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The EU's Rare-Earth Predicament: Reconciling Collective Interests with Local Costs

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Preface

The mission of the Swedish Agency for Growth Policy Analysis is to evaluate the impact of government policies on sustainable growth at regional and national levels. We also provide data and recommendations for the development, review, and streamlining of government policies.

This report analyses the EU's challenges in reducing rare-earth import dependence for the green, digital, and defence transitions. It argues that geological scarcity is not the principal explanation for Europe's limited rare-earth capacity and identifies an implementation-side collective-action problem: Union-wide strategic benefits are dispersed while environmental, social, and land-use costs are concentrated locally. The problem is examined through three Swedish case studies—Per Geijer, Norra Kärr, and Olserum. While the Critical Raw Materials Act and RESourceEU strengthen project development, financing, diversification, circularity, and supply-chain resilience, they do not fully resolve this distributional asymmetry. The report evaluates three complementary policy options: greater weight for Union-wide strategic interests, alternative resilience measures, and greater internalisation of local costs, concluding that a balanced combination offers the most viable path to stronger European resilience.

The report is written by former staff members Josefin Videnord and Håkan Nordström.

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Abstract

This report analyses the EU's challenges in reducing rare-earth import dependence for the green, digital, and defence transitions. It argues that geological scarcity is not the principal explanation for Europe's limited rare-earth capacity and identifies an implementation-side collective-action problem: Union-wide strategic benefits are dispersed while environmental, social, and land-use costs are concentrated locally. The problem is examined through three Swedish case studies—Per Geijer, Norra Kärr, and Olserum. While the Critical Raw Materials Act and RESourceEU strengthen project development, financing, diversification, circularity, and supply-chain resilience, they do not fully resolve this distributional asymmetry. The report evaluates three complementary policy options: greater weight for Union-wide strategic interests, alternative resilience measures, and greater internalisation of local costs, concluding that a balanced combination offers the most viable path to stronger European resilience.

1. Introduction

The EU's rare-earth predicament contains a striking paradox. The European Union regards secure access to rare earths as increasingly important for its green, digital, and defence transitions, yet remains highly dependent on imported rare-earth materials and permanent magnets, particularly from China. This dependence is not simply the result of geological scarcity. Europe possesses substantial identified rare-earth resources. Yet the EU has struggled to translate this geological potential into operational supply, a difficulty rooted in a collective-action problem: while the strategic and economic benefits of greater European capacity would be shared across the Union, the environmental, social, and land-use costs of mining and processing would be concentrated in the communities and territories that host these activities.

The Union has responded to growing supply-security concerns through the Critical Raw Materials Act (CRMA) and the RESourceEU Action Plan, which establish benchmarks and supporting instruments for domestic extraction, processing, and recycling, as well as diversification, financing, and supply-chain resilience. These initiatives represent an important shift from strategic diagnosis towards implementation. Yet they do not fully resolve the underlying distributional problem: how can the EU strengthen rare-earth supply resilience when the strategic benefits are shared across the Union but the costs of the projects needed to achieve them are concentrated at the local level?

This problem is reinforced by the EU's system of multi-level governance. Under Article 5 of the Treaty on European Union (TEU), the principles of conferral, subsidiarity, and proportionality define both the scope and the exercise of Union competences. The EU can establish common objectives, legislate within its conferred competences, designate Strategic Projects, coordinate financing, and support supply-chain development. It does not, however, become a general permitting authority for individual mines, processing facilities, or related infrastructure. Project approval remains embedded in Member State legal and administrative systems, through which both national law and applicable EU law are applied, including rules governing land use, environmental assessment, water protection, consultation and, where relevant, Indigenous rights. EU-level strategic priorities must therefore be implemented through national and subnational institutions responsible for assessing individual projects and their concrete environmental, social, legal, and economic implications.

The report examines this tension through three Swedish rare-earth projects: Per Geijer, Norra Kärr, and Olserum. Together, they illustrate different ways in which a common European strategic objective encounters local implementation constraints. Per Geijer highlights conflicts involving Sámi reindeer herding, Indigenous rights, and cumulative land-use pressures in an established mining region, while also illustrating the distinctive economics of recovering rare earths as secondary products within a larger iron-ore operation. Norra Kärr shows how water protection, waste management, environmental review, and nearby Natura 2000 areas can constrain the development of a strategically important heavy rare-earth deposit. Olserum represents an earlier stage of the development pipeline, where technical, commercial, environmental, and local-acceptance issues arise before the most advanced permitting stages have been reached. The cases are

therefore not intended to be statistically representative; rather, they reveal different dimensions and stages of the same implementation challenge.

Against this background, the report evaluates whether the CRMA and the RESourceEU Action Plan adequately address the tension between European supply security and locally concentrated costs. These initiatives strengthen project coordination and financing, diversify external sourcing, promote circularity and preparedness, and support downstream capacity. Strategic Project status can also give security-of-supply considerations greater procedural and, in specified circumstances, substantive weight. Yet these measures do not remove the environmental and social impacts associated with development, nor do they establish a general mechanism for sharing locally concentrated burdens across the Union.

The report therefore distinguishes between three broad policy options:

- giving greater weight to Union-wide strategic interests in relevant decision-making processes;
- reducing the need for additional domestic extraction through recycling, material substitution, efficiency improvements, stockpiling, and diversified external supply; and
- internalising a greater share of locally concentrated costs through prevention, mitigation, benefit-sharing, and, where appropriate, compensation for residual burdens.

These options are not mutually exclusive. Greater strategic weight may facilitate the development of strategically important projects, but it does not remove the associated environmental, social, or land-use costs. Alternative resilience measures can reduce the scale of new European extraction required, but cannot eliminate external dependence. Internalising local costs can improve the distribution of some project-related burdens, but not all environmental, cultural, or rights-based impacts are readily compensable. The policy choice is therefore not between complete EU self-sufficiency and continued dependence on external suppliers. It concerns how domestic capacity, external diversification, circularity, strategic prioritisation, and burden-sharing can be combined to strengthen resilience while recognising the local costs of achieving it.

The report's core contribution is to connect these project-level implementation constraints to the EU's broader geopolitical and geoeconomic agenda. The literature on geoeconomics and strategic autonomy has emphasised external risks such as weaponised interdependence and supply-chain vulnerabilities (Farrell and Newman 2019; Meunier and Nicolaïdis 2019). Recent EU-focused work has also examined the governance of economic security more broadly (Jarlebring 2026). Less attention, however, has been paid to the domestic friction generated by resource mobilisation. By linking project-level barriers to the institutional conditions of EU multi-level governance, including the principles set out in Articles 4 and 5 TEU, this report contributes to the literature on implementation and multi-level governance (Hooghe and Marks 2003; Scholten 2023). It also builds on debates concerning the limits of the European regulatory state (Kelemen 2011) by showing how localised environmental, social, and land-use conflicts can constrain the translation of Union-level strategic objectives into operational resource capacity.

The analysis combines descriptive quantitative evidence with qualitative institutional and case-study analysis. The geoeconomic sections draw on international production data, Eurostat trade statistics, Global Trade Alert data, and relevant academic and policy literature to assess the structure of the global rare-earth market and the EU's external dependencies. Europe's geological potential is assessed primarily using the Minerals4EU inventory and project-level information, while the institutional analysis draws on EU and Swedish legislation, policy documents, administrative guidance, and relevant court decisions. The case studies use public authority documents, court decisions, academic and policy research, project-developer information, and relevant reporting. The analysis of Per Geijer was additionally informed by a site visit hosted by LKAB and a presentation of the company's development plans. Company-specific estimates and assessments are attributed to the relevant developer rather than treated as independent evaluations. The purpose is not to predict whether individual projects will proceed, but to examine how external supply-chain vulnerabilities interact with the institutional, environmental, economic, and social conditions under which new European capacity must be developed.

The remainder of the report proceeds as follows. Section 2 provides the geoeconomic background to the EU's rare-earth predicament, explaining why rare earths matter strategically, how China came to dominate key parts of the value chain, and why EU vulnerability is particularly acute in processing and permanent magnets. Section 3 examines Europe's geological potential and develops the collective-action argument through the EU's multi-level governance framework, the three Swedish case studies, and the national permitting process. Section 4 evaluates the CRMA and the RESourceEU Action Plan and develops the three policy options outlined above. Section 5 concludes.

2. Geoeconomics of Rare Earths

2.1 The Industrial and Strategic Role of Rare Earths

Rare-earth elements (REEs) comprise seventeen metallic elements in the periodic table that are critical to modern industrial supply chains. Although relatively abundant in the Earth's crust, they are seldom found in concentrations that can be exploited economically. Rare-earth deposits are often low-grade, which can increase extraction, processing, and environmental-management costs, and REEs are often recovered as by-products alongside primary commodities such as iron ore. Transforming rare-earth-bearing minerals into high-purity oxides and metals requires a complex sequence of technically advanced and energy-intensive processing stages, including mechanical crushing and sorting, chemical leaching, solvent extraction, and high-temperature metallurgy (Binnemans et al. 2013; IEA 2024). Project development must also address processing residues and other environmental impacts, as well as land-use conflicts and regulatory requirements. In parts of the Nordic region, these include potential conflicts with Sámi reindeer herding and associated land-use rights.

While often discussed collectively, the strategic relevance of rare earths varies considerably by element and application. A critical subset drives high-performance permanent magnets, while others underpin advanced electronics, telecommunications, medical technologies, catalysts, and specialised metallurgy. Table 1 categorizes these elements—excluding radioactive promethium—into four overlapping functional groups, summarizing their primary industrial applications and strategic significance.

Table 1 Functional Applications and Strategic Importance of Rare Earth Elements

Functional group	Key elements	Main applications	Strategic relevance
Magnet rare earths	Neodymium (Nd), praseodymium (Pr), dysprosium (Dy), terbium (Tb), samarium (Sm)	Permanent magnets for motors, generators, robotics, guidance systems and defence equipment	Critical for EVs, wind turbines, aerospace and military electrification
Electronics, optics, and ICT rare earths	Europium (Eu), terbium (Tb), erbium (Er), yttrium (Y)	Phosphors, displays, fibre optics, telecommunications, sensors and optical components	Underpins digital infrastructure, next-generation communications and advanced electronics
Medical, laser, and precision rare earths	Gadolinium (Gd), lutetium (Lu), holmium (Ho), thulium (Tm), ytterbium (Yb)	Medical imaging, scintillators, lasers and precision instruments	Essential for specialised medical diagnostics, industrial lasers and precision defence hardware
Alloying and advanced-material rare earths	Scandium (Sc), yttrium (Y), lanthanum (La), cerium (Ce)	Lightweight alloys, catalysts, glass polishing, metallurgy, battery and industrial applications	Drives clean tech innovation, aerospace engineering and industrial manufacturing efficiency

Sources: Humphries (2013); Schüler et al. (2011); Binnemans et al. (2013); USGS (2020); IEA (2024).

Magnet rare earths are particularly important for low-carbon transition technologies and defence applications. Neodymium (Nd) and praseodymium (Pr) form the core of neodymium-iron-boron (NdFeB) magnets, while dysprosium (Dy) and terbium (Tb) help

maintain magnetic performance at high operating temperatures. These properties make NdFeB magnets particularly important for applications including electric-vehicle motors, wind-turbine generators, robotics, and guidance systems. Samarium (Sm) is used in samarium-cobalt (SmCo) magnets, which retain magnetic performance under high temperatures and demanding aerospace and military conditions.

The second functional group underpins electronics, optics, and information and communications technology. Electronics and ICT rely on europium (Eu), terbium (Tb), and yttrium (Y) for phosphors in displays and energy-efficient lighting, alongside erbium (Er) to drive fiber-optic amplifiers in long-distance telecommunications.

The third group comprises elements essential for medical, laser, and precision technologies. Medical diagnostics utilize gadolinium-based compounds as contrast agents in magnetic resonance imaging, while lutetium (Lu) serves in scintillators. Additionally, holmium (Ho), thulium (Tm), and ytterbium (Yb) enable specialised lasers and precision instruments.

The final group drives advanced materials and a broad range of industrial applications. Advanced metallurgy incorporates scandium (Sc) to improve the strength and performance of lightweight aluminium alloys, particularly in aerospace applications. Meanwhile, cerium (Ce) serves in catalytic converters and glass polishing, lanthanum (La) is deployed in optical materials and battery technologies, and yttrium (Y) stabilizes advanced ceramics and coatings.

These diverse applications mean that the strategic importance of rare earths cannot be assessed through aggregate production or trade volumes alone. Supply-security analysis must distinguish among individual elements, technological uses, and stages of the value chain, while also accounting for supplier concentration at each stage and the scope for switching to alternative suppliers in the event of a disruption. At present, this scope is limited by China's dominant position across key stages of the rare-earth value chain, as the following sections show.

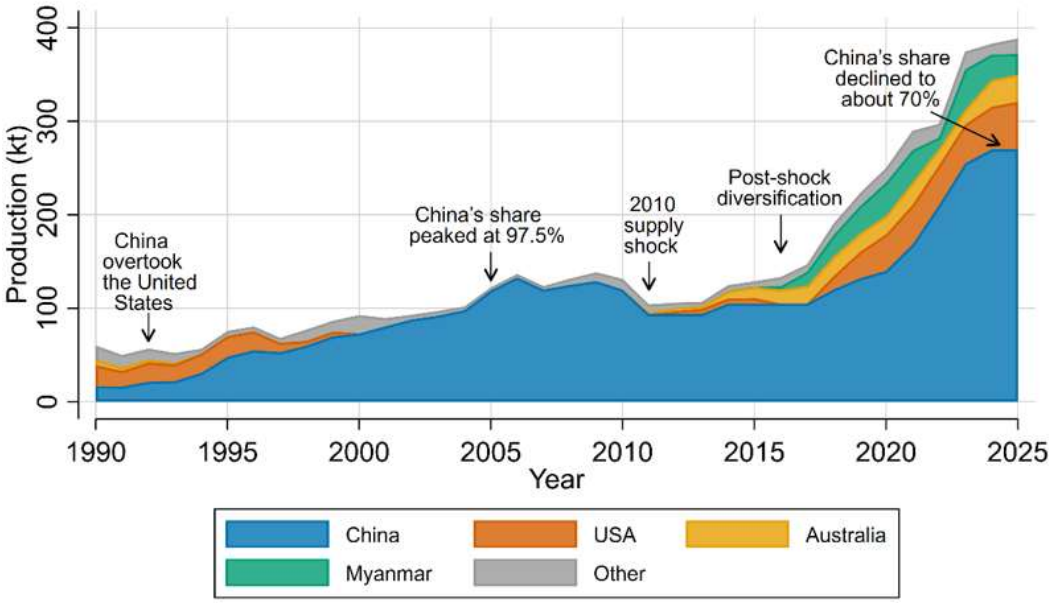
2.2 The Evolution of the Global Market

To understand how China came to dominate key stages of the rare-earth value chain, it is necessary to examine the long-term structural shifts in a market that, until the mid-1980s, was dominated by production from the Mountain Pass mine in California.

China began to develop its rare-earth sector at the Bayan Obo deposit in Inner Mongolia in the late 1950s (Hurst 2010). During the 1980s and 1990s, the government made rare-earth development a strategic priority with the objective of becoming a leading supplier in the global market (Morrison and Tang 2012). The ensuing increase in Chinese supply lowered global prices and intensified competitive pressure on traditional suppliers, and by 1992 China had overtaken the United States as the world's leading producer. Ten years later, in 2002, the Mountain Pass mine ceased production amid a combination of low rare-earth prices and stricter environmental requirements (Orris and Grauch 2002).

This trend continued throughout the first decade of the new millennium, by which time China had established a near-monopoly position in the global rare-earth market (Figure 1).

Figure 1 Global Rare-Earth Mine Production, 1990-2025 (Kilotonnes, oxide equivalent)



Sourece: U.S. Geological Survey (USGS), Mineral Commodity Summaries, various years. Recent data are estimates.

China's dominance of the mining stage remained largely unchallenged through 2010, when the global market experienced a severe supply shock. In July 2010, the Chinese Ministry of Commerce announced a sharp reduction in rare-earth export quotas. The total quota for the year was approximately 40 per cent lower than in 2009, while the allocation for the second half of 2010 was 72 per cent lower than in the corresponding period of the previous year. The restrictions were officially justified by the need to conserve resources, reduce environmental damage, and consolidate China's fragmented domestic industry (Wübbeke 2013).

The disruption was compounded in September 2010 by a reported interruption of rare-earth shipments to Japan following a dispute over the contested Senkaku/Diaoyu Islands in the East China Sea. After the Japan Coast Guard detained the captain of a Chinese fishing trawler, Japanese importers reported that Chinese customs authorities had stopped clearing rare-earth shipments. The episode exposed the vulnerability of Japanese manufacturers, which sourced approximately 90 per cent of their rare-earth imports from China, and served as a warning to other import-dependent economies (Bradsher 2010; King and Armstrong 2013).

The 2010 supply shock and associated price spike, which lasted well into 2013 (Figure 2), stimulated investment in alternative sources of supply and gradually reduced China's share of global mine production to approximately 69.2 per cent by 2025 (USGS 2026). The Mount Weld mine in Australia began production in 2011, while production at Mountain Pass in the United States resumed in 2012 and continued until 2015. After the mine was idled following Molycorp's bankruptcy, production restarted under new ownership in 2017 (Wilburn 2012; Hammarstrom and Dicken 2019). Diversification was further supported by Myanmar's emergence as a major producer from the mid-2010s. However, because much of Myanmar's output is exported to China for processing, its growing

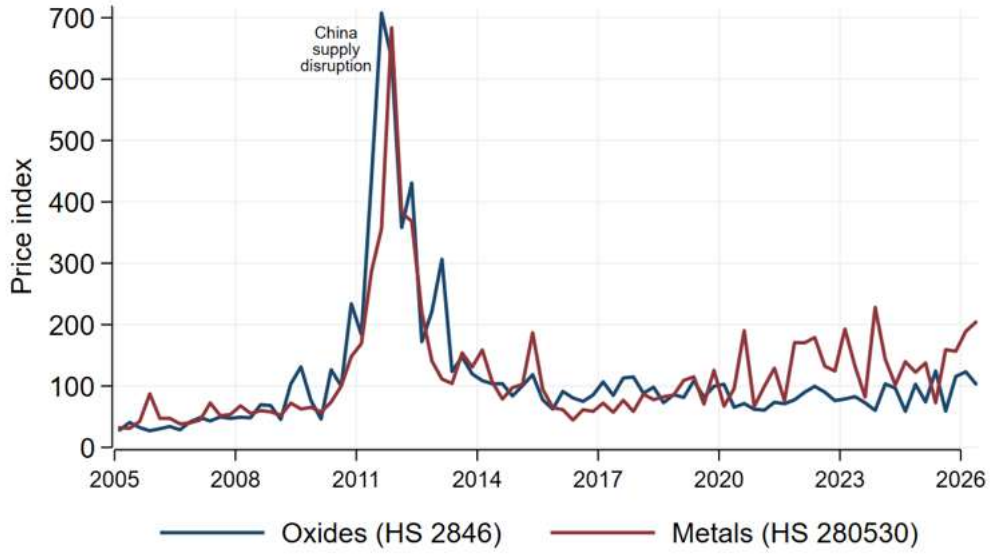
production has not provided a fully independent alternative to Chinese supply chains (Meehan, Sadan and Seng Lawn 2025).

This distinction is important because geographical diversification of mine production does not necessarily imply diversification of the rare-earth supply chain. China's strategic position therefore extends beyond its share of domestic and global mine production. Chinese firms and financial institutions have also participated in mining and processing projects outside China through ownership stakes, investment, financing, and long-term commercial arrangements, while China's dominant separation and refining capacity means that material extracted elsewhere may still depend on Chinese facilities before reaching downstream manufacturers. Effective supply-chain concentration therefore cannot be assessed solely from national mine-production shares. It also depends on ownership, processing routes, contractual relationships, and the location of the technical capabilities required to convert mineral concentrates into commercially usable rare-earth products.

More generally, the diversification achieved since 2010 has been considerably greater at the mining stage than in separation, refining, metal-making, and permanent-magnet production. China's strategic position is therefore better understood in terms of its dominance at critical nodes of the value chain rather than simply its share of global mine production.

While global mine supply has become more diversified since the 2010 shock, price volatility and associated market uncertainty have not declined to the same extent, particularly for processed rare-earth metals and alloys, where Chinese dominance remains pronounced. Figure 2 plots unit import price indices for rare-earth oxides and metals entering the EU from the first quarter of 2005 to the second quarter of 2026. The immediate consequence of the 2010 disruption was an unprecedented price shock, with the indices for both product categories peaking near 700. Although prices returned to approximately their pre-shock levels by 2014, the subsequent period has remained considerably more volatile, especially for rare-earth metals and alloys, where China retains a dominant position (see Section 2.4).

Figure 2 EU Import Price Indices of Rare Earth Oxides and Metals 2005q1-2026q2



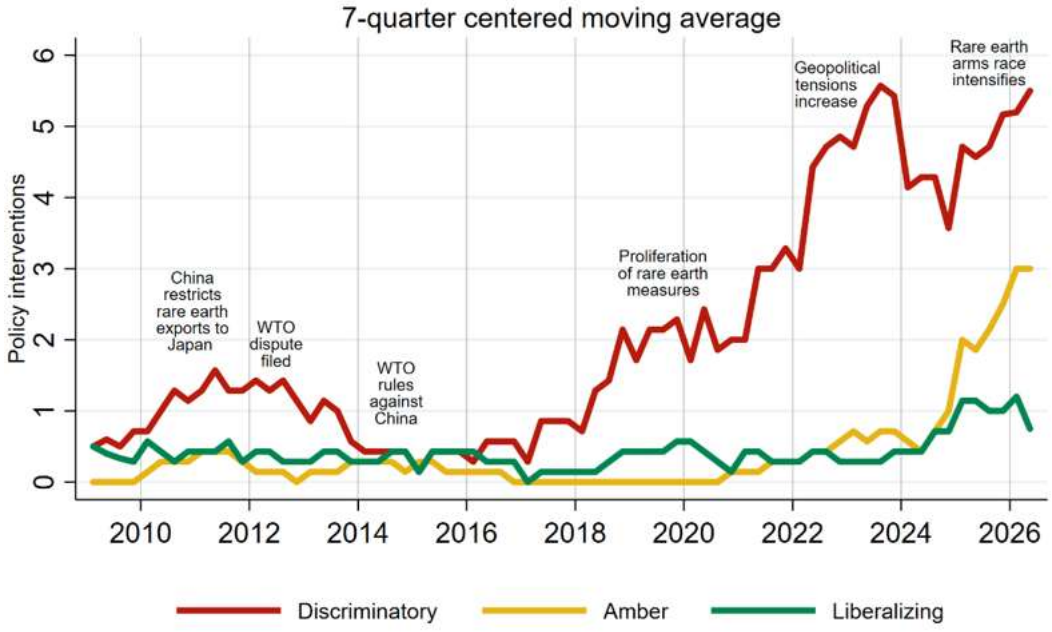
Source: Eurostat (COMEXT).
Note: Unit price indices are calculated as EU import values divided by quantities (2010q3 = 100)

These developments suggest that strategic autonomy cannot be achieved through diversified raw-material extraction alone. A mine located outside China does not necessarily constitute an independent source of supply if its output remains dependent on Chinese processing, commercial arrangements, or downstream manufacturing capacity. As long as critical midstream and downstream bottlenecks remain highly concentrated, European industrial supply chains will remain exposed to price shocks, supply disruptions, and the potential geoeconomic leverage of dominant external suppliers, China in particular.

2.3 From Supply Shock to Policy Activism

The late 2010 supply shock and subsequent price volatility helped transform rare-earth policy from a relatively narrow trade concern into a broader economic-security agenda. Figure 3 tracks rare-earth-related state interventions recorded by Global Trade Alert (GTA) from 2009 through the second quarter of 2026. Relevant measures were identified from their legislative titles, target sectors, and product coverage, while broader instruments affecting rare earths only incidentally were excluded. The dataset distinguishes among discriminatory measures, which disadvantage foreign commercial interests relative to the prevailing regime; amber measures, whose effects are mixed or uncertain; and liberalising measures, which improve market access or facilitate trade.

Figure 3 Global Rare Earth Policy Interventions, 2009q1-2026q2



Source: Global Trade Alert (GTA). Series show new policy announcements by direction and quarter. Discriminatory measures are policy changes that disadvantage foreign competitors relative to existing policy. Amber measures comprise interventions with ambiguous net effects, including those containing both discriminatory and liberalizing components.

Figure 3 identifies three broad phases in the evolution of rare-earth policy, from a dispute over Chinese export restrictions to a wider contest over economic security, industrial capacity, and strategic technologies.

The first phase followed the 2010 supply shock, when China sharply reduced its export quotas and shipments to Japan were reportedly interrupted. The European Union, Japan, and the United States responded through international trade law, bringing complaints before the World Trade Organization in 2012. In 2014, the WTO found that China's export duties, quotas, and related restrictions were inconsistent with its WTO obligations (WTO 2014). New discriminatory measures subsequently declined and remained comparatively few between 2015 and 2017, suggesting that multilateral trade disciplines had temporarily contained the dispute.

This relative calm faded around 2018. The second phase marked a broader shift from trade-law remedies towards industrial and economic-security policy, as import dependence was increasingly viewed as a structural vulnerability affecting industrial resilience. Governments expanded subsidies, public financing, procurement preferences, stockpiling, and support for domestic extraction and processing. In China, however, the consolidation of the rare-earth sector should not be understood solely as a geopolitical strategy. It also formed part of a longer-running effort to bring a fragmented industry under tighter regulatory control, curb illegal and unsanctioned production, strengthen environmental enforcement, and concentrate production in larger and more closely supervised firms (Shen, Moomy and Eggert 2020). These domestic industrial and environmental objectives increasingly overlapped with strategic concerns about supply security, technological leadership, and control over key stages of the rare-earth value

chain. The result was a policy regime in which industrial rationalisation, environmental regulation, and economic-security objectives became progressively intertwined.

A third phase emerged after 2022 as geopolitical tensions intensified and rare earths became more deeply embedded in competition over green, digital, and defence technologies. Policy activity accelerated through early 2026, driven by a broader de-risking agenda centred on strategic partnerships, recycling, stockpiling, and investment in domestic capacity.

A key regulatory development during this period was China's expansion of export controls beyond raw materials to include technologies, equipment, and downstream products associated with the rare-earth value chain. Measures announced in 2025 introduced new licensing requirements and restrictions affecting rare-earth separation, metal production, permanent-magnet manufacturing, and related technologies and equipment. China also announced an extraterritorial framework under which certain foreign-produced items containing Chinese-origin rare-earth inputs could become subject to Chinese export-control requirements. Together, these measures extended the potential reach of Chinese regulatory oversight further into global downstream supply chains (MOFCOM and GAC 2025a; MOFCOM 2025a, 2025b).

Implementation of several of the measures announced in October 2025 was subsequently suspended for one year following U.S.–China economic and trade negotiations in Kuala Lumpur. The agreement included reciprocal steps by both sides, with China undertaking to suspend the relevant export-control measures and the United States suspending specified trade and export-control measures. China formally suspended the relevant measures until 10 November 2026 (MOFCOM 2025c; MOFCOM and GAC 2025b). If implemented in their announced form, however, the Chinese measures could present significant challenges for the European Union and other import-dependent economies by constraining access not only to rare-earth materials, but also to technologies and equipment relevant to the development of domestic refining and manufacturing capacity. The episode therefore illustrates both how concentration in technologically critical stages of the value chain can create vulnerabilities extending beyond direct dependence on raw-material imports and how rare-earth controls have become intertwined with broader economic-security negotiations.

Against this backdrop, the United States, Japan, and the European Union have expanded measures aimed at reducing dependence on single suppliers and strengthening domestic or allied supply chains (Table 2). In the United States, defence procurement rules restrict sourcing of certain rare-earth permanent magnets from covered countries, while the public-private partnership between the Department of Defense and MP Materials combines public financing with mechanisms intended to reduce price and revenue risks for domestic processing and magnet production (10 U.S.C. § 4872; MP Materials 2025). Japan has similarly used state-backed equity and debt financing through JOGMEC to diversify rare-earth supply, including support for Caremag's heavy-rare-earth refining and recycling project in France. The project is designed to process both recycled magnets and raw ore and is linked to long-term supplies of dysprosium and terbium to Japan (JOGMEC 2025; METI 2025). The European Union, through the Critical Raw Materials Act and the RESourceEU Action Plan, has pursued domestic capacity-building, external diversification, financing, stockpiling, and other measures intended to reduce

dependence on individual external suppliers (European Parliament and Council 2024; European Commission 2025b).

Table 2 Typology of Rare Earth Policy Interventions by Major Jurisdictions

Jurisdiction	Policy Orientation and Core Instruments
China	**State-Directed Consolidation and Export Control:** Combines industry consolidation and tighter regulatory oversight with export controls on rare-earth materials, technologies, and equipment. Uses licensing requirements to manage access to strategic parts of the rare-earth value chain and has announced broader extraterritorial controls.
European Union	**Strategic Autonomy:** Establishes domestic extraction, processing, and recycling benchmarks via the Critical Raw Materials Act (CRMA). Deploys the RESourceEU Action Plan to expand financial support, manage strategic stockpiling pilots, and fast-track permitting timelines to reduce single-source vulnerabilities.
United States	**Subsidy-Driven Reshoring and Sourcing Mandates:** Deploys capital subsidies through Inflation Reduction Act (IRA) tax credits, price-guarantee mechanisms, and defence funding to underwrite domestic processing capacity. Enforces strict military and EV supply-chain procurement rules to reduce dependence on foreign sourcing.
Japan	**Supply Resilience and Diversification:** Uses state-backed equity and debt financing through JOGMEC for overseas rare-earth processing projects and long-term offtake arrangements. Supports diversification of heavy-rare-earth supply, including projects using both recycled magnets and primary raw materials.

Source: Compiled from Global Trade Alert (GTA) data and official policy, legislative, and programme documents.

2.4 EU Dependence Across the Rare Earth Supply Chain

While global supply has become more diversified at some stages, substantial strategic dependence on China remains a reality for the European Union, which lacks commercial rare-earth mining and possesses only limited capacity for metal refining and permanent-magnet manufacturing. As documented in Table 3, which uses the most granular available data at the eight-digit level of Eurostat's Combined Nomenclature, external supply is particularly concentrated in the midstream and downstream stages, where rare-earth compounds are converted into refined metals and alloys and subsequently used in permanent-magnet production and other industrial applications. Because these processing and manufacturing stages produce strategically important inputs for the EU's green, digital, and defence transitions, reducing vulnerabilities at these points in the value chain remains a central policy priority for the Union.

Table 3 Supplier concentration in extra-EU rare-earth imports by supply-chain stage and rare-earth group, 2025

Supply-chain stage / rare-earth group	CN code	Market concentration		Top three suppliers			Volume	Value	Unit value
		HHI	CR3 (%)	First (%)	Second (%)	Third (%)	(tonne)	(€ thousand)	(€/kg)
Minerals	**2530 90 50**	**0.43**	**98.1**	**CN (53.7)**	**IN (36.3)**	**MX (8.1)**	**9 731.7**	**4 420.2**	**0.5**
Oxides	**2846**	**0.33**	**95.8**	**CN (44.1)**	**RU (27.3)**	**MY (24.4)**	**14 336.5**	**113 691.5**	**7.9**
Ce	2846 10 00	0.34	98.1	RU (41.9)	MY (35.3)	CN (20.9)	9 348.4	26 186.4	2.8
Sc	2846 90 30	0.39	98.1	GB (51.6)	IN (30.7)	CN (15.7)	1.0	124.1	127.2
La	2846 90 40	0.95	100.0	CN (97.3)	US (1.8)	GB (0.9)	3 841.8	7 162.6	1.9
Pr/Nd/Sm	2846 90 50	0.43	92.8	MY (60.4)	JP (21.8)	CN (10.7)	256.7	15 684.8	61.1
Gd/Tb/Dy	2846 90 60	0.34	96.2	JP (41.0)	CN (37.3)	NO (17.8)	181.0	37 393.5	206.5
Eu/Ho/Er/Tm/Yb/Lu/Y	2846 90 70	0.86	99.2	CN (92.8)	KR (4.6)	US (1.7)	527.5	19 172.8	36.3
Mixed REE/Y/Sc	2846 90 90	0.22	71.0	CN (26.2)	US (22.6)	VN (22.2)	180.1	7 967.2	44.2
Metals	**2805 30**	**0.92**	**98.6**	**CN (95.6)**	**VN (2.1)**	**CA (0.8)**	**778.5**	**11 249.9**	**14.5**
Intermixtures/interalloys	2805 30 10	0.90	99.8	CN (94.8)	VN (3.1)	CA (1.8)	357.8	2 798.7	7.8
Ce/La >=95%	2805 30 21	1.00	100.0	CN (99.9)	US (0.1)	GB (0.0)	352.3	983.2	2.8
Pr/Nd/Sm >=95%	2805 30 29	0.41	99.9	CN (55.8)	VN (22.6)	TH (21.5)	24.4	1 823.0	74.8
Gd/Tb/Dy >=95%	2805 30 31	0.87	97.5	CN (92.9)	JP (2.7)	GB (1.9)	1.9	1 124.8	590.4
Eu/Ho/Er/Tm/Yb/Lu/Y >=95%	2805 30 39	1.00	100.0	CN (99.7)	US (0.2)	GB (0.0)	36.3	1 639.3	45.2
Sc >=95%	2805 30 40	0.88	100.0	CN (93.9)	US (5.7)	GB (0.4)	0.3	1 577.4	6 043.8
REE/Y/Sc <95%	2805 30 80	0.57	96.3	GB (72.8)	CN (20.9)	US (2.6)	5.5	1 303.5	235.1
Magnets	**8505 11 90**	**0.84**	**95.9**	**CN (91.5)**	**GB (2.6)**	**US (1.8)**	**17 120.5**	**295 524.7**	**17.3**

Notes: The Herfindahl-Hirschman Index (HHI) and the top three market share (CR3) are volume-based. The largest suppliers are indicated by ISO2 codes with their market shares in parentheses: CA Canada, CN China, GB United Kingdom, IN India, JP Japan, KR South Korea, MX Mexico, MY Malaysia, NO Norway, RU Russia, TH Thailand, US United States, VN Vietnam. Rare-earth elements are indicated by their symbols in the periodic table: cerium (Ce), dysprosium (Dy), erbium (Er), europium (Eu), gadolinium (Gd), holmium (Ho), lanthanum (La), lutetium (Lu), neodymium (Nd), praseodymium (Pr), promethium (Pm), samarium (Sm), scandium (Sc), terbium (Tb), thulium (Tm), ytterbium (Yb) and yttrium (Y).

Table 3 demonstrates that EU imports are highly concentrated across the major supply-chain categories examined. The top three suppliers account for 98.1 per cent of mineral imports, 95.8 per cent of oxide imports, 98.6 per cent of metal imports, and 95.9 per cent of magnet imports, with China holding the largest individual share in each category. Among the four aggregate supply-chain stages, the Herfindahl-Hirschman Index (HHI) is highest for metals, at 0.92, indicating exceptionally high supplier concentration. Russia's position is also noteworthy at the oxide stage, where it accounted for 27.3 per cent of extra-EU imports in 2025, reflecting the fact that rare-earth oxides have remained outside the import prohibitions imposed on Russia following its full-scale invasion of Ukraine.

Direct dependence on China is lowest at the mineral and oxide stages, where China accounts for 53.7 and 44.1 per cent of extra-EU imports, respectively. Dependence becomes considerably greater downstream: China supplies 95.6 per cent of extra-EU metal imports and 91.5 per cent of imports in the permanent-magnet category. The magnet category is also by far the largest of the four in value terms, totalling €295.5 million in 2025 and accounting for the majority of the import value captured in Table 3.

These aggregate figures conceal important differences between specific rare-earth groups and processing stages. China's position is particularly strong in metal categories containing heavy rare earths (HREEs) used in high-performance magnets. At the oxide stage, China supplies 37.3 per cent of imports in the Gd/Tb/Dy group, while its share rises to 92.9 per cent at the metal stage. For the specialised metal category comprising Eu, Ho, Er, Tm, Yb, Lu, and Y, China's import share reaches 99.7 per cent. This downstream concentration is particularly significant for dysprosium and terbium, which are used in small quantities but play an important role in maintaining magnet performance under demanding operating conditions.

In absolute economic terms, extra-EU imports of the rare-earth minerals, oxides, metals, and magnet categories examined in Table 3 remain modest, totalling €424.9 million in 2025. This is small compared with EU imports of bulk industrial metals such as iron and steel, aluminium, and copper. By conventional trade-value measures, rare-earth imports therefore appear relatively minor. Their strategic significance, however, cannot be inferred from trade value alone, given the dependence of critical technologies on highly concentrated supply chains.

Taken together, these patterns point to the need to strengthen resilience across the mine-to-magnet value chain, particularly at the highly concentrated midstream and downstream stages, where substitution in many applications is technically constrained or entails significant performance, cost, or design trade-offs. Additional European extraction may form part of that strategy, but geological resources alone cannot resolve vulnerabilities in separation, refining, metal production, and permanent-magnet manufacturing. The focus of the analysis that follows on primary extraction should therefore not be understood as implying that mining is the principal source of EU strategic vulnerability. Rather, primary extraction is where the particular collective-action problem examined in this report is most acute: the benefits of greater European supply resilience are widely dispersed, while many of the environmental, social, land-use, and rights-related costs are concentrated in the communities and territories hosting individual projects. The next section therefore turns to the institutional challenge of converting European geological potential into operational capacity.

3. The Collective Action Problem in EU Rare Earth Policy

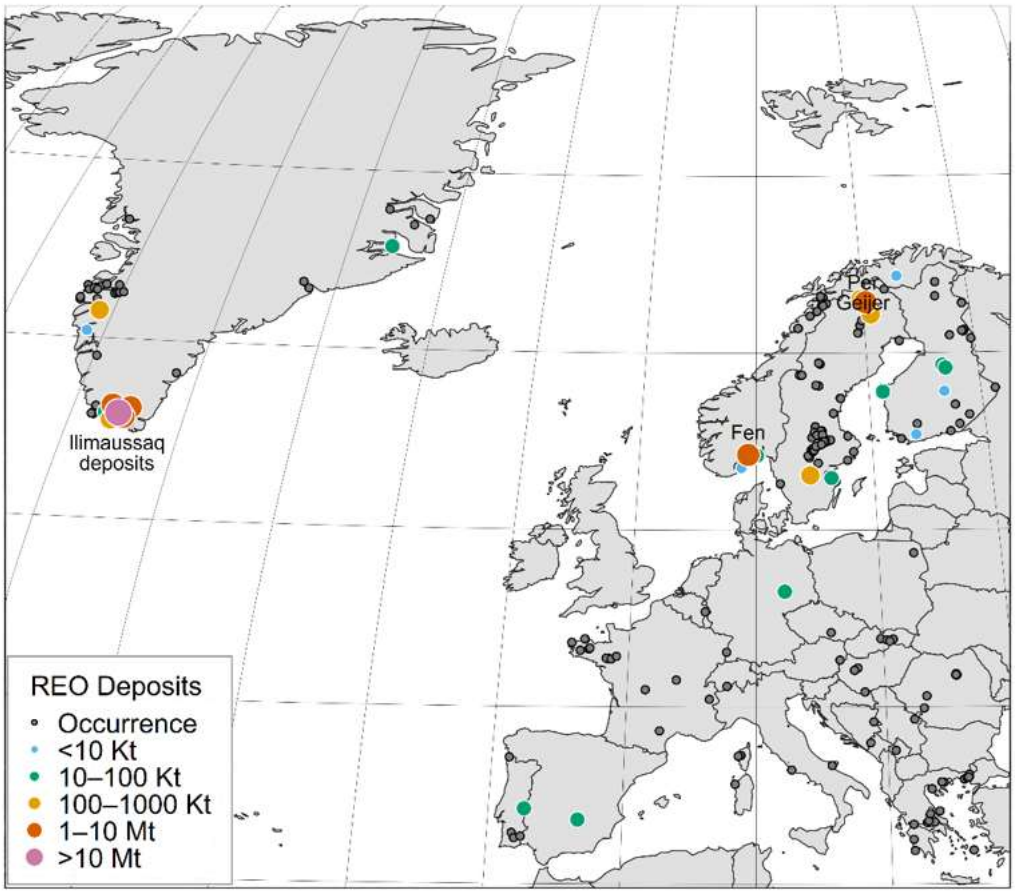
Europe possesses a substantial identified rare-earth resource base, but converting this geological potential into operational supply is constrained by a structural collective-action problem within the EU's system of multi-level governance. The strategic and economic benefits of greater European capacity would be shared across the Union, whereas many of the environmental, social, and land-use costs would be concentrated in the communities and territories hosting extraction and processing activities.

To trace this institutional friction, the analysis proceeds in four steps. First, it maps Europe's actual geological potential. Second, it evaluates the constitutional tensions embedded in Article 5 TEU. Third, it illustrates these dynamics through three distinct Swedish case studies: Per Geijer, Norra Kärr, and Olserum. Finally, it examines the national permitting process as the institutional arena where these competing spatial interests are legally balanced.

3.1 The Geological Basis for Rare Earth Mining in Europe

The geological basis for rare-earth development in Europe is stronger than is often assumed, particularly when deposits in Norway and Greenland are taken into account. Norway, as a member of the European Economic Area (EEA), participates in the EU internal market and is bound by relevant EU single-market legislation incorporated into the EEA Agreement. Greenland is a self-ruling territory of the Kingdom of Denmark. It is not part of the EU or the EEA, but is associated with the Union as an Overseas Country and Territory. Both are linked to the EU's strategic raw-materials agenda through Memoranda of Understanding signed in 2024 and 2023, respectively. The EU–Norway MoU establishes cooperation on sustainable land-based raw materials and battery value chains (European Commission 2024), while the EU–Greenland MoU establishes a strategic partnership on sustainable raw-materials value chains (European Commission 2023a). Both agreements include provisions on value-chain integration, project development, research cooperation, investment mobilisation, and environmental, social, and governance standards. Together with substantial rare-earth resources in Sweden and Finland, as well as smaller deposits in Germany, Portugal, and Spain, the deposits in Norway and Greenland reinforce the conclusion that Europe has significant geological potential to reduce its dependence on imported rare-earth raw materials.

Figure 4 Rare Earth Oxide (REO) Deposits in Europe and Greenland



Source: M4EU database (Minerals4EU), accessed January 2026.

Figure 4 maps known rare-earth deposits across Europe and Greenland in rare earth oxide (REO) equivalent terms, drawing on the Minerals4EU inventory. Project-level estimates suggest a resource base of approximately 50 million tonnes of REO—compared to current annual EU imports of approximately 14.3 thousand tonnes (Table 3)—with the most significant deposits located in Greenland, Norway, and Sweden. These figures should be interpreted with caution. They do not represent economically recoverable reserves, nor do they indicate whether individual deposits contain the specific rare earth elements most relevant to permanent magnets, defence applications, or other strategic value chains. They also say little about the availability of downstream separation, refining, metal-making, or magnet-production capacity.

Engineering challenges and technical uncertainties mean that these aggregate estimates cannot be interpreted as commercially recoverable supply. Nevertheless, the scale of Europe's identified rare-earth resource base is large relative to current EU import volumes, even though direct comparisons are necessarily approximate because of differences in recoverability, element composition, product form, and processing requirements. The principal obstacle is therefore not the absence of geological potential, but the difficulty of converting identified resources into viable, permitted, financed, and locally accepted projects. This is the implementation challenge to which the next subsection turns.

3.2 The Collective-Action Problem: European Strategic Interests and Local Implementation Costs

This shift from resource availability to project realisation reveals the central collective-action problem facing the EU. If Europe is to develop a domestic rare-earth value chain, the strategic benefits would be widely distributed across the Union: they would support the green transition, the digital economy, defence industries, and the broader objective of reducing dependence on China. The costs, however, would be territorially concentrated. Future extraction, beneficiation, separation, and refining projects would impose environmental, social, and land-use burdens on the specific communities and jurisdictions that host them, particularly in the Nordic region, where much of Europe's identified rare-earth resource base is located.

This asymmetry is reinforced by the EU's system of multi-level governance. Article 5 of the Treaty on European Union (TEU) is central to this institutional structure, as it establishes the principles of conferral, subsidiarity, and proportionality that define the scope and govern the exercise of Union competences. This allocation of competences is complemented by Article 4(1) TEU, under which competences not conferred upon the Union in the Treaties remain with the Member States. In critical raw materials policy, this competence framework helps explain why the EU can set strategic priorities, establish benchmarks, identify Strategic Projects, coordinate financing, and support market development, but cannot simply translate EU-level strategic need into local project approval. Decisions over land use, environmental assessment, permitting, water protection, consultation, and, where relevant, Indigenous rights remain embedded in national and subnational legal and political systems, through which both national law and applicable EU law are applied. The relevance of this competence framework is therefore not that it prevents EU action, but that it shapes the form such action can take.

Box 1. Article 5 TEU and the Governance of EU Critical Raw Materials Policy

Article 5 of the Treaty on European Union helps explain the governance constraints facing EU critical raw materials policy. It establishes the principles of conferral, subsidiarity, and proportionality. Conferral defines the limits of Union competence, while subsidiarity and proportionality govern the exercise of the competences conferred on the Union.

Conferral: The EU may act only within the competences given to it by the Member States. In the critical raw materials field, this allows the Union to regulate aspects of the internal market, industrial policy, environmental policy, trade, supply-chain resilience, and strategic coordination. It can set targets, designate Strategic Projects, coordinate finance, and support market development. However, the EU does not become a general permitting authority for mines, processing facilities, or related infrastructure. Project approval remains embedded in domestic legal systems, including rules on land use, environmental assessment, water protection, consultation, and Indigenous rights where applicable (Craig and de Búrca 2020).

Subsidiarity: Rare-earth supply security provides a strong case for EU-level action because no single Member State can secure the resilience of the European mine-to-magnet value chain or reduce dependence on concentrated external suppliers by

itself. At the same time, mining and processing projects are territorially embedded: their costs are experienced in specific landscapes and communities, while their strategic benefits are distributed across the Union. Subsidiarity therefore supports EU-level norm-setting and coordination, while leaving implementation and enforcement sensitive to local conditions, institutional capacity, and social preferences (de Búrca 1999; Craig 2012; van Zeben 2014).

Proportionality: Even where EU action is justified, it must not go beyond what is necessary to achieve Treaty objectives. In the critical raw materials context, this means that Strategic Project designation, permitting acceleration, and public de-risking instruments must remain proportionate to the objectives pursued and operate within applicable legal safeguards (Tridimas 2006). The proportionality principle does not itself determine how locally concentrated environmental or social burdens should be addressed or shared. From a policy-design perspective, however, the greater and more concentrated such burdens are, the stronger the case may be for complementary measures involving prevention, mitigation, meaningful participation, and, where appropriate, compensation or benefit-sharing.

This institutional structure helps explain why local resistance to rare-earth projects cannot be dismissed simply as a "Not In My Backyard" response. In many cases, opposition reflects a rational response to the unequal distribution of costs and benefits. While the strategic value of domestic rare-earth capacity would be realised at the European level, the environmental risks, land-use conflicts, social disruptions, and long-term monitoring burdens would be borne locally.

This distribution of tension is not unique to the EU, but reflects a broader structural feature of the global energy transition. The extraction and processing of critical minerals generate overlapping social and environmental harms at the local level, while the benefits of decarbonisation, electrification, digitalisation, and strategic resilience are realised at much broader spatial scales (Brown, Zhou and Sadan, 2024). From this perspective, opposition to mining projects reflects deeper trade-offs between global or European strategic objectives and locally concentrated ecological and social costs.

Empirical evidence suggests that such conflicts are widespread and systematic rather than exceptional. A recent global mapping of rare-earth supply chains documented more than 25 cases of socio-environmental conflict across extraction, processing, and recycling sites, spanning Europe, Latin America, Africa, and Asia (Walter et al., 2023). These cases reveal recurring patterns of environmental degradation, public health risks, lack of consultation, and conflicts over land rights, often involving Indigenous communities. Local opposition therefore appears not as an anomaly, but as a predictable outcome of the structural tensions embedded in the expansion of rare-earth supply chains.

In the EU context, the implementation challenge generated by this collective-action problem is shaped by three interrelated and mutually reinforcing factors.

First, concentrated costs and diffuse benefits. Developing rare-earth resources in the EU and its partner countries would strengthen the resilience and supply security of the European economy, generating benefits that are widely distributed across Member States, industries, and consumers. For the municipalities and communities hosting

individual projects, however, the costs may be much more concentrated. These may include environmental risks, land-use conflicts, pressure on local infrastructure, changes to landscapes and livelihoods, and long-term uncertainty surrounding waste management and remediation. In the case of Indigenous communities such as the Sámi, project development may also affect reindeer herding, cultural heritage, and rights protected under national and international legal frameworks. Where effective mechanisms to address localised concerns, share economic benefits, or compensate for residual burdens are absent, rare-earth projects are likely to encounter local opposition, making it more difficult to realise the Union-wide benefits of greater supply resilience.

Second, multi-level governance. The EU can define strategic priorities and create instruments such as the Critical Raw Materials Act, but individual mining and processing projects remain embedded in national and subnational legal and political systems. Even projects deemed strategically important at the European level must pass through national administrative procedures, environmental assessment, consultation requirements, and potential legal challenges. This creates an implementation challenge arising from the interaction between EU-level strategic urgency and national and subnational decision-making authority.

Third, a mismatch in time horizons. EU policy calls for rapid action to secure critical raw materials, particularly in light of escalating geopolitical tensions and Chinese export restrictions on both raw materials and associated technologies. Mining project development, however, operates on much longer timeframes. Strict environmental standards, complex approval procedures, technical uncertainty, financing constraints, and multi-level consultation processes mean that permitting and development can take many years. Based on Swedish data, this development cycle typically spans between 10 and 20 years (see below). This creates a structural tension between the political urgency expressed in the CRMA and the much longer timelines governing project development. Against this background, the CRMA's maximum permitting periods of 27 months for extraction and 15 months for processing may prove ambitious in practice, even though they cover only the formal permitting process rather than the full development cycle.

These dynamics constitute a collective-action problem in which the benefits of developing a secure rare-earth supply would be shared across the Union, while the associated costs would be concentrated locally. More specifically, the problem can be understood as resembling a volunteer's dilemma: greater European capacity does not require every Member State to host extraction, but it does require some jurisdictions to bear locally concentrated costs in order to generate benefits shared more broadly across the Union. Each potential host may therefore have an incentive to prefer that the necessary capacity be developed elsewhere (Diekmann 1985). More generally, as highlighted in Olson's (1965) analysis, situations in which costs are concentrated while benefits are widely dispersed can result in under-provision because individual actors have limited incentives to bear costs that generate wider benefits. In the EU, this problem is reinforced by multi-level governance, in which decision-making authority is distributed across European, national, regional, and local institutions (Ostrom 1990; Hooghe and Marks 2001; Scharpf 1988, 1997). In practice, this combination of dispersed benefits, concentrated costs, and multi-level decision-making can contribute to continued reliance on imports despite the collective interest of the Union as a whole.

3.3 Three Swedish Case Studies

To illustrate how the collective-action problem manifests at the project level, this section examines three Swedish projects with strategically significant rare-earth resources: Per Geijer near Kiruna, Norra Kärr near Gränna, and Olserum near Västervik. Sweden provides a particularly relevant setting because it combines significant rare-earth potential and a long mining tradition with demanding environmental standards, competing land uses, and, in northern Sweden, the protection of Sámi reindeer-herding rights and interests.

The three cases capture different dimensions and stages of the implementation challenge. Per Geijer illustrates cumulative land-use pressures and conflicts with Sámi reindeer herding in an established mining region, while also highlighting the distinctive economics of recovering REEs as secondary products within a larger iron-ore operation. Norra Kärr illustrates conflicts over water protection, waste management, environmental review, and protected areas surrounding a strategically important heavy rare-earth deposit. Olserum represents an earlier-stage project where technical, commercial, environmental, and local-acceptance issues may arise before the most advanced permitting stages are reached.

3.3.1 Per Geijer

The Per Geijer deposit, located near Kiruna in northern Sweden and in close proximity to LKAB's existing mining operations, is a large polymetallic deposit containing iron ore, phosphate-bearing mineralisation, and rare-earth elements (REEs). According to the state-owned mining company LKAB, the deposit contains more than two million tonnes of rare-earth oxides, which the company describes as making it the largest known rare-earth deposit in the European Union (LKAB 2023). Its scale gives it clear strategic relevance for the Union's green, digital, and defence transitions. If fully developed, LKAB estimates that the project could supply approximately 18 per cent of Europe's future demand for rare-earth materials.

From an EU perspective, Per Geijer has been designated a Strategic Project under the Critical Raw Materials Act (CRMA) (European Commission 2025a). This status gives the project priority in administrative procedures and facilitates access to coordinated public and private financing. The designation reflects the project's potential contribution to strengthening the EU's domestic raw-material supply and reducing dependence on external suppliers, particularly China, as part of a more integrated European rare-earth value chain. At the same time, Strategic Project status does not in itself determine whether the project will proceed, as development remains subject to Swedish permitting requirements, environmental assessment, judicial review, and consultation with affected stakeholders.

The main economic and industrial interest in the Per Geijer deposit is iron ore rather than the rare-earth elements and phosphate-bearing minerals, which could be recovered as secondary products of strategic significance to the EU. This multi-product structure is important for assessing the economics of REE recovery at Per Geijer. By recovering several products within the same mining operation, infrastructure and logistics costs can be shared across the three product streams. In addition, the deposit's proximity to LKAB's existing mining operations in Kiruna may provide advantages through access to

established infrastructure, logistics networks, technical expertise, and other shared resources. Together, these characteristics may improve the economics of REE recovery compared with stand-alone REE projects, where the investment case depends much more directly on expected revenues from rare-earth production.

Per Geijer is envisaged as part of a broader integrated processing chain, further strengthening its strategic relevance for the European rare-earth value chain. Under LKAB's development concept, an apatite concentrate would be produced from the iron-ore production stream and transported to the company's planned industrial park in Luleå, for which the Land and Environment Court at Umeå District Court granted an environmental permit in May 2026 (Umeå District Court 2026). There, the concentrate would be processed into phosphorus products and a mixed rare-earth concentrate. The rare-earth concentrate would subsequently require further separation into individual rare-earth products, a downstream stage planned in connection with LKAB's investment in REEtec and the company's separation facility at Herøya in Norway. The strategic value of the Per Geijer project would thus extend beyond primary extraction by strengthening the European rare-earth value chain from mine to separated rare-earth products.

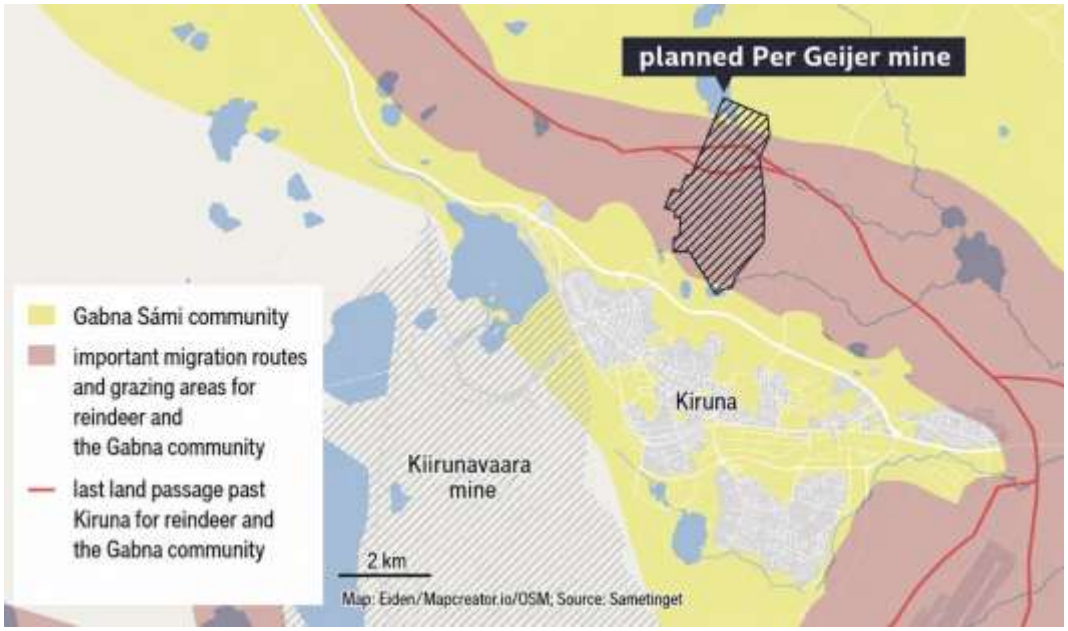
The Per Geijer project is currently subject to an application for an exploitation concession under the Swedish Minerals Act, which LKAB submitted to the Mining Inspectorate in June 2023. As of 2026, the application remains under consideration. An exploitation concession would give LKAB the exclusive right to develop and extract the deposit, but would not in itself authorise mining; a future operation would also require, among other approvals, an environmental permit under the Swedish Environmental Code. The continuing concession process therefore illustrates the lengthy sequence of regulatory steps between identification of a strategically important mineral resource and potential commercial extraction.

The project is located within the traditional reindeer-herding lands of the Gabna Sámi community, whose reindeer-herding rights are recognised and regulated under the Reindeer Husbandry Act (1971:437).[1] Research by the Stockholm Environment Institute shows that mining projects in reindeer-herding areas can pose significant risks to Indigenous rights and livelihoods, particularly through impacts on grazing land, migration routes, and the cumulative fragmentation of land used for reindeer husbandry (Kløcker Larsen et al. 2026). In the case of Per Geijer, further mining development could reduce access to grazing areas and disrupt seasonal movements.

As illustrated in Figure 5, the Per Geijer deposit is situated in an already heavily developed mining landscape, where existing mining operations and associated infrastructure constrain the routes available for reindeer migration past Kiruna. Of particular concern to the Gabna Sámi community is the remaining migration corridor past the city, which representatives of the community have described as the only viable passage for moving reindeer between seasonal grazing areas. The spring migration towards calving and summer grazing areas is particularly sensitive because it coincides with the calving period (Unga 2024).

[1] The Swedish Reindeer Husbandry Act (Rennäringslagen, 1971:437), Section 1, provides that the right to reindeer husbandry belongs to the Sámi population, is founded on immemorial prescription (*urminnes hävd*), and may be exercised by members of a Sámi reindeer-herding community (*sameby*).

Figure 5 Per Geijer deposit and reindeer-migration routes around Kiruna.



Source: Adapted from Süddeutsche Zeitung (Bertrams, Gercama and Taylor 2025), map by Eiden/Mapcreator.io/OSM; underlying data from Sametinget.

These conflicting land-use interests have strained the longstanding cooperation agreement between LKAB and the Gabna Sámi community. In December 2025, Gabna announced that it was terminating the agreement with LKAB, arguing that the existing consultation arrangements no longer provided a useful platform for resolving the conflicting interests.[2] LKAB has stated that it wishes to maintain dialogue and develop new forms of cooperation, but as of August 2026 no new cooperation agreement has been publicly reported.

Opposition from Sámi stakeholders reflects broader questions of Indigenous rights, cultural continuity, and the ability to maintain reindeer husbandry as a traditional livelihood. These concerns are reflected in international Indigenous-rights norms, including the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Article 32 of the Declaration calls on states to consult and cooperate in good faith with Indigenous peoples through their representative institutions in order to obtain their free, prior, and informed consent before approving projects affecting their lands, territories, or resources (UN 2007). Although UNDRIP is not itself a legally binding treaty, it provides an important international normative framework for assessing consultation, participation, and Indigenous rights in projects such as Per Geijer.

Environmental considerations add another layer of complexity. Although Per Geijer is envisaged as an underground mine, its development would still require surface facilities and generate waste streams requiring long-term management, with potential impacts on

[2] LKAB and the Gabna Sámi community entered into a formal cooperation agreement in 2013. The agreement established a framework for dialogue, information exchange, joint meetings, and discussion of land-use conflicts and measures to mitigate impacts on reindeer husbandry. It remained in place for more than twelve years before being terminated in December 2025. Similar cooperation arrangements were also established with other Sámi reindeer-herding communities affected by LKAB's operations.

land, surface and groundwater systems, and surrounding ecosystems. The extent and location of these impacts will depend on the eventual mine design and processing arrangements. Such concerns are particularly relevant in a sub-Arctic environment, where ecological recovery can be slow and cumulative pressures from existing mining activity and associated infrastructure are already significant (Tolvanen et al. 2019).

The Per Geijer case thus illustrates the central tension in EU rare-earth policy between Union-wide benefits and locally concentrated environmental, social, and land-use costs, which can give rise to significant local conflicts that delay or prevent project development altogether, even where a project has substantial strategic value for the Union as a whole.

3.3.2 Norra Kärr

The Norra Kärr deposit, located near Gränna in southern Sweden, is one of Europe's most important known sources of heavy rare-earth elements (HREEs), including dysprosium and terbium, which are among the most supply-constrained segments of the global rare-earth market (European Commission 2023b; IEA 2026). These elements are critical for high-performance permanent magnets used in electric vehicles, wind turbines, and defence technologies, making the deposit strategically significant within EU critical raw materials policy. China's dominant position in HREE supply further underlines the importance of the Norra Kärr deposit in the EU's ambition to reduce its external dependencies.

Despite its strategic relevance, the project has faced prolonged contestation, primarily due to environmental concerns. Norra Kärr is located close to Lake Vättern, one of Sweden's largest lakes and an important source of drinking water (Swedish Agency for Marine and Water Management 2022). This proximity has made the project particularly sensitive to concerns about water contamination, waste management, and long-term environmental risk.

Legal processes have been central to the project's trajectory. In 2016, the Supreme Administrative Court of Sweden annulled the exploitation concession because the assessment was too narrow and did not sufficiently cover the wider mining operation and its potential effects on nearby Natura 2000 areas (HFD 2016 ref. 21). The judgment became an important reference point in Swedish mining law because it clarified that the concession-stage assessment cannot artificially isolate the extraction area from the facilities and environmental effects necessary for the operation as a whole.

Following the Supreme Administrative Court's ruling, the project developer substantially revised the project before submitting a new application for an exploitation concession. The revised design envisages limiting processing at the Norra Kärr site largely to physical concentration, while chemical processing would take place at another location. It also eliminates the need for a wet tailings storage facility at the mine site. These changes are intended to reduce the project's environmental footprint, including its land use, water requirements, and waste-management risks (Leading Edge Materials 2021).

In June 2026, the Swedish Government granted GREENNA Mineral AB a new 25-year exploitation concession for Norra Kärr, allowing the project to proceed to the next stage of development (Government of Sweden 2026). The concession does not itself authorise mining, and the project remains subject to subsequent environmental permitting under

the Swedish Environmental Code. The Government attached conditions requiring precautionary measures to protect the Hålaveden area, drinking-water supply from Lake Vättern, the Holkaberg Natura 2000 area, and total-defence interests (Government of Sweden 2026). Significantly, the concession decision illustrates that the strategic and socio-economic importance of rare-earth extraction can enter the substantive balancing of competing land-use interests under Swedish law. At the same time, strategic mineral value does not remove the need for subsequent and legally robust environmental review. Norra Kärr therefore illustrates the interaction between two EU policy objectives: strengthening access to critical raw materials and maintaining environmental and nature-protection safeguards.

As of August 2026, Norra Kärr has not been designated a Strategic Project under the CRMA. This distinction is important because CRMA Strategic Project status can give security-of-supply considerations additional legal weight in certain environmental-law balancing tests, as discussed in Section 3.4, but that specific legal status does not currently apply to Norra Kärr.

From a local perspective, opposition reflects concerns about environmental risk, water security, and long-term sustainability. The case has mobilised local communities, environmental actors, and regional stakeholders, demonstrating how site-specific environmental risk can scale into broader political contestation. The local concerns also extend beyond environmental risk to questions of regional identity, landscape values, recreation, and the long-term implications of introducing large-scale mining activities into an area not traditionally associated with contemporary mining. At the same time, the developer emphasises the strategic importance of the deposit and has proposed technical adjustments intended to reduce environmental impacts, including changes to project design and waste-management arrangements (Leading Edge Materials 2021).

Norra Kärr illustrates how legal and environmental review can significantly extend project timelines and highlights a different dimension of the EU's implementation challenge: even where mineral development is strategically important, environmental risks—particularly those related to water, waste, and protected areas—can generate local resistance, legal uncertainty, and delays. The case shows that the collective-action problem is not only about whether local communities accept strategically important projects, but also about whether such projects can satisfy the legal and environmental requirements necessary to convert geological potential into operational supply.

3.3.3 Olserum

The Olserum deposit, located near Västervik in southeastern Sweden, represents a smaller and less advanced rare-earth occurrence within the European context. The deposit contains both light and heavy rare-earth elements and is relatively enriched in heavy rare-earth elements (HREEs), including dysprosium, terbium, and yttrium, while light rare-earth elements such as neodymium are also present (Lundqvist 2022). These elements are among the most strategically important inputs for permanent magnets and advanced technologies. Despite its strategic potential, Olserum remains in the exploration stage, with ongoing drilling programmes aimed at expanding and validating the resource base (European Green Transition 2024). While its scale is more limited than those of Per Geijer or Norra Kärr, Olserum forms part of the broader European resource

base and is regarded, alongside Norra Kärr, as one of the most promising rare-earth deposits in Sweden and Europe (Lundqvist 2022).

The deposit has been designated by Swedish authorities as an area of national interest for valuable minerals, reflecting its perceived strategic importance within Sweden's critical minerals policy (Lundqvist 2022). However, this designation does not automatically translate into project approval or local acceptance, illustrating the gap between strategic objectives and implementation.

From an EU perspective, Olserum illustrates the earlier stages of the rare-earth development pipeline. The project remains at an exploratory phase, highlighting the gap between identified geological resources and operational supply capacity (European Commission 2023b). Recent exploration results have increased interest in the Olserum deposit, as drilling campaigns conducted in 2024–2025 confirmed rare-earth mineralisation across all tested drill holes and suggested a larger resource potential than previously estimated (Ubaidi 2025).

Although unlikely to transform European supply security on its own, Olserum could contribute to the diversification of the EU's resource base. Even if the deposit were developed, its contribution to European supply security would depend on the existence of downstream processing, separation, and refining capacity within Europe. The case therefore highlights that geological resources alone are insufficient to reduce strategic dependencies.

One key issue associated with the deposit is the presence of naturally occurring radioactive materials (NORM), such as thorium and uranium, which are commonly found in rare-earth mineralisation. The extraction and processing of such materials can generate radioactive waste streams requiring long-term management and monitoring (IAEA 2011; Lundqvist 2022). These risks are a recurring feature of rare-earth projects and often contribute to public concern. Concerns surrounding radioactive by-products have already featured in local environmental debates. Although the project remains at an early stage, the presence of thorium- and uranium-bearing minerals has raised questions regarding future waste management, environmental monitoring, and long-term liability.

Unlike Per Geijer, which is located in an established mining region, and Norra Kärr, where concerns centre on water protection, Olserum is situated in a region with limited contemporary mining activity and closer proximity to agricultural land, residential areas, and coastal landscapes. This may shape local perceptions of both risks and benefits associated with future extraction, particularly where mining is not viewed as an established part of the local economy.

Beyond its immediate resource potential, Olserum is analytically important because it illustrates the earliest stage of the EU's implementation challenge. Yet concerns regarding radioactive by-products, waste management, and future land-use impacts have already emerged in public debate. The case therefore demonstrates that the collective-action problem can arise well before permitting decisions are taken, as local actors begin to assess the potential costs of projects whose strategic benefits would largely accrue at the European level.

3.3.4 Synthesis

Of particular interest across all three cases is the estimated concentration of rare-earth elements (REEs) within each deposit and the relative proportion of heavy rare-earth elements (HREEs) compared to light rare-earth elements (LREEs). HREEs are generally less abundant geologically and carry higher strategic significance, with global extraction and downstream processing heavily dominated by China. Table 4 details the estimated mineral resources for each Swedish deposit, alongside the associated geological confidence levels and specific concentrations of REEs, HREEs, and LREEs. This information originates from the Minerals4EU database.

As shown in Table 4, Per Geijer represents by far the largest total resource base of the three deposits, despite exhibiting the lowest relative concentration of REEs. At the same time, Norra Kärr and Olserum contain significantly higher REE concentrations, grading at 0.5 per cent and 0.6 per cent respectively, compared to Per Geijer's 0.183 per cent.

Table 4 REE Deposits and Estimated REE Concentrations

Deposit	Resource Classification	Confidence Level	Ore (Mt)	REE (Kt)	REE (%)	LREE	HREE
Per Geijer	Inferred mineral resource	Low confidence	1,200	2,200	0.183%	0.147%	0.035%
Norra Kärr	Indicated mineral resource	Medium confidence	110	550	0.5%	0.242%	0.257%
Olserum	Indicated + inferred mineral resource	Mixed confidence	4.5	27	0.6%	N.A.	N.A.

Source: Minerals4EU.

Taken together, the three Swedish cases illustrate how the collective-action problem in EU rare-earth policy manifests across different stages of project development and through different types of implementation constraint.

First, the cases show that locally concentrated costs can take multiple forms and become operational through different project-level constraints. Per Geijer illustrates how strategic mineral development may conflict with Sámi reindeer herding, Indigenous rights, and cumulative land-use pressures in an already heavily industrialised mining region. Norra Kärr illustrates how water protection, Natura 2000 concerns, and the scope of environmental assessment can constrain even strategically important heavy rare-earth development. Olserum illustrates how earlier-stage projects may face technical, metallurgical, financial, environmental, and acceptance-related challenges before reaching the most advanced permitting stages. The cases therefore demonstrate that the implementation challenge is not a single phenomenon, but a combination of constraints that varies by project type, location, and stage of development.

Second, where local opposition or concern does arise, it should not be treated as merely procedural or idiosyncratic. In the Swedish cases, such responses are linked to substantive environmental, land-use, livelihood, and rights-based interests and, more

generally, to the distribution of project costs and benefits. Local contestation is therefore not peripheral to rare-earth strategy, but one part of the implementation challenge through which strategic objectives are translated into—or prevented from becoming—operational capacity.

Third, the cases highlight that the implementation challenge operates across the entire project pipeline, from exploration to advanced development and potential large-scale extraction. Project-level constraints become strategically consequential because they are processed through national legal and administrative systems that determine whether identified deposits can be converted into operational supply. The next subsection therefore turns to the Swedish permitting process, which provides the institutional setting in which competing land-use interests, environmental risks, Indigenous rights, technical viability, and questions of local acceptance are assessed.

3.4 The Swedish Permitting Process

The Swedish cases illustrate not only project-specific conflicts, but also the broader permitting structure through which rare-earth projects must pass before they can become operational. Sweden has significant mineral potential and a long mining tradition, but the transition from geological discovery to production is shaped by a demanding legal and administrative process. A project must normally demonstrate not only that a deposit is economically viable, but also that extraction can be reconciled with environmental protection, land-use planning, water management, infrastructure needs, and affected rights (SGU n.d.-a; Minerals Act 1991:45; Environmental Code 1998:808). In practice, project development must also navigate questions of local acceptance.

A mining project generally requires, at minimum, an exploitation concession under the Minerals Act and an environmental permit under the Swedish Environmental Code. These constitute distinct administrative stages. An exploitation concession gives the holder a right to exploit a proven, extractable mineral deposit, normally for a fixed period, but it does not by itself authorise the operation of a mine (SGU n.d.-b). Environmental permits under Chapters 9 and 11 of the Environmental Code are granted by the Land and Environment Court, and additional permits may be required depending on the project's location and design (SGU n.d.-a; Environmental Code 1998:808). The central hurdle is therefore not a single administrative decision, but the interaction between several stages of review.

Table 5 The Swedish Permitting Process for Opening New Mines

Stage	Main authority	Typical issue	Main hurdle	Historical duration
Exploration permit	Mining Inspectorate / Bergsstaten	Right to investigate a mineral deposit	Access, work plans, landowner and rights-holder concerns	1-3 years
Exploitation concession	Mining Inspectorate / sometimes Government	Right to exploit a defined deposit	Economic viability and competing land-use interests	3-7 years

Stage	Main authority	Typical issue	Main hurdle	Historical duration
Environmental permit	Land and Environment Court	Permission to operate the mine and associated activities	Water, waste, biodiversity, Natura 2000, emissions, and cumulative impacts	4-8 years
Local, building, and technical approvals	Municipality and technical agencies	Zoning, roads, power, water, safety, and infrastructure	Local legitimacy and practical implementation	2 – 4 years

Source: Adapted from SGU's description of Swedish mining legislation and the exploration process, together with Boverket's description of municipal planning and building responsibilities (SGU n.d.-a; SGU n.d.-b; Boverket 2024a; Boverket 2024b). The duration estimates are based on historical administrative data compiled from complex industrial permitting reviews (Tillväxtanalys 2016; Bergsstaten 2026).

Table 5 highlights why the permitting challenge is difficult to reduce to a single approval stage. Each phase addresses a distinct regulatory question: geological investigation, extraction principles, environmental permissibility, or local land-use implementation. Delays stem from the sequential interaction between stages, iterative requests for supplementary data, design modifications, and administrative appeals. However, not all stages necessarily need to proceed strictly in sequence. Depending on the project and the applicable legal requirements, parts of the environmental assessment, technical design, consultation, infrastructure planning, and preparation of subsequent permit applications may be undertaken partly in parallel. There may therefore be significant scope to shorten the overall development timeline through earlier coordination between authorities and developers, better sequencing of information requirements, and greater overlap between preparatory stages, without reducing the substantive standards applied to environmental protection, land use, or affected rights.

This multi-layered structure drives the collective-action problem. While a rare-earth project may be strategically desirable at the EU level, national permitting must evaluate it as a localised land-use intervention. Authorities must balance the deposit's characteristics against competing national interests, environmental risks, and affected community rights. Consequently, within the Swedish land-use framework, strategic mineral value operates as one relevant consideration rather than an automatic trump card (Environmental Code 1998:808, Ch. 3; HFD 2024 not. 36).

Permitting authorities must evaluate the broader project system rather than the mine footprint alone, as rare-earth operations may involve auxiliary infrastructure and environmental issues associated with tailings management, chemical processing, and naturally occurring radioactive materials (NORM). This was demonstrated in the Norra Kärr judgment, where the Supreme Administrative Court ruled that a concession assessment is legally deficient if it isolates the extraction area from the facilities and environmental effects necessary for the entire operation (HFD 2016 ref. 21).

Accordingly, Swedish law requires a balancing of competing national interests rather than granting categorical priority to mineral extraction. Reindeer husbandry, nature conservation, and mineral extraction may each receive protection as national interests under Chapter 3 of the Environmental Code. Where such interests are incompatible,

Section 10 requires priority to be given to the use that most appropriately promotes the long-term management of land, water, and the physical environment. HFD 2024 not. 36 (Kallak/Gállok) illustrates this balancing framework: the Supreme Administrative Court upheld the Government's decision to grant an exploitation concession after the competing national interests in mineral extraction and reindeer husbandry had been weighed against one another and conditions had been imposed on the concession. Strategic mineral value can therefore carry substantial weight, but it does not operate as an automatic rule of preference.

In northern Sweden, this balancing is also shaped by the legal significance of Sámi land use and reindeer-herding rights. While the landmark Girjas judgment concerned hunting and fishing rather than mining, the Supreme Court held that Girjas sameby possessed exclusive rights to grant hunting and fishing in the relevant area on the basis of immemorial prescription (NJA 2020 s. 3). The judgment is therefore important in demonstrating that Sámi rights may have a historically grounded legal basis independent of their statutory regulation. In the mining context, this reinforces the importance of properly assessing how proposed projects may affect established reindeer-herding rights and the practical conditions necessary for their exercise.

The EU Critical Raw Materials Act (CRMA) modifies this regulatory environment but does not displace national permitting requirements or applicable EU environmental law. Under Article 6(3), recognition as a Strategic Project does not affect requirements applicable to the project or project promoter under Union, national, or international law. Strategic Project status gives projects administrative priority and, under Article 11, establishes general maximum permitting periods of 27 months for extraction projects and 15 months for projects involving only processing or recycling, subject to specified exclusions and possible extensions. More importantly, Strategic Project status can also have a limited substantive legal effect. Under Article 10, Strategic Projects are recognised as contributing to the Union's security of supply and, for the purposes of specified derogation provisions in the Habitats Directive, Water Framework Directive and Birds Directive, are considered to be in the public interest or to serve public health and safety and may be regarded as being of overriding public interest. This does not guarantee authorisation or lower the applicable environmental standards: all other conditions contained in those legislative acts—including requirements concerning alternatives, mitigation and, where relevant, compensation—must still be satisfied. Strategic Project status can increase the legal weight attached to security-of-supply considerations in defined environmental-law balancing tests, but it neither guarantees authorisation nor establishes a general rule giving strategic raw-material interests priority over competing public interests.

The implementation challenge is therefore not a product of mere bureaucratic inertia. It reflects a fundamental governance reality: projects with European strategic benefits must be assessed and authorised through national permitting frameworks that apply both national and EU law to concrete local socio-environmental impacts. The historical durations compiled in Table 5 illustrate that the broader development process from exploration to operational approval can span roughly 10 to 20 years (Tillväxtanalys 2016; Bergsstaten 2026). These historical development timelines are not directly comparable with the CRMA's statutory permitting periods, which begin only once a permit

application is acknowledged as complete and exclude specified stages and delays. They nevertheless illustrate the broader institutional challenge of accelerating strategically important projects within complex national review processes.

This analysis provides the basis for the policy evaluation in the following section, which assesses whether the CRMA and RESourceEU address this structural friction or primarily focus on market de-risking and financing coordination while leaving local burden-sharing unresolved.

4. EU Policy Responses and Policy Options

The CRMA establishes four benchmarks for strengthening the EU's critical-raw-materials capacity by 2030. The Union aims to develop extraction capacity equivalent to at least 10 per cent of annual consumption, processing capacity of at least 40 per cent, and recycling capacity of at least 25 per cent, while ensuring that no more than 65 per cent of annual consumption of any strategic raw material at any relevant stage of processing is supplied by a single third country. These benchmarks provide quantitative reference points for the broader measures established, announced, or further developed under the CRMA and RESourceEU. Table 6 summarises the principal instruments relevant to rare-earth supply security under three headings.

Building and financing supply-chain capacity focuses on reducing the administrative, financial, and commercial barriers that constrain investment in European extraction, processing, and recycling. Strategic Project designation, accelerated permitting, access to public and private finance, demand aggregation, and market-support mechanisms are intended to improve project development and bankability. These measures can reduce some of the risks borne by developers and investors, but they do not in themselves determine whether projects can satisfy environmental, land-use, and other substantive requirements.

Resilience, diversification, and downstream capacity broadens the strategy beyond domestic extraction. Stockpiling can provide temporary protection against supply disruptions, while external partnerships and diversified sourcing seek to reduce dependence on individual third-country suppliers. Support for European processing and downstream manufacturing is particularly important because some of the EU's most acute rare-earth vulnerabilities arise after extraction, in separation, metals, and permanent magnets. These measures therefore address supply-chain concentration at several stages rather than treating additional European mining as a sufficient response.

Corporate preparedness and product circularity address vulnerabilities at the firm and product level. Supply-chain risk assessments, diversification and substitution measures can reduce corporate exposure to disruptions, while improved product design, information requirements, reuse, and recycling can increase the retention of rare-earth materials within the European economy. Their contribution is inherently gradual, however, because recycling depends on available end-of-life material, collection systems, and economically viable recovery technologies. Circularity can therefore reduce future primary-material requirements, but cannot be expected to eliminate them.

Table 6 CRMA and RESourceEU instruments relevant to rare-earth supply security

A. Building and financing supply-chain capacity
2030 benchmarks Sets EU targets for 2030: 10 per cent of annual consumption from EU extraction, 40 per cent from EU processing, 25 per cent from recycling, and no more than 65 per cent dependence on a single third country for any strategic raw material. **Strategic Projects and accelerated permitting** Identifies strategically important projects for priority treatment, including coordinated procedures, single points of contact, and support in accessing finance. Sets general maximum permitting periods of 27 months for extraction projects and 15 months for projects involving only processing or recycling, subject to specified exclusions and extensions. **Critical Raw Materials Centre** Provides for a future EU-level centre intended to centralise strategic intelligence, project monitoring, stockpiling coordination, joint purchasing, and market support. **Financial measures** Provides for coordinated access to EU and public financial instruments, technical assistance, and project-finance support, with the aim of mobilising €3 billion in EU funding within 12 months. **Market and risk-support mechanisms** Provides for mechanisms intended to connect buyers and suppliers, aggregate demand, support long-term offtake agreements and joint purchasing, and reduce revenue and price risks through guarantees and price-support mechanisms. **Recycling and circularity** Supports the recovery of strategic raw materials from waste streams, including end-of-life permanent magnets and other rare-earth-containing products.
B. Resilience, diversification, and downstream capacity
Stockpiling and crisis preparedness Builds EU capacity to purchase, store, and release critical raw materials during supply disruptions, including through the future CRM Centre. **External diversification and economic-security measures** Supports projects and strategic partnerships in third countries, secures diversified supplies and offtakes, and uses trade, investment-screening, and anti-distortion tools to protect EU supply chains. **Downstream manufacturing support** Supports permanent-magnet production and other strategic downstream activities, strengthening demand for diversified rare-earth inputs and reducing reliance on imported components.
C. Corporate preparedness and product circularity
Corporate risk management and diversification Requires designated large companies to map strategic raw material supply chains, assess vulnerabilities, and mitigate risks through diversification, substitution, and contingency planning. **Product design, labelling, and recoverability** Requires information on the type, composition, location within products, and removal of permanent magnets, and promotes designs that facilitate recovery, reuse, and recycling. **Recycled-content requirements** Introduces disclosure requirements for recycled content in permanent magnets and provides for future minimum recycled-content shares.

Source: Compiled by the authors based on Regulation (EU) 2024/1252 (Critical Raw Materials Act) and European Commission (2025b).

4.1 Remaining Challenges and Policy Options

While the current EU policy framework addresses a broad range of supply-security risks, it does not fully resolve the distributional asymmetry at the centre of the collective-action problem identified in this report. The CRMA and RESourceEU provide increasingly developed mechanisms for accelerating strategically important projects, mobilising finance, reducing market and supply-chain risks, diversifying external sourcing, and strengthening downstream capacity and circularity. In these respects, risks that would otherwise fall on individual firms, investors, or Member States are increasingly mitigated or shared at the European level.

What remains less developed is a corresponding framework for addressing the environmental, social, and land-use burdens associated with projects that generate Union-wide strategic benefits. These costs remain concentrated in the particular territories and communities where extraction, processing, and related infrastructure are located. Strategic Project status may accelerate procedures and, in specified circumstances, give security-of-supply considerations additional legal weight, but it does not remove the underlying environmental and social impacts of development or provide a general mechanism for sharing those burdens more broadly across the Union. The resulting asymmetry—between increasingly collective management of strategic and commercial risks and the continued local concentration of environmental, social, and land-use costs—is the principal unresolved issue in the current framework.

There is no single institutional response to this problem. At a conceptual level, three broad policy options can be distinguished: giving greater weight to Union-wide strategic interests in relevant decision-making processes; reducing the need for additional domestic extraction by relying more heavily on alternative resilience measures; and internalising a greater share of the locally concentrated costs associated with projects that provide wider European benefits. These options are not mutually exclusive, nor are they intended as detailed policy prescriptions. Rather, they provide a framework for examining the different trade-offs involved in reconciling European supply security with environmental, social, and land-use interests at the project level.

4.1.1 Giving greater weight to Union-wide strategic interests

The first policy option is to give Union-wide security-of-supply interests greater weight in the legal and administrative processes governing critical-raw-material projects. This could involve stronger priority rules for designated Strategic Projects, further coordination and acceleration of permitting procedures, or giving strategic supply considerations greater weight when authorities balance competing public interests. The CRMA has already moved some distance in this direction. Strategic Projects receive administrative priority and shortened permitting periods and, as discussed in Section 3.4, Article 10 gives Strategic Project status limited substantive significance by recognising such projects as contributing to Union security of supply and allowing that strategic interest to enter specified public-interest tests under EU environmental law.

EU law can therefore shape both permitting procedures and, within defined limits, the substantive weight attached to strategic interests. The CRMA does not, however, create a general EU-level authority to approve individual mining projects or displace applicable environmental, land-use, and rights-based requirements. A substantially stronger role for

Union-wide strategic considerations would consequently raise questions concerning EU competence, proportionality, and the relationship between Union legislation and Member-State permitting systems.

The principal limitation of this option is that greater strategic weight changes the balance between competing interests without removing the underlying environmental, social, and land-use costs of development. It may facilitate authorisation in some circumstances, but it does not by itself address how the locally concentrated costs of achieving Union-wide supply security are distributed. Depending on how such priority is applied, it may also generate additional legal or political contestation where affected communities perceive strategic acceleration as reducing meaningful participation or weakening established safeguards.

4.1.2 Focusing on alternative resilience measures

The second policy option is to reduce the scale of new primary extraction required within the Union by focusing on alternative resilience measures. These include recycling and circularity, material substitution and efficiency improvements, strategic stockpiling, and greater diversification of external supply through partnerships with third countries. External diversification can also be supported through trade agreements, strategic raw-material partnerships, and newer instruments such as Clean Trade and Investment Partnerships, which seek to combine supply diversification with investment cooperation and sustainability objectives (European Commission 2025c). This option is already embedded in the EU's critical-raw-materials strategy: the CRMA promotes recycling and circularity, diversification of external supply, resource efficiency, and coordination of strategic stocks, while RESourceEU further develops several of these resilience measures. Under this option, the EU would continue to strengthen domestic processing and downstream manufacturing capacity where feasible, while sourcing a larger share of primary and intermediate materials from a more diversified set of external suppliers.

This approach has several advantages. Recycling and improved product design can reduce primary-material demand over time, while substitution and greater material efficiency can lower exposure to particularly supply-constrained rare earths. Strategic stockpiles can provide temporary protection against short-term supply disruptions, and diversified sourcing can reduce dependence on any single external supplier. These measures may also be implemented more rapidly than the development of new European mines and can therefore contribute to resilience during the lengthy period required to bring additional domestic extraction capacity into production.

The option nevertheless has clear limitations. Recycling cannot immediately replace primary supply because the available stock of end-of-life products is constrained by long product lifetimes and by the rapid growth of demand for rare-earth-intensive technologies. Material substitution may involve performance, cost, or design trade-offs, while stockpiles can cushion temporary disruptions but cannot provide a sustained flow of material. External diversification reduces concentration risk but does not eliminate external dependence: European supply would remain exposed to political developments, transport disruptions, processing bottlenecks, and contractual risks in third countries. A strategy that substantially reduces domestic extraction would therefore still depend on

continued European capacity in processing, separation, recycling, and downstream manufacturing if it is to address the vulnerabilities identified earlier in this report.

There is also an important distributional qualification. Reducing mining within the EU does not eliminate the environmental and social costs associated with primary extraction; it means that a greater share of those costs will be incurred in producer countries outside the Union. External diversification therefore also raises questions about the environmental, social, and governance standards applied in producer countries and the interests of communities affected by extraction.

This option can therefore reduce, but not eliminate, the need for additional European primary extraction. Its principal advantage is that it lowers the number or scale of domestic projects required to improve resilience and thereby reduces some of the locally concentrated costs analysed in this paper. Its principal limitation is that the Union remains dependent on external supplies for part of the value chain. The policy question is consequently not whether alternative resilience measures can replace domestic extraction altogether, but how far they can reduce the amount of new extraction required without leaving the EU excessively exposed to external supply disruptions.

4.1.3 Internalising local costs

The third policy option is to internalise a greater share of the locally concentrated costs associated with projects that generate Union-wide strategic benefits. If a more resilient rare-earth supply chain benefits Member States, downstream industries, and consumers across the Union, there is an economic and political rationale for considering whether some of the environmental, social, and land-use burdens associated with providing that resilience should also be shared more broadly. Internalisation therefore directly addresses the distributional asymmetry at the centre of the collective-action problem identified in this report.

Internalisation can be understood as involving two broad elements. The first is prevention and minimisation of local impacts; the second is possible benefit-sharing or compensation where significant residual burdens remain. Project developers would continue to bear the costs of complying with environmental law, permit conditions, remediation requirements, and other obligations associated with their activities. EU or national instruments could nevertheless play a complementary role where additional measures are linked to the wider strategic value attributed to a project and where the resulting benefits extend beyond the host territory or Member State.

Where significant burdens remain after prevention and mitigation, possible forms of internalisation may include support for affected communities, local infrastructure, livelihood measures, or other forms of locally appropriate benefit-sharing. Such measures cannot, however, be assumed to make all impacts compensable. Some environmental, cultural, or rights-based losses cannot readily be converted into monetary equivalents, and financial transfers cannot substitute for meaningful participation, applicable legal safeguards, or the protection of established rights.

Benefit-sharing should not be understood simply as monetary compensation. The form and governance of benefits may matter as much as their monetary value. Evidence from the facility-siting literature suggests that direct financial compensation can, in some

circumstances, reduce rather than increase acceptance if it is perceived as an attempt to purchase consent (Frey, Oberholzer-Gee and Eichenberger 1996). Locally appropriate arrangements may instead include infrastructure, livelihood measures, long-term community benefits, or other forms of collective benefit-sharing. Such measures complement rather than substitute for prevention, mitigation, meaningful participation, and applicable rights protections.

This distinction is particularly relevant where projects affect Sámi reindeer-herding communities. As the Per Geijer case illustrates, impacts on grazing land and migration routes may affect the practical exercise of established reindeer-herding rights and the continuity of a traditional livelihood. Benefit-sharing or compensation in such circumstances would therefore raise particular questions concerning rights protection and meaningful participation by the affected Sámi community. Financial compensation would not substitute for the applicable legal requirements governing consultation, environmental assessment, or the protection of Sámi rights.

Any burden-sharing arrangement would also need to distinguish between ordinary project costs and environmental liabilities, which remain the responsibility of project developers, and additional measures linked to the wider strategic value attributed to a project. EU or national co-financing could, in principle, provide one mechanism for sharing such additional costs where the resulting benefits extend beyond the host region or Member State. In this sense, supranational support would complement rather than replace the polluter-pays principle. Where such additional mitigation or benefit-sharing measures are used, their credibility may depend on transparent and durable ex ante commitments, particularly where obligations concerning long-term monitoring, remediation, or community benefits extend well beyond the initial permitting decision.

The Per Geijer project provides a concrete illustration of the underlying trade-off. LKAB examined an alternative underground mining method based on continuous backfilling, which its technical studies indicated could eliminate or substantially limit the ground deformation associated with caving and potentially leave the surface above the deposit available for other land uses (Jones et al. 2022; Kløcker Larsen et al. 2026). The method was not selected in LKAB's application for an exploitation concession, with the company citing substantially higher costs, extensive infrastructure requirements, and additional surface land needed for handling backfill material (Kløcker Larsen et al. 2026). Whether such a method would preserve a functionally viable reindeer migration corridor for the Gabna Sámi community has not yet been established, and the publicly available material does not show that it would resolve the broader land-use conflict. The case nevertheless raises a broader burden-sharing question central to the policy option considered here: if a costlier project design can materially reduce locally concentrated impacts while delivering strategic benefits to the Union as a whole, should EU or national co-financing help cover the incremental cost?

4.2 A Balanced Approach

The three policy options outlined above involve different trade-offs and need not be regarded as mutually exclusive. Giving greater weight to Union-wide strategic interests may help accelerate strategically important projects and ensure that security-of-supply considerations receive appropriate weight in permitting decisions, but it does not remove

the environmental, social, and land-use costs associated with those projects. Conversely, reducing the need for domestic extraction through recycling, substitution, stockpiling, material efficiency, and diversified external sourcing can lower some of these local burdens, but leaves a degree of external dependence. Internalising local costs offers a third response by considering whether some of the burdens associated with Union-wide supply security can be reduced or distributed more broadly, although not all environmental, cultural, or rights-based impacts can readily be compensated.

In practice, the three options could be combined in different proportions. Alternative resilience measures can reduce the amount of new European extraction required, while selective expansion of domestic extraction, processing, separation, recycling, and downstream manufacturing can contribute to reducing external vulnerabilities. Where new projects generate benefits extending across the Union, mechanisms for preventing, mitigating, or sharing locally concentrated costs may provide an additional component of such a strategy.

The appropriate balance will differ across projects and stages of the value chain. The EU's most acute strategic vulnerabilities are concentrated particularly in downstream processing and manufacturing, whereas the collective-action problem examined in the Swedish case studies is especially visible upstream, where extraction projects generate concentrated territorial costs. Expanding European mining capacity is therefore neither a sufficient nor necessarily the primary response to rare-earth dependence, but it may form one component of a broader resilience strategy.

The policy choice is consequently not between complete European self-sufficiency and continued external dependence. Rather, it concerns how different combinations of domestic capacity, external diversification, circularity, strategic prioritisation, and burden-sharing affect the trade-off between supply-chain resilience and locally concentrated costs. From the perspective developed in this report, a balanced combination of these instruments appears more realistic and viable than relying predominantly on any one of the three options.

5. Conclusion: The EU's Rare-Earth Challenge in International Perspective

The European Union's rare-earth challenge is not primarily a consequence of geological scarcity. Europe possesses substantial resource potential, yet the EU remains highly dependent on China, particularly in the midstream and downstream stages where rare-earth materials are converted into separated oxides, metals, alloys, permanent magnets, and other industrial inputs. The challenge is therefore broader than opening new mines: it is to build a more resilient value chain from extraction through processing to downstream manufacturing.

The implementation-side collective-action problem examined in this report is nevertheless most visible upstream. The benefits of a more resilient rare-earth supply chain are dispersed across Member States and European strategic industries, while many of the environmental, social, and land-use costs of new projects are concentrated in the communities and territories that host them. The Swedish cases illustrate different forms of this tension: conflicts with Sámi reindeer herding and cumulative land use at Per Geijer; water protection, waste management, and environmental review at Norra Kärr; and prospective environmental, technical, commercial, and local-acceptance issues at the earlier-stage Olserum project. Strategic vulnerability may therefore be greatest downstream, while the particular collective-action problem analysed here is especially visible upstream.

The underlying distributional problem is not unique to the EU. Similar tensions arise in other resource-producing federal systems, including Canada, Australia, and the United States, where the benefits of critical-mineral development are broadly shared while many of the environmental, cultural, and land-use costs are concentrated in particular regions and communities. Their institutional responses differ, but they illustrate a common tendency to combine strategic resource development with mechanisms for addressing its local consequences. Canada's Critical Minerals Strategy emphasises Indigenous participation, respect for Aboriginal and treaty rights, and benefit-sharing alongside increased mineral development (Government of Canada 2022). Australia's Critical Minerals Strategy similarly makes First Nations engagement and benefit-sharing an explicit part of critical-minerals policy, including employment, procurement, community benefits, and opportunities for equity participation (Australian Government 2023). In the United States, federal mechanisms such as FAST-41 seek to improve the coordination, transparency, and predictability of permitting for major projects without displacing applicable environmental review or public-participation requirements (Federal Permitting Improvement Steering Council 2023). These experiences do not show that local conflicts can be eliminated. Rather, they suggest that politically and institutionally sustainable resource development is likely to require consultation, mitigation, rights protection, and mechanisms through which affected communities can participate in the benefits of development.

Lessons may also be drawn from other policy areas in which broadly shared societal benefits are accompanied by locally concentrated costs. The siting of wind-power

installations, hydropower facilities, electricity infrastructure, and other major projects can generate similar tensions between wider policy objectives and the interests of affected host communities. Research on renewable-energy acceptance has highlighted the distinction between broad support for policy objectives and community acceptance of particular projects, while the wider facility-siting literature shows that monetary compensation cannot be assumed to resolve local opposition (Wüstenhagen, Wolsink and Bürer 2007; Frey, Oberholzer-Gee and Eichenberger 1996). These experiences point to the importance of participation, credible mitigation, and appropriately designed benefit-sharing, while also underlining that some environmental, cultural, or livelihood impacts may not be readily compensable. The collective-action problem examined in this report can therefore be understood as one manifestation of a broader challenge of reconciling geographically dispersed societal benefits with geographically concentrated costs.

The comparison also clarifies what is distinctive about the EU case. Canada, Australia, and the United States likewise face tensions between federal priorities and regional, local, or Indigenous interests, but the EU adds a cross-national dimension. The security and industrial benefits of greater rare-earth resilience can accrue across Member States, while many of the environmental, social, and land-use costs of an individual project remain concentrated within one Member State and often within a much smaller host territory. Moreover, many of the fiscal, administrative, and distributive instruments through which federal states can connect nationally defined strategic objectives with local development remain primarily national in the EU. International experience therefore does not provide a directly transferable model, but it reinforces the broader conclusion that collective-action problems surrounding strategic mineral development cannot be addressed through strategic prioritisation alone.

The CRMA and RESourceEU represent an important strengthening of the EU's response, but the central asymmetry identified in this report remains. Strategic, commercial, and supply-chain risks are increasingly addressed collectively at European level, while many of the environmental, social, and land-use burdens associated with strategically important projects remain locally concentrated. Addressing this tension therefore requires a combination of strategic prioritisation, alternative resilience measures, and credible mechanisms for participation, mitigation, and, where appropriate, benefit-sharing. European rare-earth security should consequently not be understood as complete self-sufficiency, but as the capacity to combine diversified external supply with selective European production in ways that strengthen resilience while recognising—and, where possible, more broadly sharing—the locally concentrated costs of achieving it.

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