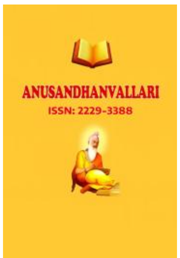

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The Political Economy of Critical Minerals: Energy Transitions and the Fractured World Order

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Abstract

The accelerating shift toward renewable energy has positioned critical minerals such as lithium, cobalt, nickel, and rare earths, at the centre of twenty-first century geopolitics. Unlike fossil fuels, whose extraction was geographically concentrated, critical minerals are characterised by dispersed reserves but highly concentrated refining capacity, producing new asymmetries of structural power. This raises an urgent question: how do critical minerals reshape power, inequality, and governance within global energy transitions, and how does this configuration contribute to the fragmentation of the world order? The chapter addresses this question through a three-part analytical lens. First, it examines the securitisation of supply chains in the United States, European Union, and India, where access to minerals is reframed as a matter of strategic autonomy. Second, it analyses the emergence of a "green resource curse" in the Global South, where resource-rich but institutionally constrained states face renewed patterns of extractive dependency. Third, it evaluates governance gaps in the evolving critical-minerals landscape, showing how parallel regulatory blocs and weakened multilateral institutions accelerate system-level fragmentation. Drawing on comparative cases including China's refining dominance, cobalt extraction in the DRC, lithium governance in the Andean states, and India's resource diplomacy, the chapter demonstrates how critical minerals reconfigure sovereignty, interdependence, and legitimacy in a multiplex global order.

Keywords: Critical minerals, Global fragmentation, Energy transitions, Political economy, Resource governance

1. Introduction

Critical minerals have emerged as the new oil of the twenty-first century. Numerous countries have announced net-zero targets, and the use of environment-related non-trade barriers has grown, intensifying the urgency of transitioning to clean energy systems. Achieving this transition, however, depends on secure and sustained access to critical minerals, which are crucial inputs for clean energy technologies. Control over these minerals bestows substantial economic and geopolitical leverage. Nations endowed with raw critical mineral resources and those dominating their refining and processing capacities now wield influence over global supply chains. Consequently, critical minerals have become instruments of power, reshaping how nations engage in the procurement and trade of such inputs, and contributing to the growing fragmentation of the world order. Considering this transformation from critical minerals being mere technological inputs to tools of geopolitical bargaining, this chapter investigates the question: *How do critical minerals reshape power, inequality, and governance in energy transitions, and how does this contribute to the fragmentation of the global order?* The analysis proceeds through a three-part framework examining the securitization of supply chains, the dynamics of the green resource curse, and the governance gaps in critical minerals that shape the evolving global order. This chapter makes three contributions to the literature on critical minerals and global order. First, while recent studies have begun to examine the geopolitical implications of critical minerals and the risks of supply-chain concentration, these analyses often remain siloed. This chapter brings together three aspects that are typically studied separately – geopolitics of mineral supply chains, resource curse dynamics in the Global South, and debates on gaps in global governance.

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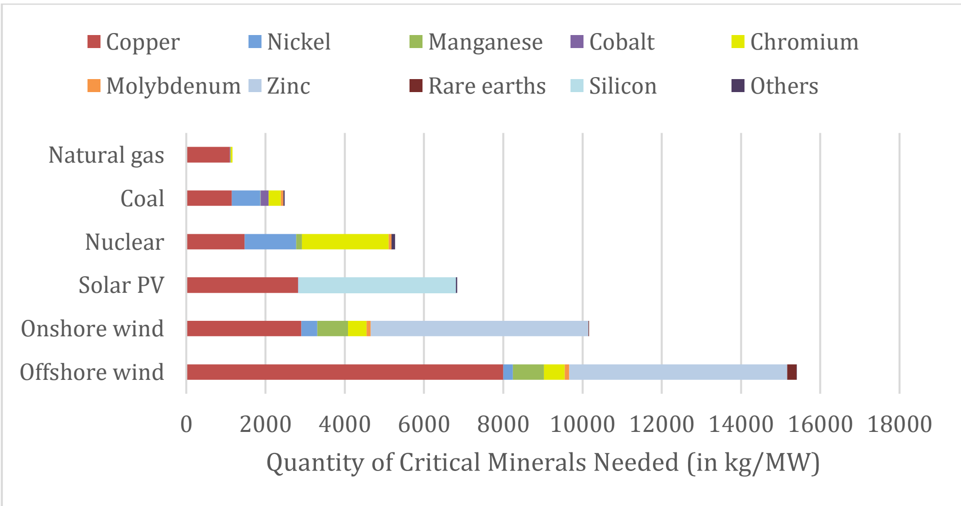
Bringing these strands into a single analysis provides a more comprehensive understanding of the political economy of critical minerals. Second, it situates these developments within established traditions of international political economy by applying concepts such as structural power, embeddedness, and dependency to the contemporary context of the energy transition. Third, and most significantly, the chapter argues that critical minerals are beyond inputs for clean technologies. They are catalysts that actively reshape patterns of sovereignty, interdependence, and institutional authority. By linking mineral supply chains to broader shifts in world-order dynamics, the chapter provides a conceptual connection that some existing studies acknowledge but do not systematically develop.

The chapter proceeds as follows. Section 2 develops the political economy foundations of critical minerals. Section 3 explores how mineral supply chains have become securitised in major economies. Section 4 investigates the green resource curse facing producer states in the Global South. Section 5 assesses the governance gaps that underpin a fragmenting global order. Section 6 offers concluding reflections.

2. The Political Economy of Critical Minerals

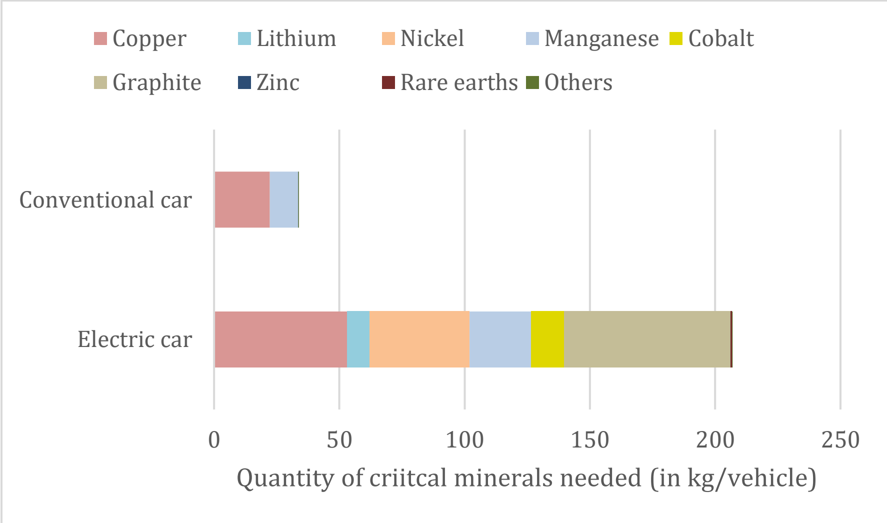
Critical minerals are increasingly important in current political economy and international relations, given the crucial role they play in the global energy transition. Though countries have varying definitions to identify critical minerals, most of the classification frameworks contain the following three criteria: (i) the economic importance of the mineral; (ii) strategic sectors in which it is used; and (iii) its vulnerability to supply disruption. Based on these criteria, most countries classify copper, lithium, nickel, cobalt, graphite, and rare earth elements as critical minerals. These minerals are the input for clean energy technologies such as solar photovoltaics, electric vehicle batteries, and wind turbines. The transition to renewable energy sources is not only a technological transition but is instead rooted in material scarcity and control. Clean energy technologies will require more mineral inputs, and therefore the energy transition is expected to put increased pressure on critical mineral supply (see figures 1 and 2). For example, the International Energy Agency (2022) estimates that EVs require six times more mineral inputs than conventional cars and onshore wind plants require nine times more mineral resources than gas-fired power plants.

Figure 1. Minerals needed for clean energy technologies compared to traditional power generation sources



Source: International Energy Agency, 2024

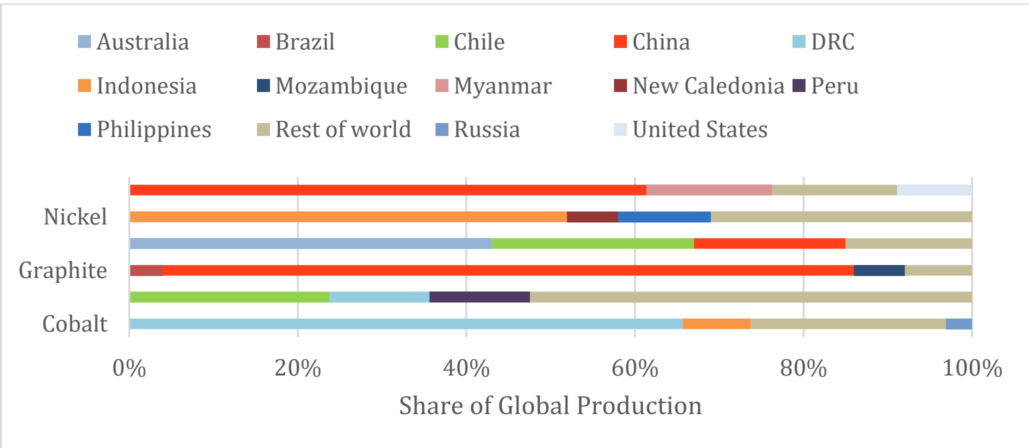
Figure 2. Minerals needed for electric cars compared to conventional cars



Source: International Energy Agency, 2024

Thus, as traditional fossil-fuel-based systems are phased out, the demand for critical minerals is expected to surge. It is estimated that if governments are to achieve their announced clean energy targets, the global demand for critical minerals could more than double by 2030 and quadruple by 2050 (International Energy Agency, 2023). However, while critical mineral demand is global, production and refining of critical minerals remain geographically concentrated (see figure 3). Indonesia accounts for over half of global nickel output, the Democratic Republic of Congo produces nearly two-thirds of cobalt, and China dominates the supply of graphite and rare earth elements, accounting for 82 and 62 percent respectively. Refining and processing capacities are even more skewed (see figure 4). China alone accounts for over half of global refining of cobalt, lithium, graphite, and rare earths (International Energy Agency, 2024). This asymmetry between dispersed demand and concentrated supply has far-reaching geopolitical consequences.

Figure 3. Share of global critical mineral production, by country



Source: Data from International Energy Agency, 2024

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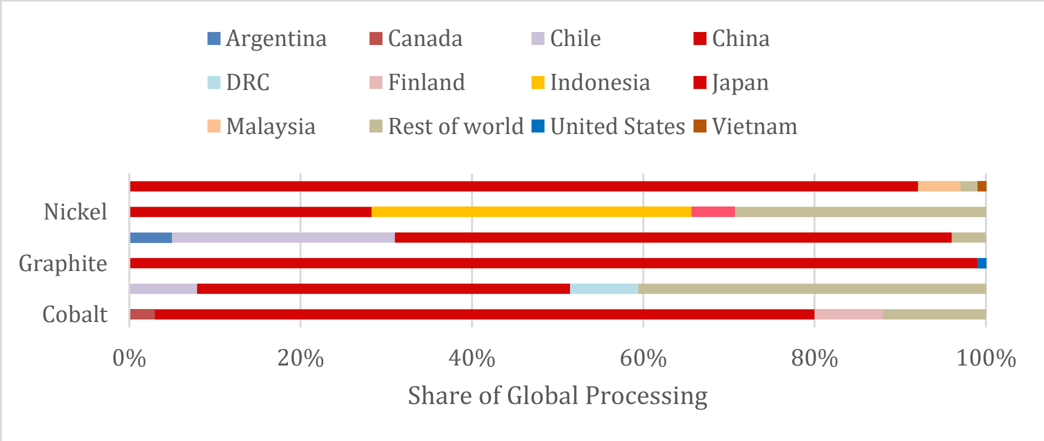
Figure 4. Share of global critical mineral processing, by country



Source: Data from International Energy Agency, 2024

From a theoretical standpoint, the concentration of control over these materials illustrates the concept of structural power, which is the ability of certain states to shape the frameworks in which others operate (Strange, 1988). According to Strange (1988), structural power stems not only from ownership of resources but also from control over production, finance, knowledge, and security systems. Applying this lens, the states dominating mineral extraction and refining are gaining the structural power to shape the path of the global energy transition itself. Similarly, the notion of the embeddedness of markets underscores that economic relations are not completely autonomous; they are politically constituted (Polanyi, 1944; Granovetter, 1985). The market for critical minerals is thus an extension of industrial policy, state strategy, and geopolitical rivalry.

These dynamics echo earlier debates in resource politics. Classical dependency theorists argue that primary commodity exporters were at a disadvantage in the global division of labour, as value addition and technological rents flowed to industrialised economies (Prebisch, 1950; Frank, 1967). The body of literature on the resource curse demonstrates how natural resource endowment can exacerbate underdevelopment through rent-seeking, volatility, and governance failure (Auty, 1993; Ross, 2012). Although critical minerals are framed as enablers of a sustainable future, there also exists the risk of them creating a green resource curse – a system in which the Global South remains an extractive periphery supplying the inputs for a clean-energy core of the Global North.

This asymmetry also transforms the nature of global power. As Strange (1988) and Gilpin (2001) emphasise, economic power increasingly resides not in territorial dominance but in control over transnational production networks. The global distribution of mineral supply chains thus embeds new hierarchies of dependence: those who control the refining nodes of the chain exercise influence over those who depend on them for the transition. Such interdependence is fragile, as evidenced by China's rare earth export suspensions, which underscore the strategic weaponisation of supply chains (Reuters, 2023; Mancheri et al., 2018).

Taken together, these developments reveal how the political economy of critical minerals, characterised by resource scarcity and market imbalance, is contributing to the restructuring of global order. The asymmetric geography of production and processing translates into new forms of economic statecraft, while the largely fragmented governance of these resources reflects the erosion of collective management institutions. In this sense, the political economy of critical minerals represents both continuity and change: continuity with the extractive logic of the fossil-fuel era, and change in the ways power, autonomy, and legitimacy are negotiated in a decarbonising but divided world.

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3. Securitisation of Supply Chains

3.1 United States and European Union: Securitising Supply Chains through Industrial Policy

The Inflation Reduction Act (IRA) of the United States and the Critical Raw Materials Act (CRMA) of the European Union together marked a shift in how Western economies approach the green transition. Rather than treating clean-energy supply chains as an entirely economic concern, the policies elevate them to matters of strategic autonomy, national resilience, and geopolitical security. This changed approach is an example of securitisation, the process through which an issue is framed as existentially important, thereby justifying extraordinary state intervention (Buzan, Wæver and de Wilde, 1998).

Enacted in 2022, the IRA allocates USD 370 billion to clean-energy deployment, domestic manufacturing, and technological innovation, with the goal of significantly reducing America's carbon emissions by 2030 (White House, 2023; McKinsey & Company, 2022). The Act embeds strict domestic-content and friendshoring requirements. For instance, to qualify for full electric-vehicle tax credits, a rising share of battery minerals must be recycled or processed in North America or sourced from US free-trade partners. These provisions reconfigure the green-industrial landscape by reshoring production, steering foreign investment toward US soil, and reducing exposure to what senior US officials describe as "unreliable single-source suppliers" (Financial Times, 2023). In this sense, the IRA represents not only climate legislation but an assertion of governance over global value chains.

The European Union's CRMA, adopted in 2023, reflects the same logic. The Act sets ambitious quantitative thresholds to ensure that, by 2030, at least 10 percent of critical minerals consumed in the EU will be extracted in the EU, 40 percent processed within Europe, and no more than 65 percent of annual consumption of any strategic mineral comes from a single non-EU country (European Commission, 2024). These quantitative thresholds reveal a similar concern for over-dependence on China. Like the IRA, the CRMA blends industrial policy with security logic by incentivising domestic production, accelerating permitting processes for EU-based projects, and strengthening strategic partnerships with "trusted" third countries.

Together, these policies illustrate a shared transatlantic approach: the clean-energy transition is now inseparable from the pursuit of sovereignty and the mitigation of geopolitical risk. By reshaping global value chains through subsidies, local-content requirements, and partnership criteria, the United States and the European Union are attempting to reconstitute structural power in their favour after decades of offshoring. At the same time, these measures expose governance gaps in the multilateral system. Elements of both the IRA and CRMA appear inconsistent with World Trade Organization rules, particularly regarding local-content requirements and discriminatory subsidies, underscoring the diminishing authority and legitimacy of multilateral economic institutions.

These developments have broader geopolitical implications. In attempting to reduce vulnerability, the United States and European Union may inadvertently heighten strategic competition, divert investments from other jurisdictions, and accelerate the emergence of parallel regulatory blocs. The transatlantic securitisation of critical-mineral supply chains thus exemplifies the fragmentation of the global order, in which industrial policy, climate commitments, and geopolitical rivalry increasingly intersect.

3.2 China: Dominance and Leverage in the Geopolitics of Critical Mineral Supply Chains

China is positioned uniquely in the global political economy of critical minerals. While its critical mineral reserves are not very large compared to other leading producers such as the Democratic Republic of Congo, Australia, or Chile (U.S. Department of the Interior & U.S. Geological Survey, 2024); China's dominance is derived from its control over processing and refining of critical minerals, which add significant value in the supply chain. China processes over 90 percent of global rare earths, 99 percent of natural graphite, 65 percent of lithium, and 77 percent of the world's cobalt (International Energy Agency, 2024). This asymmetrical distribution, with geographically dispersed extraction but concentrated refining, is another example of structural power (Strange, 1988). In this case, control over refining gives China the capacity to shape global production networks and define the terms on which others participate in them.

China's approach reflects long-term state planning, rather than a coincidence. Starting in the 1990s, Beijing classified the rare earth elements as strategic resources and heavily invested in domestic refining, pollution-intensive processing technologies, and export-oriented industrial clusters (Shen et al., 2020; Wübbeke, 2013). In tandem with consolidation and regulation of the industry, the measures taken included export quotas, production caps, and environmental standards. These policies allowed China to do more than simply enter the global mineral economy; it allowed them to set terms under which other states could access materials that were indispensable for high-technology manufacturing, renewable energy systems, and defence applications.

This dominance first acquired a political meaning in 2010 when China suspended rare earth exports to Japan following a maritime dispute in the East China Sea (Bradsher, 2010; Vekasi, 2019). Although Beijing denied the embargo was politically motivated, the episode showed how easily critical mineral supply chains could be weaponised. It also underlined the vulnerability of advanced industrial economies reliant upon Chinese refining capacity. Over the last decade, China has frequently suggested, both implicitly and explicitly, that it retains the capacity to restrict exports of rare earths, graphite, and other strategic minerals should foreign policy pressures require it.

These actions can be regarded as a specific instance of the following general trend: through commanding refining, China is capable of turning its economic capacity into geopolitical leverage. Gilpin (2001) argues that international economic power increasingly flows from the control over strategic nodes in global production networks. Related to critical minerals, such powers of China-for restricting or conditioning access-can be considered a type of economic statecraft, allowing it to influence behavior beyond its borders without necessarily having to resort to military instruments. This corresponds with the notion of sovereignty being "organized hypocrisy" (Krasner, 1999), while states rhetorically proclaim norms about free trade and open markets, they have no problem breaching these when strategic interests are involved.

At the same time, China's position is directly contributing to the fragmentation of the global order. Its dominance catalyzes the securitisation efforts of the United States and the European Union, which respectively frame the diversification away from Chinese supply chains as a matter of national security and industrial resilience. China, in response, sees such measures as part of its containment, thus justifying more extensive stockpiling, export controls, and resource diplomacy in Africa, Latin America, and South-East Asia. According to Acharya (2014), this dynamic is symptomatic of the passage from a US-centric order to a "multiplex world" marked by overlapping regionalisms and different, contending governance frameworks.

In this sense, China's mineral strategy is more than the pursuit of an economic comparative advantage; it is also the major driving force behind geopolitical reordering. The control over refining nodes amplifies interdependence asymmetries, enables strategic retaliation, and accelerates restructuring processes at the level of global alliances and supply-chain blocs. Consequently, China has assumed the role of central actor in the geopolitical contestation of critical minerals, simultaneously shaping and responding to international order fragmentation.

3.3 India: Strategic Hedging in the Quest for Mineral Security

India neither has the refining dominance of China nor the power to reshore supply chains via large-scale industrial policy like that of the United States and the European Union. With limited domestic mineral reserves and modest processing capacity, India has a twofold problem: securing supplies of the critical minerals needed for its energy transition without deepening vulnerability to geopolitical shocks (Indian Bureau of Mines, 2023). The dual constraint has driven India to adopt a strategy of strategic hedging-diversifying supply sources, strengthening domestic institutional capacity, and selective alignment with like-minded partners while avoiding overdependence on any single geopolitical bloc.

India's policy response begins with the recognition of the fact that its transition cannot be supported by domestic endowments alone. India has modest reserves of lithium, rare earths, and graphite but mining output is likely to be inadequate in view of projected demand. This has prompted structural reforms in the mining sector under the Mines and Minerals (Development and Regulation) Act, or MMDR, including opening up exploration to private firms, auctioning new blocks, and designating critical minerals as strategic resources (Government of India, 2015; Government of India, 2023). At the same time the establishment of Khanij Bidesh India Limited (KABIL), a joint venture between three public-sector firms, signals a proactive turn to resource diplomacy. KABIL has been mandated to secure equity stakes and long-term offtake agreements in resource-rich countries like Argentina and Australia (Ministry of Mines, n.d.), mimicking outward investment strategies pursued by East Asian economies in the past.

These initiatives yet again reflect the pursuit of structural power (Strange, 1988). India is not merely attempting to acquire minerals but also to position itself within global production networks in ways that hedge the risks arising from asymmetric interdependence. Yet the limits of domestic refining capacity pose significant constraints and contribute to persistent reliance on foreign refining facilities. India continues to rely heavily on global markets for processed lithium, cobalt, graphite, and rare earth oxides. This dependence becomes particularly acute given China's overwhelming dominance in refining. As a result, India's supply-chain vulnerabilities are not simply economic but geopolitical, exposing the country to potential coercion or disruption during periods of Sino-Indian tension.

In this regard, the government's industrial strategy seeks to overcome such vulnerabilities by promoting the domestic manufacture of batteries, solar modules, and electric vehicles under the "Atmanirbhar Bharat" initiative. PLI schemes for ACC batteries and solar PV manufacturing are some of the tools employed in the effort to overcome the import dependence characteristic of India's clean-tech sector. Yet, in the absence of parallel increases in domestic refining capacity or securing long-term offtake from external partners, India risks trading dependence on one part of the supply chain (finished products) for another – the critical minerals themselves. This is a variant of what Polanyi (1944) once described more generally: that markets are embedded within political structures; India's green-industrial strategy thus remains bound by an external political economy of minerals.

India's hedging behavior also extends into multilateral and regional forums. It is on platforms such as the Quad Critical and Emerging Technology Working Group, the India-EU Trade and Technology Council, and emerging partnerships under the Indo-Pacific Economic Framework that India seeks to align with countries similarly concerned about China's supply-chain dominance. Yet, India has avoided completely aligning with the West's decisive shift away from China. It continues to maintain economic ties with China while simultaneously seeking diversification – a characteristic balancing act of emerging powers navigating a multiplex world (Acharya, 2014).

The net effect is that India's approach to critical minerals is adaptive and yet constrained. It reflects a desire to build sovereignty and resilience within the energy transition while recognizing the structural realities of the global market. India's strategy illustrates the challenges faced by developing economies keen to participate in the green economy without replicating historical patterns of dependency. It also underlines how major power securitization of supply chains generates spillover pressures for states lacking the fiscal capacity or technological depth to reshape global value chains independently. In this sense, India's hedging behavior is not simply a national strategy but also a microcosm of the broader fragmentation of the world order, where states must navigate overlapping, sometimes conflicting, economic and geopolitical pressures.

4. The Green Resource Curse in the Global South

The rapid expansion of clean-energy technologies has heightened demand for lithium, cobalt, nickel, manganese, graphite, and rare earth elements, which are largely found in countries of the Global South. The countries endowed with crucial mineral riches benefit from this increase in demand, but it also has the potential to repeat well-known patterns of extractive dependency that academics refer to as the "resource curse" (Auty, 1993; Ross, 2012). Resource booms led to erratic income, undermined institutions, and encouraged rent-seeking in traditional fossil-fuel economies. The period of critical minerals is currently experiencing a similar trend that has led to the "green resource curse" (Leonard et. al, 2022).

Critical mineral-rich states frequently share common structural traits that increase vulnerability. These include inadequate domestic value-adding ability, weak regulatory structures, the possibility of corruption, and insecure property rights (Lyons, 2015). These circumstances lead to power imbalances between producer governments that continue to rely on exporting raw ores for income and extractive multinational corporations that control capital, technology, and access to international markets. Because of this, many producer economies only get a small portion of the value generated in supply chains involving green technologies. The peripheralization long discussed in dependency literature is reinforced by this process (Prebisch, 1950; Cardoso, 1982).

Cobalt mining in the DRC embodies these dynamics. The DRC accounts for roughly 70 percent of global cobalt output (U.S. Department of the Interior & U.S. Geological Survey, 2024), but artisanal and small-scale mining remains widespread and is often marked by hazardous working conditions, weak enforcement, and instances of child labor (Amnesty International 2016). Despite its resource wealth, the country captures little value downstream, because nearly all cobalt is exported for refining in China, which holds over half of global processing capacity (International Energy Agency, 2024). Governance challenges, opaque contract negotiations, and unpredictable taxation regimes may discourage long-term investment in domestic processing facilities, allowing the cobalt boom to produce uneven development outcomes and enclave-style extractive economies.

The same pattern is observed in the Lithium Triangle of Argentina, Bolivia, and Chile, countries that hold more than half of lithium resources worldwide (U.S. Department of the Interior & U.S. Geological Survey, 2024). Institutional barriers constrain domestic value addition, and the increased lithium brine extraction has exacerbated water scarcity in arid Andean ecosystems and generated socio-environmental conflict, including protests by Indigenous communities (Bustos-Gallardo et al., 2021; Paz et al., 2023). These cases illustrate that the green transition is not per se equitable. Rather, it threatens to redistribute environmental burdens to marginalized communities in producer regions.

The green resource curse underlines an important contradiction: the global energy transition reshapes material flows without transforming the political economy of extraction. Producer states remain stuck in low-value segments of supply chains, while high-income economies seek to secure minerals to advance their decarbonization agendas. As Sovacool et al. (2020) argue, the clean-energy shift reconfigures rather than eliminates extractive frontiers, often intensifying contestation over land, water, and labour.

These dynamics also generate political consequences. To the extent major powers securitise supply chains, mineral-rich developing economies face more pressure to align with external players offering investment, infrastructure, or preferential market access. Competitive courting of such investors enables governments to extract short-term benefits but may weaken incentives for structural governance reforms.

In sum, the green resource curse shows how inequality in the political economy of extraction persists within the low-carbon transition. The emerging mineral boom is at risk of solidifying the structural position of producers in the Global South as raw-material suppliers, while technological and financial power stays concentrated within the

Global North and China. Understanding these dynamics is vital for explaining how critical minerals reproduce global inequalities and contribute to fragmenting world order.

5. Governance Gaps and the Fragmentation of the Global Order

Whereas the governance of fossil fuels is underpinned by institutions such as OPEC, the IEA and long-established market norms, there is no comparable multilateral platform for critical minerals. Critical mineral supply chains are the result of incomplete patchworks of bilateral agreements, informal partnerships, national industrial policies, and corporate-driven standards. There is thus an institutional vacuum, which further contributes to a fragmented international order, due to the lack of international regulations or norms.

Three governance gaps are particularly salient.

5.1 Lack of Binding Multilateral Frameworks

Presently, no existing global institution is responsible for regulating access, pricing, transparency, or sustainability standards for critical minerals (International Energy Agency, 2022). The WTO provides a partial framework, but its capacity to discipline industrial policy has eroded. Local content requirements in the US Inflation Reduction Act and EU Critical Raw Materials Act are widely viewed as inconsistent with core WTO rules, yet they are in place as the WTO has neither the legitimacy nor the enforcement power to constrain them. This reflects a broader weakening of multilateral economic governance, consistent with the argument that the liberal international order is giving way to a multiplex world characterised by decentralised and overlapping institutions (Acharya, 2014).

The absence of a binding global regime enables nations to define "strategic minerals" unilaterally, impose export restrictions, subsidize domestic production, and even weaponize supply chains, reinforcing national sovereignty at the expense of cooperative global governance.

5.2 Competing Industrial Blocs and Regulatory Fragmentation

The securitization of supply chains by advanced economies has led to the emergence of competing blocs. This is evident in the implementation of friendshoring frameworks by the US and EU targeted at trusted partners, while China deepens its mineral diplomacy through the Belt and Road Initiative, BRICS, and through bilateral agreements with African and Latin American countries (Farooki & SNL Financial, 2018).

These parallel frameworks reflect the rival conceptions of openness, security, and industrial policy. As noted by Gilpin (2001) and Krasner (1999), international regimes are often arenas of geopolitical competition rather than cooperation. The result of fragmentation is complexity for investment, higher compliance costs, and uncertainty for producer economies that must operate under different and sometimes conflicting regulatory expectations.

5.3 Inadequate Environmental and Social Safety Standards

Environmental and social standards for mining are still lax, inconsistent, and frequently unenforced, even though sustainability issues are crucial to the energy transition. Although voluntary frameworks are provided by several corporate-led initiatives, such as the Initiative for Responsible Mining Assurance (2018) and the OECD Due Diligence Guidance (OECD, 2016), their acceptance varies greatly between nations and businesses.

This normative gap disproportionately affects the Global South, where weak capacity for monitoring and enforcement exacerbates socio-environmental harms. Without robust governance, the expansion of mining for energy transition minerals risks consolidating neo-extractive regimes (Gudynas, 2012; Burchardt & Dietz, 2014). The lack of universal safeguards further fragments global governance through leaving environmental and social protections to state and firm discretion.

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5.4 Implications for the Global Order

Cumulatively, these governance gaps create a more fragmentated international order in four ways:

1. Erosion of Multilateral Norms: The inability of the WTO or UN bodies to regulate industrial policy accelerates the shift from rules-based to power-based governance.
2. Rise of Supply-Chain Geopolitics: States increasingly treat critical minerals as instruments of influence, leverage, or retaliation, reflecting structural power.
3. Institutional Multiplicity: Rival blocs create competing standards, reinforcing the multiplex world.
4. Asymmetrical Vulnerabilities: The producer state is more susceptible to pressure from outside forces, with little institutional protection, which reflects old dependencies theory.

These dynamics complicate cooperation on the global energy transition, transforming critical minerals into catalysts for political and institutional fragmentation.

6. Conclusion

Critical minerals lie at the heart of the political economy of the global energy transition. Insofar as states accelerate their pursuit of decarbonisation, these minerals have become more than simple technological inputs; they are now strategic resources through which power, vulnerability, and influence are exercised. This chapter has demonstrated that the politics surrounding critical minerals cannot be understood in isolation from broader transformations in global order but are in fact deeply embedded within evolving patterns of sovereignty, interdependence, and institutional authority.

The securitisation of mineral supply chains has emerged as a signature characteristic of great-power strategy. Transatlantic industrial policies increasingly reflect the active adoption of reshoring, friendshoring, and selective decoupling as strategies for limiting exposure to Chinese monopoly positions in the realm of mineral processing. China, for its part, maintains substantial structural power through control of refining and midstream capabilities, presenting it with unique opportunities to convert economic capability into geopolitical leverage. Emerging economies like India take advantage of these pressures by diversifying imports, developing domestic refining capabilities, and pursuing new forms of resource diplomacy.

The chapter further demonstrates how the energy transition threatens to replicate longstanding extractive asymmetries in the Global South. The mineral-rich states of the Democratic Republic of Congo or those in the Lithium Triangle, for instance, continue to suffer environmental degradation, limited downstream value capture, and volatile state revenues-those very dynamics constituting a contemporary "green resource curse." Unless institutional strengthening and more equitable governance arrangements occur, those states risk remaining locked into forms of dependency that reinscribe, rather than redress, global hierarchies.

These developments unfold within a fragmented governance landscape. No comprehensive multilateral framework governs the extraction, processing, or trade of critical minerals despite their centrality to global net-zero ambitions. The WTO has been considerably weakened in the regulation of unilateral industrial subsidies, export controls, and local-content requirements. In contrast, competing regulatory blocs have begun to define mineral governance along geopolitical lines. The result is an increasingly incoherent institutional environment in which power-based bargaining often substitutes for collective rulemaking.

Taken together, these dynamics reveal the existence of a clear mechanism through which critical minerals drive world-order fragmentation. Geographical concentration in extraction and refining generates asymmetric interdependencies that give structural power to a small group of countries. Other countries react by securitizing supply chains, deploying industrial policy, and reorganizing trade relationships around strategic blocs. This further intensifies developmental asymmetries for mineral-rich but institutionally weaker states and deepens global inequality. The absence of any effective multilateral governance leaves these unilateral strategies unchecked, with the erosion of institutional coherence accelerating geopolitical rivalry. Critical minerals, in that sense, act as catalysts through which global fragmentation is enacted and reproduced.

The energy transition in the world is not only a shift in technology but a transformation of perhaps the most profound order politically and institutionally. It would depend on the degree to which states navigate the tension between national security imperatives and the need for collective, rules-based governance whether critical minerals become foundations for cooperation or fault lines of competition. Without explicit efforts to strengthen institutions, support producer-state capacity, and build shared standards for responsible sourcing, the minerals that enable a sustainable future could contribute simultaneously to a more fractured and unequal world.

References:

[1] Acharya, A. (2014). *The end of American world order*. Polity Press.

[2] Amnesty International. (2016). *This is what we die for: Human rights abuses in the Democratic Republic of the Congo power the global trade in cobalt* (Index AFR 62/3183/2016). Amnesty International Ltd. https://www.amnesty.org/en/wp-content/uploads/2021/05/AFR6231832016ENGLISH.pdf

[3] Auty, R. M. (1993). *Sustaining development in mineral economies: The resource curse thesis*. Routledge.

[4] Barandiaran, J. (2019). *Science and environment in Chile: The politics of expert advice in a neoliberal democracy*. MIT Press.

[5] Bradsher, K. (2010, September 22). Amid tension, China blocks vital exports to Japan. *The New York Times.* https://www.nytimes.com/2010/09/23/business/global/23rare.html

[6] Bridge, G., Bouzarovski, S., Bradshaw, M., & Eyre, N. (2018). Geographies of energy transition: Space, place and the low-carbon economy. *Energy Research & Social Science, 36*, 107–115. https://doi.org/10.1016/j.erss.2017.10.011

[7] Burchardt, H., & Dietz, K. (2014). (Neo-)extractivism: A new challenge for development theory from Latin America. *Third World Quarterly, 35*(3), 468–486. https://doi.org/10.1080/01436597.2014.893488

[8] Bustos-Gallardo, B., Bridge, G., & Prieto, M. (2021). Harvesting lithium: Water, brine and industrial dynamics in the Salar de Atacama. *Geoforum, 119*, 177–189. https://doi.org/10.1016/j.geoforum.2021.01.001

[9] Buzan, B., Wæver, O., & de Wilde, J. (1998). *Security: A new framework for analysis*. Lynne Rienner Publishers.

[10] Cardoso, F. H., & Faletto, E. (1982). *Dependency and development in Latin America*. University of California Press.

[11] Financial Times. (2023, December 6). *How Biden's Inflation Reduction Act changed the world* [Video]. YouTube. https://youtu.be/cfaubxeS5HU?si=U8n4XfNHh6R6jGNr&t=133

[12] Frank, A. G. (1967). *Capitalism and underdevelopment in Latin America*. Monthly Review Press.

[13] Gilpin, R. (2001). *Global political economy: Understanding the international economic order*. Princeton University Press.

[14] Government of India. (2015, March 27). *The Mines and Minerals (Development and Regulation) Amendment Act, 2015* (Gazette of India, Extraordinary, Part II, Section 1). Ministry of Law and Justice. https://prsindia.org/files/bills_acts/acts_parliament/2015/the-mines-and-minerals-(development-and-regulation)-amendment-act,-2015.pdf

[15] Government of India. (2023, August 9). *The Mines and Minerals (Development and Regulation) Amendment Act, 2023* (Gazette of India, Extraordinary, Part II, Section 1). Ministry of Law and Justice. https://mines.gov.in/admin/download/64dc579c4f9e31692161948.pdf

[16] Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology, 91*(3), 481–510.

[17] Gonzalez-Vicente, R. (2012). Mapping Chinese mining investment in Latin America: Politics or market? *The China Quarterly, 209*, 35–58. http://www.jstor.org/stable/41447821

[18] Gudynas, E. (2012). Extractivisms: Tendencies and consequences. In R. Munck & R. Delgado-Wise (Eds.), *Reframing Latin American development* (pp. 23–51). Routledge.

[19] Indian Bureau of Mines. (2023). *Indian minerals yearbook 2023*. https://ibm.gov.in/writereaddata/files/17454767536809dc9139ba8IMYB_BOOK_2023.pdf

[20] Initiative for Responsible Mining Assurance. (2018). *Standard for Responsible Mining v1.0.* https://responsiblemining.net/wp-content/uploads/2018/07/IRMA-Standard-for-Responsible-Mining-v1.0-EN.pdf

[21] International Energy Agency. (2022). *The role of critical minerals in clean energy transitions.* https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

[22] International Energy Agency. (2023). *Critical minerals market review 2023.* https://iea.blob.core.windows.net/assets/c7716240-ab4f-4f5d-b138-291e76c6a7c7/CriticalMineralsMarketReview2023.pdf

[23] International Energy Agency. (2024). *Global critical minerals outlook 2024.* https://iea.blob.core.windows.net/assets/ee01701d-1d5c-4ba8-9df6-abeeac9de99a/GlobalCriticalMineralsOutlook2024.pdf

[24] Kiros, B. (2022). Governing cobalt mining in the DRC: Regulatory challenges and development prospects. *Resources Policy, 76*, 102553.

[25] Klinger, J. (2018). *Rare earth frontiers: From terrestrial subsoils to lunar landscapes.* Cornell University Press.

[26] Krasner, S. D. (1999). *Sovereignty: Organized hypocrisy*. Princeton University Press.

[27] Leonard, A., Ahsan, A., Charbonnier, F., & Hirmer, S. (2022). The resource curse in renewable energy: A framework for risk assessment. *Energy Strategy Reviews, 41*, 100841. https://doi.org/10.1016/j.esr.2022.100841

[28] Lyons, S. W. (2015). Preventing a renewable resource curse. *Sustainable Development Law & Policy, 15*(2), Article 2. https://digitalcommons.wcl.american.edu/cgi/viewcontent.cgi?article=1625&context=sdlp

[29] Mancheri, N. A., Sprecher, B., Bailey, G., Ge, J., & Tukker, A. (2018). Effect of Chinese policies on rare earth supply chain resilience. *Resources Conservation and Recycling*, *142*, 101–112. https://doi.org/10.1016/j.resconrec.2018.11.017

[30] McKinsey & Company. (2022). *The Inflation Reduction Act: Here's what's in it.* https://www.mckinsey.com/industries/public-sector/our-insights/the-inflation-reduction-act-heres-whats-in-it

[31] Ministry of Mines. (n.d.). *KABIL (Khanij Bidesh India Limited).* Government of India. https://mines.gov.in/webportal/content/kabil

[32] OECD. (2016). *OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas* (3rd ed.). https://www.oecd.org/content/dam/oecd/en/publications/reports/2016/04/oecd-due-diligence-guidance-for-responsible-supply-chains-of-minerals-from-conflict-affected-and-high-risk-areas_g1g65996/9789264252479-en.pdf

[33] Paz, W. F. D., Escosteguy, M., Seghezzo, L., Hufty, M., Kruse, E., & Iribarnegaray, M. A. (2023). Lithium mining, water resources, and socio-economic issues in northern Argentina. *Resources Policy, 81*, 103288. https://doi.org/10.1016/j.resourpol.2022.103288

[34] Polanyi, K. (1944). *The great transformation: The political and economic origins of our time.* Farrar & Rinehart.

[35] Prebisch, R. (1950). *The economic development of Latin America and its principal problems.* United Nations Economic Commission for Latin America.

[36] Reuters. (2023, December 21). *China bans export of rare earths processing technologies*. Retrieved from https://www.reuters.com/markets/commodities/china-bans-export-rare-earths-processing-technologies-2023-12-21/

[37] Ross, M. L. (2012). *The oil curse: How petroleum wealth shapes the development of nations.* Princeton University Press.

[38] Shen, Y., Moomy, R., & Eggert, R. G. (2020). China's public policies toward rare earths, 1975–2018. *Mineral Economics, 33*(1–2), 127–151. https://doi.org/10.1007/s13563-019-00214-2

[39] Sovacool, B. K., Ali, S., Bazilian, M., Radley, B., Nemery, B., Okatz, J., & Mulvaney, D. R. (2020). Sustainable minerals and metals for a low-carbon future. *SSRN Electronic Journal.* https://doi.org/10.2139/ssrn.3513313

[40] Strange, S. (1988). *States and markets.* Pinter Publishers.

[41] U.S. Geological Survey. (2024). *Mineral commodity summaries 2024*. U.S. Department of the Interior. https://pubs.usgs.gov/periodicals/mcs2024/mcs2024.pdf

[42] Vekasi, K. (2019). Politics, markets, and rare commodities: Responses to Chinese rare earth policy. *Japanese Journal of Political Science, 20*(1), 2–20. https://doi.org/10.1017/S1468109918000385

[43] White House. (2023). *Building a clean energy economy: A guidebook to the Inflation Reduction Act's investments in clean energy and climate action.* https://bidenwhitehouse.archives.gov/wp-content/uploads/2022/12/Inflation-Reduction-Act-Guidebook.pdf

[44] Wübbeke, J. (2013). Rare earth elements in China: Policies and narratives of reinventing an industry. *Resources Policy, 38*(3), 384–394. https://doi.org/10.1016/j.resourpol.2013.05.005