raw materials research, procurement programmes promoting innovation and targeted support for start-ups in the field of CRM technologies (e.g. in the area of critical metal substitution or recycling processes) need to be substantially furthered. France is already pursuing a more active innovation policy in this area with targeted government coordination. Germany, by contrast, has relied more heavily on market-driven impulses to date. However, technological resilience requires a new interplay between government, industry and science – in France, Germany and at the European level.

Thinking strategically by fostering partnerships

A third focus takes stock of geopolitical instruments for securing raw materials. International competition has intensified dramatically. China is acting in an increasingly aggressive manner, controlling a large part of global processing capacities and using export controls as a targeted instrument to further geopolitical goals. Under the new Trump administration, the US is pursuing disruptive raw materials diplomacy, securing access to deposits worldwide – from Ukraine to the Democratic Republic of Congo – and making strategic use of trade agreements to secure raw materials. Europe's business model, relying on an open and rules-based global trading system, is under enormous pressure. Establishing strategic raw material partnerships with third countries is therefore becoming a foreign trade priority, combining political stability, environmental standards and a level playing field.

The CRMA includes strategic projects with non-EU partners (such as Uzbekistan, Greenland, Ukraine and the Democratic Republic of Congo), which must be coherent and be considered in the long term, taking into account both the interests of the EU and suppliers. CRM diplomacy can no longer merely be deemed a matter of technocratic paperwork, but must be strategically enshrined in foreign policy.

While France relies on geopolitical partnerships and centrally coordinated economic missions, Germany is focusing on private investment and instruments for foreign trade promotion. However, only a coordinated European approach will help to build up structurally resilient and diversified CRM supply chains. Whether embedded in the EU's Global Gateway Strategy or within the G7 or the OECD, diversification initiatives should be launched to increase the EU's resilience with regard to CRM. Partnerships could be sought with countries such as Japan, South Korea, Canada and Australia. The importance of this debate was reflected by the decision taken by the G7 in Canada in June 2025 to develop secure supply chains for strategically important CRM to become less dependent on authoritarian states such as China.

It is important to acknowledge that transatlantic CRM cooperation is under increasing pressure against the backdrop of the new Trump administration's transactional raw materials diplomacy and that formats established under the Biden administration such as the Minerals Security Partnership (MSP) are now stalling. This limits the prospects of G7 coordination in the domain of CRM. The bilateral raw materials agreement concluded between Canada and Germany at the end of August 2025, showcasing the difficulty to address the challenges of CRM cooperation at the multilateral level, is certainly an expression of this complex situation.

France and Germany need to push for a raw materials strategy

Technological resilience cannot be taken for granted but is the result of strategic decisions. Three key areas of action therefore need to be addressed as a matter of priority: first, the establishment of European value chains to reduce strategic dependencies; second, the promotion of raw material-related innovations to open up new production channels; and third, actively shaping global partnerships and supply chains through strategic raw materials diplomacy.

The Franco-German perspective shows that different political traditions do not have to be an obstacle but can complement each other in a joint European raw materials strategy. In fact, at the Franco-German Ministerial Council on 29 August 2025, France and Germany sketched out different economic flagship projects that reflect both countries' ambitions, one of them being a joint initiative on raw materials, aiming notably to reap "the benefits of the CRM aspects of the Circular Economy Act – establishing a centre of excellence". The time to act is now, before others create facts on the ground. While this urgency seems to have been understood, the EU needs to do more than just pay lip service to this matter.

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