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Problems of Upstream and Downstream Integration of Rare Earth Metals in the National Mining Legal System

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Abstract: *Rare Earth Metals play a strategic role in the development of high-tech industries and the global energy transition. Indonesia, a country with abundant mineral resources, faces the challenge of integrating upstream mining activities with downstream policies aimed at increasing added value. This study analyzes the problematic integration of upstream and downstream Rare Earth Metals within the national mining legal system, specifically based on Law Number 3 of 2020 and its implementing regulations, including Minister of Energy and Mineral Resources Regulation Number 18 of 2025. The method employs normative legal research with legislative, conceptual, and systemic approaches. The study results reveal a disharmony between extraction-based licensing designs and downstreaming obligations, which have not been integrated from the initial stages of permit issuance. Regulatory fragmentation and overlapping authority between sectors also impact the effectiveness of value-added policies. The absence of an institutional model specifically addressing critical minerals has hindered the development of the national value chain. The study proposes a reconstruction of value chain-based licensing designs, cross-sectoral regulatory harmonization, and the establishment of an integrative institutional model as steps toward industrial sovereignty. This approach is expected to strengthen the sovereignty of Rare Earth Metal management while simultaneously encouraging a sustainable transformation of the strategic resource-based economy.*

Keywords: *Rare Earth Metals, downstreaming; regulatory harmonization; upstream-downstream integration; critical minerals; industrial sovereignty*

Introduction

Rare Earth Metals hold a highly strategic position in contemporary global economic development. These minerals are key components in the production of electric vehicle batteries, wind turbines, telecommunications equipment, and even modern defense systems (Agung, 2023). The high-tech industry's dependence on Rare Earth Metals makes them commodities with not only economic but also political strategic value (Yon, 2025). Major countries are competing to secure supplies of these minerals to maintain the stability of their national industries (Allo, 2025). This situation positions Rare Earth Metals as a crucial element in the energy transition architecture and global geopolitical competition (Prasodjo, 2024).

The shift in national development orientation is pushing mineral resource management beyond exploitation. For years, the mining sector has been synonymous with

the extraction and export of raw materials, generating short-term state revenue (Delila, 2025). This pattern often leads to dependence on foreign markets and minimal domestic industrial development. Modern development policies demand increased added value through domestic processing and refining (Rini, 2025). This paradigm shift presents new demands for the mining legal system to adapt its regulatory design.

The obligation to increase added value is firmly grounded in Law Number 3 of 2020. This regulation emphasizes that mining business permit holders must process and refine mining products domestically (Widyaningrum, 2024). This provision reflects a policy direction that no longer relies on raw material exports. The norm incorporates a dimension of economic sovereignty that seeks to reduce dependence on foreign industry. However, translating this obligation into practice has raised several technical and structural issues.

The strengthening of downstreaming obligations was then followed by the issuance of more technical implementing regulations, including the Minister of Energy and Mineral Resources Regulation Number 18 of 2025. This regulation is designed to provide operational guidelines regarding governance, technical standards, and supervision of certain mining activities (Fenetiruma, 2025). The presence of these technical regulations demonstrates the government's efforts to detail the policy direction established by law. There is hope that technical regulations can bridge the gap between general norms and implementation on the ground. In reality, technical regulations do not always align with the needs of comprehensive upstream-downstream integration.

Indications of disharmony begin to emerge when mining business licensing designs are still focused on the exploration and exploitation stages. The permit structure often does not simultaneously bind business actors to the development of downstream facilities from the initial stage (Rifqi, 2026). Downstreaming obligations are introduced as additional requirements after production activities have commenced (Rachmawati, 2024). This pattern has the potential to create a disconnect between mining operations and processing industry development. Regulatory fragmentation also arises due to differing orientations between the mining and industrial sectors.

The concept of state control over natural resources is rooted in Article 33 of the 1945 Constitution. This principle legitimizes the state to regulate, manage, and oversee the utilization of resources for the prosperity of the people (Setiawan, 2025). The state's right to control is not interpreted as absolute ownership, but rather as public authority to direct resource utilization fairly and sustainably. This concept demands an active role for the state in establishing strategic policies (Angrayni, 2023). The management of Rare Earth Metals as critical minerals requires a more progressive implementation of this principle.

The theory of state control evolved into state control theory, which positions the state as the primary actor in controlling strategic sectors (Kusumawardhana, 2023). The state's role extends beyond issuing permits to overseeing the distribution of economic benefits. The state can act as a regulator establishing norms, as an operator through state-owned enterprises, and as a guardian of resource sovereignty. Rare Earth Metals, as a high-value commodity, test the state's ability to balance these three functions (Puspita, 2025). Tensions emerge when investment interests and economic sovereignty are aligned within a single policy framework.

The theory of regulatory harmonization provides a perspective on the importance of alignment between laws and regulations. Vertical harmonization requires consistency between laws and their implementing regulations. Horizontal harmonization relates to synchronization between intersecting sectors (Busroh, 2024). The mining legal system is interconnected with industrial, trade, and investment law. A lack of synchronization between legal regimes has the potential to create uncertainty for business actors and undermine national policy objectives.

Regulatory fragmentation often occurs when each sector develops regulations based on its own administrative interests. This sectoral approach can result in overlapping authorities and differing standards. The concept of regulatory coherence emphasizes the importance of integrated policy design from the outset (Febriani, 2025). Integrated policy design requires a unified vision between resource management and industrial development. Without such integration, downstreaming risks become merely a formal obligation without a strong structural foundation (Hermansyah, 2025).

The concept of upstream-downstream integration stems from the understanding that mining activities are part of a long value chain. The exploration, production, processing, and final manufacturing stages should be viewed as a unified system (Syamil, 2026). The compliance-based approach tends to view downstreaming as an administrative obligation to be fulfilled to avoid sanctions. The system-based integration approach views all stages as an industrial design planned from the outset (Mery, 2025). This difference in approach determines the effectiveness of policies in encouraging the formation of a competitive domestic industry.

Licensing integration is a crucial instrument for encouraging industrial engineering. Licensing designs that require a plan for the construction of processing facilities from the initial stage can create certainty about investment direction. Separate licensing schemes for upstream and downstream often create disparities in interests. Coordination between licensing agencies is a determining factor in the success of integration. Efforts to build integration are not sufficient simply by increasing obligations; they require changes to the regulatory structure (Saripudin, 2025).

Rare Earth Metals are categorized as critical minerals due to their vital role in strategic industries and the energy transition. Their characteristics differ from conventional minerals, which have more widespread uses and are less geopolitically sensitive. The global supply of Rare Earth Metals is concentrated in certain countries, making them vulnerable to international political dynamics. The resilience of the national industry is greatly influenced by the ability to secure and process these minerals independently. This situation demands a mining legal system that is adaptive, integrated, and capable of addressing future strategic challenges.

Method

This research employs normative legal research methods with a statutory, conceptual, and systems approach. The statutory approach involves reviewing Law No. 3 of 2020 and its implementing regulations, including Minister of Energy and Mineral Resources Regulation No. 18 of 2025, to identify the normative framework governing upstream–downstream rare earth metals. The conceptual approach is used to analyze the theory of

state control, regulatory harmonization, and value chain integration as an evaluative framework. The systems approach is used to interpret the interrelationships between norms and sectors that shape the national mining legal architecture. Primary and secondary legal materials are analyzed qualitatively through systematic and argumentative interpretation to formulate a more integrated model of legal reconstruction and harmonization.

Result and Discussion

Normative Construction of Upstream–Downstream Regulation of Rare Earth Metals

The upstream-downstream regulatory structure for Rare Earth Metals rests on the national mining legal architecture established through Law Number 3 of 2020, amending Law Number 4 of 2009. This law affirms the centralization of mining authority within the central government and strengthens the mandate to increase the added value of minerals domestically. The normative framework includes regulations regarding licensing, processing and refining obligations, supervision, and administrative and criminal sanctions. This design is intended to create a more integrated and controlled mining governance. Rare Earth Metals, as part of strategic minerals, fall within the scope of this system, although they are not always specifically regulated in a separate chapter.

The regulation of mining business permits is structured through the Mining Business Permit and Special Mining Business Permit schemes, as stipulated in Articles 35 to 54 of Law Number 3 of 2020. Mining Business Permits (IUP) are granted for exploration and production operations, while Special Mining Business Permits (IUPK) are granted for certain special areas with strategic characteristics. Each holder of a production operation permit is obligated to increase the added value of mining products through domestic processing and refining activities. This provision is reaffirmed in Article 103 paragraph (1), which requires Mining Business License (IUP) and Special Mining Business License (IUPK) holders to process and refine mining products. This multi-layered permit structure forms the legal foundation for the relationship between upstream activities and downstream obligations.

Technical regulations serve as operational tools to translate legal norms into administrative and technical practices. One relevant regulation is the Minister of Energy and Mineral Resources Regulation Number 18 of 2025, which governs the technical aspects of the business and governance of certain minerals. In the hierarchy of laws and regulations, as stipulated in Law Number 12 of 2011, as most recently amended by Law Number 13 of 2022, ministerial regulations are subordinate to government regulations and presidential regulations. This position places technical regulations as implementing instruments that must not conflict with the law. The role of technical regulations is crucial because they touch on operational details that determine the effectiveness of upstream-downstream integration.

The norm of increasing added value is further emphasized through provisions restricting the export of raw minerals. Articles 102 and 103 of Law Number 3 of 2020 mandate domestic processing and refining before international sales. The policy of banning or restricting the export of raw minerals aims to encourage the growth of the domestic processing industry. Rare Earth Metals, with their high strategic value, are one of the commodities potentially impacted by this policy. This normative framework seeks to shift

the orientation of mining operations from simply producing raw materials to value-added production.

The economic rationale of the downstreaming policy relates to efforts to create a multiplier effect for the national economy. The development of refining facilities creates jobs, technology transfer, and increases state revenue through higher taxes and royalties. Its legal rationale lies in the constitutional mandate of Article 33, paragraph (3) of the 1945 Constitution, which requires the management of natural resources for the greatest prosperity of the people. Downstreaming is not merely a technical industrial issue but a long-term development strategy. Rare Earth Metals, as raw materials for high-tech industries, have significant potential to support knowledge-based economic transformation.

Implementing the domestic refining obligation faces significant challenges. Developing processing facilities requires significant investment, advanced technology, and a secure supply of raw materials. Not all Mining Permit (IUP) holders have the financial and technical capacity to build complex smelters or refining facilities for rare earth metals. Limited energy and logistics infrastructure also impact the feasibility of downstream projects. This situation creates tension between the ideals of norms and the realities of business actors' capabilities.

The relationship between mining operations and industrial policy often operates along divergent paths. The mining regime focuses on regional governance, licensing, and production oversight. The industrial regime places greater emphasis on manufacturing capacity development, fiscal incentives, and product competitiveness. This lack of synchronization in policy orientation can hinder value chain integration. Rare earth metals require an integrated approach that links resource exploitation with the national industrialization strategy.

The disparity between permitted extraction and downstream infrastructure readiness poses a structural challenge. Production permits may be issued and mining activities underway, while processing facilities are either unavailable or still in the planning stages. This imbalance has the potential to create pressure for relaxation of export policies. Businesses face a dilemma between fulfilling refining obligations and maintaining company cash flow. The mining legal system is required to design a realistic transition mechanism without sacrificing downstream objectives.

The problem of cross-sector coordination is evident in the involvement of various ministries and institutions in upstream-downstream regulation. Ministries overseeing mining, industry, trade, investment, and finance each have their own regulatory interests. The lack of a permanent coordination mechanism can hinder policy synchronization. Integrating Rare Earth Metals management requires an institutional design capable of unifying the vision for strategic industrial development. This challenge is a crucial part of normative construction, which will be further analyzed in the next section.

Problems of Integration and Regulatory Disharmony

From the outset, the design of mining business permits in Indonesia has been oriented more toward the exploration and exploitation stages. The IUP and IUPK structures, as stipulated in Law Number 3 of 2020, still position production activities as the core business activity. Processing and refining obligations are included, but they are presented as

continuing obligations after the production operation permit is granted. This scheme does not automatically link permit issuance to the readiness of downstream infrastructure. As a result, upstream and downstream integration is not systematically established from the business planning stage.

Downstreaming obligations are more often understood as administrative requirements that must be met to maintain a permit. This approach has led to the practice of formal compliance without structural transformation of the mining business model. Business actors tend to view the construction of refining facilities as an additional burden, rather than as an inherent part of the industrial design. The relationship between mining and processing industries develops gradually, rather than as a unified whole designed from the outset. This situation creates a gap between legal norms and the direction of national industrial development.

The domestic industry's failure to fully absorb mining products reveals a disconnection in the national value chain. Rare Earth Metals have significant potential as raw materials for strategic industries, but adequate processing facilities remain limited. The production chain from mining to final products is not yet efficiently connected. This situation leaves Indonesia primarily a supplier of raw or semi-finished materials. Added value that should be enjoyed domestically is instead diverted to other countries with more advanced industrial capacity.

Regulatory fragmentation poses additional challenges to upstream–downstream integration. Each sector has its own regulations and policy interests, which are not always designed in an integrated manner. Mining regulations focus on regional governance and licensing, while industrial regulations emphasize competitiveness and production incentives. These differing orientations create significant coordination gaps. Harmonization between regulations has not yet fully established a regulatory architecture that unifies the vision for critical mineral management.

Overlapping sectoral authority often arises in the supervision and control of mining businesses. Ministries responsible for energy and mineral resources, industry, trade, and investment have overlapping authorities. The licensing and supervision processes can involve several agencies with different evaluation standards. Business actors face complex, multi-layered procedures. This lack of alignment has the potential to create uncertainty in the implementation of downstream processing obligations.

Technical regulations issued to clarify the implementation of laws have not yet fully established a unified regulatory architecture. Implementing regulations often regulate specific aspects in detail without considering their interrelationships with other sectors. The sectoral approach makes inter-agency coordination dependent on ad hoc policies. The absence of a comprehensive framework integrating all stages of the value chain creates room for diverse interpretations. It impacts the consistency of policy implementation in the field.

Overlapping and fragmented regulations negatively affect legal certainty and the investment climate. Investors require clarity regarding long-term obligations and policy stability. Uncoordinated changes to technical regulations can impact the economic calculations of downstream projects. This situation creates regulatory risks that must be considered in investment decision-making. Uncertainty hinders the formation of an integrated Rare Earth Metals industry ecosystem.

The lack of an institutional integration model is another fundamental issue. There is no permanent coordination mechanism specifically addressing the management of critical minerals from upstream to downstream. Cross-ministerial coordination forums are usually temporary or program-based. Rare Earth Metals require a more strategic and long-term approach. The absence of a dedicated institution or mechanism hinders constant policy direction.

National supply chain control is also not yet fully structured. Distribution of mining products, processing, and final utilization often occurs through market mechanisms without strong industrial design intervention. The country lacks an integrated monitoring system that maps the flow of rare earth metals from mine to finished product. Dependence on the global market remains high, particularly for advanced processing. This situation complicates efforts to build a self-sufficient domestic resource-based industry.

The design of industrial zones specifically for Rare Earth Metals lacks a comprehensive legal basis. While industrial zone development is regulated by separate regulations, there is no specific scheme integrating mining, processing, and manufacturing based on critical minerals. Spatial and regulatory integration have not been implemented simultaneously. Concentrating activities in a single area can improve efficiency and coordination. The absence of such a design leaves integration dependent on the initiative of individual business actors.

The extractive paradigm remains dominant in mining policy orientation. The primary focus is often directed at state revenue from royalties and taxes. Production targets and fiscal contributions are the primary indicators of the success of the mining sector. Advanced industrial development aspects have not always been a top priority in policy evaluations. This approach leaves untapped room for structural economic transformation.

The geopolitical development of critical minerals demands more adaptive regulatory readiness. Rare Earth Metals have strategic value related to energy security and high-tech industries. Other countries have developed protectionist policies and planned supply security strategies. The national mining legal system needs to move toward an industrial sovereignty paradigm that anchors economic sovereignty in downstreaming. This transition in orientation requires updating regulatory design and strengthening institutional integration so that the management of Rare Earth Metals does not stop at a purely extractive pattern.

Reconstruction and Legal Harmonization Model

Reconstruction of the integrated licensing design needs to begin with a shift in perspective on mining business permits. Permits are no longer positioned solely as legality for exploitation, but rather as instruments for long-term industrial planning. The Rare Earth Metals value chain must be viewed as a single entity, from exploration to advanced manufacturing. Integrated licensing requires a transparent downstream plan before a production operation permit is issued. This scheme encourages closer linkages between upstream activities and downstream facility development.

An integrated licensing model can be designed through a single integrated mining and processing license mechanism. Permit applicants are required to submit a processing facility development plan along with its implementation stages. The evaluation of permit feasibility considers not only reserves and mining technical aspects but also the readiness of the

processing industry. The government could set measurable milestones as part of its investment commitment. This design strengthens the state's position in directing resource-based industrial development.

A conditional licensing scheme based on industry obligations can be a more effective control instrument. Production operation permits can be issued in stages, conditional on the timely construction of downstream facilities. Failure to comply with industry commitments could result in production restrictions or permit review. This approach is not solely repressive, but rather preventative and planned. The relationship between production rights and downstreaming obligations becomes more balanced and measurable.

A consortium-based or industrial estate-based integration model offers a realistic alternative. Not all permit holders have the capacity to build refining facilities independently. The formation of consortia between business actors can strengthen investment efficiency and technology transfer. Special industrial estates for rare earth metals allow for the concentration of mining, processing, and manufacturing activities in a single integrated area. The legal design of such estates needs to clearly regulate incentives, governance, and the division of responsibilities.

Harmonization of mining and strategic industry regulations is a key prerequisite for upstream-downstream integration. Synchronization of norms between sectors must be achieved through a review of overlapping regulations. Mining regulations cannot stand alone without considering industrial, trade, and investment policies. Aligning objectives between ministries requires a permanent regulatory coordination forum. This harmonization aims to establish a unified national policy direction regarding critical mineral management.

The integration of export, investment, and downstreaming policies needs to be designed in a coherent manner. Export restriction policies must align with the readiness of the domestic industry. Investment incentives for refining facility development need to be aligned with the obligation to increase added value. Investment regulations can facilitate strategic downstream projects. This policy integration creates a conducive ecosystem for the growth of the Rare Earth Metals industry.

Developing a national legal framework for critical minerals is the next strategic step. Rare Earth Metals require special treatment that differs from conventional minerals. This legal framework can include critical mineral classification, supply chain governance, and a national reserve security strategy. Special regulations provide certainty regarding long-term policy direction. The state has a stronger legal basis for controlling the use of strategic minerals.

An integrative institutional model can be realized through the establishment of a national critical minerals coordinating body. This body serves as a center for policy formulation, cross-sector coordination, and implementation oversight. Its existence minimizes the potential for conflict of interest between institutions. Structured coordination creates a consistent direction for industrial development. This body can also serve as a communication hub between the government and business actors.

A sovereignty-based supply chain oversight system needs to be designed to ensure added value remains domestic. Strengthening the state's role in controlling added value does not mean closing investment opportunities, but rather directing investment towards

national strategic objectives. Oversight instruments can include integrated reporting, production chain audits, and export distribution controls. The state acts as both a guide and guardian of the public interest. Integrated legal reconstruction provides the foundation for realizing the sovereignty of the rare earth metal-based industry.

Conclusion

Inadequate upstream–downstream integration of rare earth metals stems from the absence of a legal architecture aligning mining operations with the national industrialization strategy. Licensing regimes remain focused on extraction, while downstream obligations are treated as administrative burdens rather than integrated into system design. Regulatory fragmentation and overlapping authorities weaken the effectiveness of value-added policies, leaving the national industrial chain incompletely connected. The lack of an institutional model specifically addressing critical minerals further exacerbates the asymmetry between sectors. The management paradigm, which is still oriented toward short-term revenue, needs to shift toward an approach that positions Rare Earth Metals as the foundation of industrial sovereignty and long-term economic strategy.

System improvement requires a reconstruction of the value chain-based licensing design that binds downstreaming commitments from the initial permit issuance stage. Regulatory harmonization across the mining, industry, trade, and investment sectors must be carried out in a planned manner through a permanent coordination forum or the establishment of a dedicated critical minerals agency. Export policies and investment incentives need to be aligned with domestic industrial capacity to prevent imbalances between production and processing. Strengthening the national supply chain monitoring system will help ensure added value remains domestic and support the development of integrated industrial estates. This policy transformation paves the way for a more robust and sustainable industrial sovereignty.

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