

Strengthening the supply chain resilience of critical raw materials: lessons from the ERM chapter of the EU free trade agreements

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Abstract. Nowadays, the green and digital transformation of economy has become a global trend. Critical Raw Materials (CRMs) play a vital role in supporting the energy transition and technological innovation. Their secure, stable and sustainable supply is increasingly taking center stage in the world. In recent years, the European Union (EU) has signed and negotiated free trade agreements with many trading partners. Many of these agreements include an Energy and Raw Materials (ERM) Chapter. This kind of chapter targets the design of rules for raw material trade and investment, and is conducive to creating a more resilient raw material supply chain. By analyzing the content of these provisions and summarizing their characteristics, reference could be provided for other countries when negotiating relevant rules regarding raw materials in the free trade agreements. At the same time, it is also necessary to consider how to promote the relevant rules on raw materials to move towards a more just and reasonable direction under the multilateral trading system.

Keywords: European Union, critical raw materials, free trade agreement, energy and raw materials, supply chain resilience

1. Introduction

In recent years, the green and digital transition of the global economy has been accelerating. As the foundational resources of the energy transition and the scientific and technological revolution, Critical Raw Materials (CRMs) play an increasingly significant role in the development strategies of governments [1]. How to ensure the safe, stable and affordable supply of CRMs has become one of the key issues of the international community.

There is no internationally agreed definition of CRMs (sometimes referred to as “critical minerals”), and the categories vary depending on different government considerations. In general, CRMs refer to a range of metal and mineral raw materials that are vital to social economy, national security and development [2]. Rare earth elements, lithium, cobalt, nickel, graphite, etc. are generally included in the list of CRMs. However, this kind of materials are limited in reservation and concentrated in distribution in their nature. Combined with problems of long mining cycles, low recovery and substitutability, CRMs are pretty likely to be in supply shortages. Under the current surge in demand of CRMs, the security of their supply has become increasingly prominent. Countries and regions generally emphasize their indispensability to industrial development, technological innovation and clean energy transition, as well as the vulnerability of their supply chains [2]. In short, the importance in the development of new energy and new technology, the concentration in spatial distribution and the scarcity in reservation of CRMs make them a new field in the battle of today’s world powers.

At present, countries and regions have promulgated policies and taken measures in an attempt to strengthen the supply chain of CRMs and ensure their supply security. For example, Canada issued the Critical Minerals Strategy in 2022, Australia issued the Critical Minerals Strategy 2023-2030, and the United States enacted the Critical Minerals Consistency Act 2024. As a resource-scarce region, the EU relies heavily on imports of natural resources and is particularly concerned about the supply of CRMs. In addition to strategic dependence, the need for economic transformation has further exacerbated the EU’s sense of insecurity over the CRMs supply. The EU has adopted an increasing number of policy measures, aimed at strengthening its safe, diversified and more resilient supply chains. These measures include the enactment of the Critical Raw Materials Act [3], the signing and negotiating of Free Trade Agreements (FTAs) and Investment Facilitation Agreements (IFAs), etc [4]. The EU has introduced a new chapter on Energy and Raw Materials (ERM) in the FTAs signed or under negotiation, setting a series of rules for ERM. These rules contribute to further unblocking the EU’s raw material trade and investment market and ensuring stable and affordable supply.

This study concentrates on the special provisions for raw materials of ERM chapters in the EU FTAs, and uses normative analysis to analyze their role in ensuring the security of the CRM supply in the EU. At the same time, comparative analysis and inductive analysis are used to compare similar provisions in different FTAs, to summarize their commonalities and particularities, and to interpret the considerations of the EU in formulating these rules. The analysis of these provisions in this study can provide reference for other countries to make similar rules. In addition, it can also provide guidance for the construction and development of international economic and trade rules under the multilateral trading regime.

2. ERM chapter in EU's ftas

From the current FTAs and the EU proposals, the EU has included special considerations for ERM in the FTA negotiations with Chile, New Zealand, Kazakhstan, Australia, the Philippines, Thailand, Mexico, Indonesia, India, Tunisia and other countries. Each of these relevant documents contains an ERM Chapter. A comprehensive review of these rules reveals the EU's considerations for including such chapters in FTAs:

2.1. Common considerations

2.1.1. Adhere to market principles and consider national policy objectives

In terms of general provisions, other chapters in the EU FTAs already require the elimination in principle of all export duties or any measures having an equivalent effect. In particular, the ERM chapters contain special provisions for the elimination of import and export monopolies and of dual pricing.

Firstly, the article of general prohibition on import and export monopoly appears in all ERM chapters with the exact same terminology. Under this article, the Parties shall not designate or maintain an import or export monopoly, which means the exclusive right or grant of authority by a Party to an entity to import a good from, or export a good to, the other Party. This rule prevents government agencies or State-Owned Enterprises (SOEs) from controlling raw materials. For example, Chile may grant special access to certain companies to process lithium extracted by Chile, thereby promoting its value chain [5].

Monopolies greatly weaken the role of the market, making it difficult for market regulation to take effect. Banning monopolies could purify the unbalanced power in the market and ensure free and fair competition [5]. This clause helps guarantee the free flow of raw materials on the market between the EU and the other Party and maintains normal market prices for raw materials.

Secondly, these ERM chapters also include a general prohibition on dual pricing. The relevant provisions are reflected in the "export pricing" and "domestic pricing" clauses. The former prohibits the Parties from taking any measure that results in the higher price of energy goods or raw materials exported to the other party than the price destined for the domestic market. Therefore, the supply of related products must be based on market principles. However, the latter recognizes and respects the "regulatory needs" of government [6]. For example, "based on market principles", Chile may regulate the prices for energy goods out of a "public service obligation", but such obligation is bound to be "clearly defined, transparent and non-discriminatory", and does not go beyond what is "necessary" to achieve the objectives [6].

2.1.2. Ensure stable and secure infrastructure and extraction conditions

The ERM chapters include provisions regarding access to infrastructure. For instance, they require that renewable energy producers on both sides be granted non-discriminatory access to the grid and other essential infrastructures, to promote cross-border energy investments and electricity transmission. Moreover, an independent regulatory body is required to oversee the utilization of infrastructure and to resolve related disputes in a timely manner. In certain agreements, these chapters encompass provisions on the safety of equipment and infrastructure and offshore risk and safety. These are designed to ensure the safe extraction and transit, thereby safeguarding the development of investment projects in the extraction of energy and raw materials.

In addition to threats posed by natural disasters like hurricanes [7], socio-political risks also affect the stable and reliable access to infrastructure [8], which in turn impacts the security of energy systems. The extraction industry—particularly in the context of offshore oil and gas projects—demands an unequivocal emphasis on the safety of facilities and equipment. These rules facilitate the provision of infrastructure and reduce non-tariff barriers, therefore enhancing the predictability of trade and investment and ensuring the EU's stable access to the minerals and energy of its contracting parties.

2.1.3. Uphold sustainable development and foster technological exchange and innovation

The ERM chapters underscore the importance of sustainable development and technological innovation. These objectives are primarily reflected in the "Assessment of Environmental Impact" and "Research, Development and Innovation" articles. They

mandate the execution of environmental impact assessments, ensure transparency of information and public participation, and promote responsible mining and mineral trade. They also stress the need to enhance bilateral cooperation in areas such as green extraction, thereby facilitating the dissemination and exchange of environmentally friendly and cost-effective technologies.

These provisions aim to address the potential ecological and social impacts of extraction activities, ensuring the stable, reliable, and sustainable access to energy and raw materials, promoting a green transformation, and establishing a more efficient supply chain. They may correspond with the “Sustainable Development” chapters. While the ERM chapters specifically prescribe measures for the mining environment and safety, the broader sustainable development provisions often encompass wider commitments to environmental and labor protection. The two sets of provisions may overlap and complement one another, jointly fostering the development of a green supply chain [5].

2.1.4. Pursue the harmonisation of standards and regulatory practices

The EU emphasizes the coordination of relevant standards and administrative management in raw materials activities—particularly in the fields of energy-saving and renewable energy standards, environmental standards, labor standards, technical specifications, administrative approvals, and information transparency. The ERM chapters include dedicated provisions for cooperation in these areas. For instance, the Parties shall promote cooperation through “the convergence or harmonisation, if possible, of their respective current standards, based on mutual interest and reciprocity, and in line with modalities to be agreed by the regulators and the standardising bodies concerned” [6].

The EU has consistently prioritized sustainable development and continues to advance its green transition policies. Moreover, the EU considers increasing transparency and predictability, which facilitates the flow of investments and enhances energy infrastructure, as “the first and most important step” toward improved governance of ERM trade [8]. These provisions help establish and unify higher environmental and social standards, ensure the sustainable supply of ERM, and promote the EU’s energy transition.

These provisions may also relate to other chapters, such as those on “Technical Barriers to Trade” (TBT) and “Good Regulatory Practices” (GRP). The TBT chapter aims to eliminate technical obstacles between the Parties, while the GRP chapter is designed to collect best practices in standards and regulatory measures, and to promote public policy measures that eliminate trade distortions or unfair treatment, thereby fostering regulatory coordination between the two energy markets [9].

2.2. Individual considerations

2.2.1. Pay special attention to cooperation in key areas

In addition to the common provisions aimed at enhancing cooperation in the ERM sectors, certain agreements take into account the differing resource endowments of individual countries and specifically stipulate cooperation in the field of renewable energy [6]. Renewable energy occupies a particularly critical position in the EU’s energy policy [10]. For instance, the EU-Chile Interim Trade Agreement (ECITA) includes a commitment to cooperate in the area of renewable fuels, particularly concerning “the whole renewable hydrogen supply chain” [6]. On one hand, Chile boasts abundant wind and solar resources that provide exceptional conditions for the development of a green hydrogen industry [11]. On the other hand, for the EU, incorporating hydrogen supply is a solution to the intermittency issues associated with renewable energy as well as challenges in electricity storage and transportation [12]. Similarly, in the proposed FTA with the Philippines, the EU places special emphasis on eliminating non-tariff barriers to trade and investment in renewable energy production [13]. This targeted cooperation in key areas reflects the EU’s particular concern for the clean energy transition.

2.2.2. Incorporate special considerations based on actual circumstances

Within the FTAs with various contracting parties, the ERM chapters may also include different specific provisions. For instance, in the ECITA, an exemption is provided for small and isolated electricity systems. Specifically, these systems are exempt from regulations concerning price control, licensing, and infrastructure access, as long as the measures adopted do not amount to an indirect restriction on trade or investment [6]. Furthermore, in the proposed FTA with Mexico, it is explicitly stipulated that the exemption for performance requirements does not apply to renewable energy projects funded and managed by international organizations [14]. Additionally, regarding price commitments, both Chile and Kazakhstan retain a degree of policy flexibility. Chile is permitted to implement preferential domestic pricing for specific raw materials for the purpose of “fostering value addition” [6]. For Kazakhstan, the prices for raw materials and energy products destined for the domestic market may differ from export ones, provided that the government supplies the relevant information [15].

These different provisions reflect the EU’s tailored considerations based on the actual national circumstances of different countries, as well as the balance of interests achieved during the negotiation process. For example, the EU has consistently tried to uphold uniformly high environmental and social standards with its trade partners. However, in the proposed FTA with

Indonesia, the sustainability provisions are relatively limited, adopting more of a cooperative and encouraging approach [5]. Unlike many other FTAs, this proposal does not incorporate a standalone article on the assessment of environmental impact within its ERM chapter. This may be due to Indonesia's policy sensitivities and the practical obstacles associated with implementing such commitments domestically. However, as the EU further heightens its environmental concerns and the global green economic transformation trend continues, the future agreement may well include stricter related commitments.

3. Implications and lessons

The resilience of raw material supply has risen to a global concern. In particular, the supply chain disruptions caused by sudden events—such as the COVID-19 pandemic and the Russia-Ukraine conflict—have further intensified the sense of crisis in the ERM supply chains on a global scale. Not only the EU, but many other countries and regions currently experience a strong sense of insecurity regarding raw material supplies [16]. By entering into FTAs with its trade partners that include ERM chapters with detailed provisions on relevant rules, the EU has made a significant contribution to enhancing the resilience of its raw material supply. These provisions facilitate the expansion of the EU's raw material trade market as well as the EU's investments in external markets. This ensures the reliable, stable, and affordable acquisition of raw materials within the EU, thereby building a more resilient supply chain. For other countries, the EU's innovative approach serves as a new paradigm for FTAs and offers valuable lessons and insights:

3.1. Provides a paradigm for CRM provisions in ftas

Countries with resource endowments and socio-economic conditions similar to those of the EU can draw valuable lessons from the EU's experience. When negotiating FTAs with trade partners—especially those rich in resources—it is advisable to consider incorporating a dedicated ERM chapter. In designing the specific provisions within this chapter, special and individual rules may be established in addition to the common rules. The common rules typically cover aspects such as price commitments, the equipment and infrastructure, and sustainable development. Individual provisions, on the other hand, should be tailored to each country's national circumstances and development strategies, with particular emphasis on relevant aspects. For instance, in regions with relatively unstable political conditions, more detailed regulations regarding the safeguarding of transportation conditions and the mitigation of social risks can be adopted to ensure the stable trade and investment.

3.2. Incorporate reciprocal concession provisions tailored to the parties' actual circumstances

Although the EU has put forward specific requirements regarding CRM in its FTAs, mutual concessions between the Parties are also evident. For instance, the Parties have committed to technology exchange and cooperation. As a developed economy with advanced science and technology, the EU's commitments in technology transfer facilitate its trade partners in obtaining more advanced technological information from the EU. This essentially reflects a reciprocal benefit approach. In other words, the EU enhances its trade partners' scientific and technological capabilities and promotes the development of their industrial and value chains in exchange for commitments regarding resource supply.

This implies that the conclusion of a FTA requires mutual understanding and compromise. Therefore, the Parties shall adhere to the principle of mutual benefit and reciprocity, achieving a win-win situation through the exchange of benefits rather than resorting to unilateral pressure through hegemonic or coercive practices. For example, considering one party's need to develop its downstream industries, it may be permitted to maintain certain policy space for requirement of local content in processed products.

Meanwhile, for resource-rich but economically underdeveloped countries, there is a greater need to focus on securing economic benefits during negotiations—such as strategies for developing downstream industries, extending value chains, and promoting the transformation and upgrading of economic structures. These countries are increasingly emphasizing control over their natural resources to ensure that they retain the processing and sale of raw materials [5]. Consequently, during trade negotiations, these countries should approach overly strict commitments with caution and prioritize safeguarding their national policy space in order to build up manufacturing capabilities and advance industrialization. For example, technology transfer can be leveraged to foster value-added production of clean green technology [5].

3.3. Promote more equitable and just ERM provisions on an international scale

Although the EU's FTAs that include ERM chapters emphasize mutual interest and provide certain countries with policy flexibility for developing local industries, the primary objective remains the facilitation of trade and investment [11]. Under this kind of rules, developed economies are able to secure ERM supply in a more stable and convenient manner, whereas resource-rich but underdeveloped countries are compelled to intensify large-scale extraction of metals and minerals, further deepening the

associated social, economic, and environmental impacts [5]. On one hand, these rules bring increased capital investment and technical support that may benefit the development of industries in these countries. On the other hand, they also add to the burden of social and ecological governance and may lead these countries to become even more reliant on resource-intensive economic development models.

Currently, the increasingly prominent role of CRM in economic transformation has heightened global attention to their importance. For a long period, provisions governing raw materials are likely to remain an essential component of both bilateral and multilateral trade negotiations. However, under the current EU paradigm of FTAs, these provisions reveal an uneven distribution of benefits, with the balance of interests still favoring more developed economies. In the future, if major countries are to negotiate rules on ERM within the multilateral trading system, they should more seriously consider the welfare of the whole international community and promote a more balanced and just regulatory framework—a goal that is in line with the overall prosperity pursued by multilateral organizations such as the WTO.

Therefore, multilateral rules regarding raw materials should, while pursuing trade liberalization, also ensure that underdeveloped members retain policy flexibility and that developed economies do not leverage their advantageous positions to restrict the developmental space of these vulnerable members. Moreover, achieving a just transformation requires a comprehensive approach—one that considers both securing supply and reducing demand, and that addresses not only how to develop new resources but also how to maximize the use of existing ones [5]. Under the current EU model, the rules focus on market openness to facilitate resource development and ensure supply security. In contrast, a more equitable set of international economic and trade rules should give greater weight to measures that encourage the reduction of ERM needs, promote resource recycling, and enhance utilization efficiency.

4. Conclusion

The global economy is accelerating its transformation toward greener and more digital models, and the demand for CRM is growing correspondingly. The vulnerability of raw material supply chains has heightened governments' sense of crisis. Against this backdrop, ensuring a stable, secure, and affordable supply of raw materials has become a central concern for the international community. This study examines a series of FTAs negotiated and signed by the EU, focusing specifically on the provisions within the ERM chapters. It analyzes and synthesizes the common characteristics of these rules while comparatively summarizing their specific individual provisions, thereby elucidating the considerations underlying the EU's formulation of these regulations.

Such FTAs that include dedicated ERM chapters may represent a new paradigm in trade rule-making. Moreover, from a broader multilateral trade perspective, this study argues that to achieve globally equitable and comprehensive development necessitates a more holistic and multifaceted approach.

While this study centers on the provisions of the ERM chapters, there is relatively little study of other clauses in EU FTAs that affect raw material supply—such as those on investment, SOEs, and sustainable development—which also directly or indirectly impact raw material trade and investment. Future research should further explore these issues from the perspective of other chapters to assess their impact on raw material supply. In addition, as international economic and trade relations are continually evolving, the construction of trade rules remains a dynamic process. This study will continue to monitor relevant changes and developments in order to achieve deeper and more systematic analysis.

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