

From Climate to Security: Energy Transition and the New Geopolitics of Strategic Supply

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ABSTRACT

The global energy transition is reshaping international politics by shifting strategic attention from fossil fuel dependence toward critical minerals, industrial processing, and clean technology supply chains. As decarbonization accelerates, questions of climate policy are increasingly intertwined with security concerns, economic resilience, and geopolitical competition over strategic supply. This article examines how the energy transition transforms strategic supply into a central issue of contemporary geopolitics and global order. The study employs a qualitative research design grounded in document analysis and is guided by a geopolitical framework that links supply, dependency, and infrastructural power. Data are drawn from policy documents, institutional reports, regulatory texts, and scholarly materials related to critical minerals, clean energy manufacturing, industrial policy, and energy security. The analysis focuses on key dimensions including supply concentration, processing capacity, technological dependence, securitization, and differentiated state positioning within the emerging low-carbon economy. Strategic supply operates not only as an economic requirement of decarbonization but also as a mechanism through which states reorganize power, hierarchy, and vulnerability in the international system. The article argues that the energy transition is producing a security-centered politics of supply that redefines the geopolitical meaning of energy in the post-carbon era. Its contribution lies in integrating energy transition debates with a broader geopolitical understanding of strategic supply, order formation, and uneven global restructuring.

Keywords: Energy Transition, Geopolitics, Strategic Supply, Energy Security

INTRODUCTION

The global energy transition has become one of the most important structural transformations in contemporary international politics. What was once mainly discussed as a climate agenda is now increasingly understood as a matter of industrial competition, technological leadership, and national security (Borovsky, 2021). The shift from fossil fuels to low-carbon energy systems has altered the strategic value of supply chains, infrastructure, and critical raw materials (Agazhanova, 2025). Solar panels, batteries, electric vehicles, rare earth elements, lithium, cobalt, nickel, and grid technologies now occupy a central place in geopolitical calculation. This transition does not reduce the political importance of energy, but instead changes the sources of vulnerability and advantage among states. As energy systems are rebuilt around new technologies and materials, states are rethinking dependence, resilience, and strategic autonomy. In this setting, the politics of energy is no longer limited to oil routes and gas corridors, because the control of industrial inputs and processing capacity has become equally decisive. The new geopolitics of energy therefore emerges from the intersection of climate ambition, economic restructuring, and strategic supply (Bradshaw, 2009).

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The central problem lies in the fact that the energy transition creates a new map of dependency even as it seeks to solve the environmental crisis associated with the old one. Decarbonization is widely presented as a pathway toward sustainability, yet its practical implementation requires concentrated resources, processing infrastructure, and manufacturing capacity that are unevenly distributed across the world (González et al., 2024). This creates a tension between the normative promise of climate action and the strategic reality of supply insecurity. States that aim to accelerate clean energy deployment often remain dependent on external suppliers for critical minerals, battery components, renewable technologies, and logistical networks. Such dependence generates political concern because disruptions in these supply chains can affect industrial policy, national security, and long-term energy resilience. The issue has clear real-world relevance as governments increasingly adopt subsidy programs, strategic reserves, friend-shoring policies, and investment screening to protect energy-related supply chains. These developments affect not only major powers but also middle-income and resource-rich states seeking to position themselves within the new energy economy (Mokdad, 2024). The transition thus becomes a geopolitical issue because access to strategic supply determines who can lead, adapt, and benefit from the emerging energy order.

A growing body of scholarship already explains that energy has always been embedded in power relations, state strategy, and international hierarchy. Earlier debates focused on fossil fuel dependence, maritime chokepoints, producer-consumer relations, and the geopolitical significance of hydrocarbon reserves (Mauro, 2024). More recent literature extends this discussion by showing that low-carbon transitions also generate forms of concentration and dependency, especially around minerals, manufacturing, and technology. Research on critical minerals, green industrial policy, and supply-chain resilience has clarified that energy transition technologies rely on geographically uneven resources and highly concentrated processing capabilities. Existing studies also show that states increasingly frame clean energy not only as an environmental necessity but as a strategic sector linked to competitiveness and security. In parallel, work on economic statecraft and geoeconomics demonstrates that infrastructure, trade, and industrial regulation are becoming central instruments of geopolitical competition. These debates provide an important foundation for understanding why strategic supply has moved to the center of energy politics (İvgin & Demirel, 2025). What is known, therefore, is that the energy transition is not geopolitically neutral, because it reorganizes material dependence and strategic leverage in new forms.

Even so, several important dimensions remain insufficiently developed in the literature. Much existing discussion treats energy transition either as a climate governance issue or as a supply-chain management problem, without fully integrating these two dimensions within a broader theory of geopolitical order (Liubachivska, 2025). There is still limited conceptual clarity on how strategic supply in the clean energy economy reshapes international hierarchy beyond simple narratives of competition or scarcity. In many accounts, supply insecurity is described as a technical challenge of sourcing and logistics rather than as a political process of ordering access, dependence, and exclusion. The implications for states that are neither dominant industrial powers nor primary mineral exporters also remain underexamined. In addition, the relationship between decarbonization and security is often presented in policy language without sufficient theoretical attention to how climate-driven transformation alters the structure of global power (Jerzyniak, 2024). This leaves uncertainty about whether the new energy geopolitics represents continuity with fossil-era rivalry or a qualitatively different form of strategic

organization. What remains unknown, then, is how the transition from climate agenda to security agenda changes the political meaning of supply in the emerging global order (Ibekwe et al., 2024).

This gap becomes clearer when the topic is placed within a geopolitical framework that treats supply not merely as an economic chain but as an infrastructure of power (Hira, 2025). Through such a perspective, strategic supply can be understood as the material basis through which states secure industrial capacity, shape dependency, and exercise influence in periods of structural transition. The research gap lies in the weak synthesis between studies of energy transition and theories of geopolitical restructuring. On one side, climate and energy scholarship explains decarbonization, technological change, and resource demand. On the other side, geopolitical and geoeconomic theory explains hierarchy, strategic control, and the political management of interdependence. Yet fewer studies bring these strands together to explain how the energy transition itself reorganizes global order through new forms of supply concentration and strategic competition. A stronger synthesis is necessary because strategic supply is not simply a supporting issue within the transition, but one of its main political foundations (Zhao & Huang, 2024). The article therefore positions strategic supply as the point where climate transformation and geopolitical ordering intersect most directly. This approach helps move the debate beyond sectoral concerns and toward a more structural understanding of energy transition as a reconfiguration of international power.

Filling this gap is theoretically justified because the energy transition cannot be adequately explained through environmental necessity alone. Climate goals may provide the normative driver, but the political realization of those goals depends on material control, industrial coordination, and unequal access to strategic resources (Wang et al., 2024). A theory-informed analysis is needed to explain why some supply relations are politicized, how certain dependencies become securitized, and under what conditions states shift from market openness to strategic intervention. This is especially important because the transition is often assumed to produce a more cooperative and post-carbon order, even though the underlying infrastructures may create new vulnerabilities and hierarchies. Geopolitical theory brings analytical coherence by showing that order is shaped not only by resource possession but also by control over processing, standards, transportation, finance, and manufacturing ecosystems. Such a perspective makes it possible to interpret strategic supply as a mechanism of power rather than a neutral technical requirement. It also clarifies why the movement from climate discourse to security discourse has major implications for international cooperation, development, and industrial competition. The theoretical justification therefore rests on the need to understand energy transition as both an environmental transformation and a geopolitical reordering (Bélaïd et al., 2023).

From this basis, the article is guided by a set of interconnected research questions. How does the global energy transition transform strategic supply into a central issue of contemporary geopolitics? In what ways do critical minerals, industrial processing, and clean technology manufacturing reshape patterns of dependence and power in the international system? How does the securitization of energy transition supply chains alter the relationship between climate governance and geopolitical competition? To what extent does the emerging political economy of clean energy reproduce older forms of hierarchy, and to what extent does it create new ones? How can a geopolitical theory of strategic supply better explain the linkage between decarbonization, industrial policy, and international order? What are the broader implications of these dynamics for states seeking energy security, developmental autonomy, and meaningful participation in the low-carbon economy? These questions direct attention to the political

logic of supply under conditions of transition rather than to technical questions of energy deployment alone. They also align the article with the broader goal of explaining how climate transformation becomes embedded in security and geopolitical reasoning (Yang et al., 2023).

The urgency of this research lies in the accelerating pace of global decarbonization and the simultaneous intensification of geopolitical competition over strategic resources and technologies. As governments race to secure critical minerals, expand domestic manufacturing, and reduce external dependence, the institutions and alliances formed in the present period may shape the future energy order for decades. This makes the issue especially significant because decisions made in the name of resilience or security can lock in asymmetrical patterns of access and influence (Lee et al., 2020). The study contributes by providing a clearer conceptual understanding of how energy transition shifts from a climate-centered narrative toward a security-centered politics of supply. It also contributes by connecting debates on sustainability and industrial strategy to wider questions of power, hierarchy, and order formation. In doing so, the article offers a more integrated way of understanding why the low-carbon transition is generating not only opportunities for decarbonization but also new geopolitical tensions. The relevance of this perspective extends across climate policy, international political economy, and strategic studies. Such a framing helps explain why the future of energy politics will depend not only on reducing emissions, but also on who controls the infrastructures and supply relations of the post-carbon world (Gusek et al., 2025).

RESEARCH METHOD

This study adopts a qualitative research design to examine how the energy transition reconfigures strategic supply and reshapes contemporary geopolitics. A qualitative approach is appropriate because the research addresses a complex transformation involving power, dependency, securitization, and order formation that cannot be adequately captured through numerical measurement alone (Moriña, 2020). The analysis is guided by an analytical framework that combines the concept of strategic supply with a geopolitical perspective on interdependence, hierarchy, and infrastructural control. This framework makes it possible to connect climate-driven energy transformation with broader political struggles over critical minerals, industrial capacity, clean technology production, and supply-chain security.

The design works well for this research because the central objective is to explain the political logic through which energy transition shifts from an environmental agenda toward a security-centered geopolitical issue. Qualitative analysis also allows the study to capture the meanings, priorities, and strategic narratives embedded in policy and institutional discourse. In addition, this design supports conceptual clarification, especially because strategic supply in the context of energy transition is often treated in fragmented ways across climate, economic, and security debates (Pyo et al., 2023). For these reasons, a qualitative design provides the most suitable basis for a coherent and theory-informed analysis of the new geopolitics of strategic supply.

The study uses qualitative secondary data drawn from policy documents, government strategies, international organization reports, energy transition roadmaps, regulatory texts, and scholarly publications addressing critical minerals, clean energy technologies, industrial policy, and geopolitical competition. Data were collected through purposive document selection, focusing on materials directly related to supply security, decarbonization policy, strategic industries, and the political management of energy transition dependencies. The units of analysis are policy discourses, institutional strategies, and

geopolitical practices through which states and organizations frame and manage strategic supply in the low-carbon transition (Taherdoost, 2022). The main instrument is a document analysis matrix designed to classify and compare recurring themes across the selected materials.

The principal analytical dimensions include supply concentration, resource dependency, industrial strategy, securitization, infrastructural control, and implications for global order. Validity was strengthened by aligning these dimensions closely with the research questions and theoretical framework, while reliability was supported through transparent source selection, consistent coding procedures, and systematic documentation of the analytical process. Trustworthiness was further ensured through source triangulation and the use of authoritative and publicly accessible materials to improve credibility and dependability. Ethical considerations were maintained by accurately representing all sources, respecting intellectual ownership, and, because no direct human participants were involved, informed consent and confidentiality were not required in a conventional sense, although all documentary materials were handled with academic integrity and due care (Seaman, 1999).

RESULTS AND DISCUSSION

The Results and Discussion section addresses the geopolitical transformation produced by the global energy transition through its dependence on strategic supply. The material examined indicates that decarbonization has not displaced the political significance of energy, but has relocated it to new sites of control involving minerals, processing capacity, industrial technology, and logistics. This shift matters because the transition to low-carbon systems depends on infrastructures that are highly uneven in their geographic distribution and institutional governance (Given, 2008). Energy politics is therefore no longer defined only by access to fossil fuel reserves and transport corridors, but by the capacity to secure the material foundations of batteries, grids, renewable technologies, and industrial manufacturing. The central pattern emerging from the discussion is that strategic supply has become a mechanism through which states pursue security, influence, and economic advantage under the language of climate transition. Such a pattern aligns with the concerns raised in the introduction regarding the movement from climate-centered policy to security-centered political calculation (Blondeel et al., 2021). The energy transition thus appears as a process that reorganizes geopolitical competition rather than neutralizing it. Strategic supply becomes the point where environmental ambition and power politics converge in the reconstitution of global order.

A major result of the analysis concerns the transformation of supply from a technical component of industrial production into a strategic source of geopolitical leverage. Critical minerals such as lithium, cobalt, nickel, copper, and rare earth elements are increasingly tied to national planning, industrial policy, and international competition because they are indispensable to clean energy deployment. Control over extraction alone, however, does not determine influence. Equal importance attaches to refining, processing, component manufacturing, and downstream industrial integration, where power is often more concentrated than raw resource distribution itself. This creates a political environment in which states seek not merely to obtain materials, but to secure preferential positions across the entire supply chain. Strategic advantage therefore depends on the ability to convert resource access into institutional and industrial control (Goldthau & Youngs, 2023). The geopolitical significance of energy transition is shaped by this movement from resource possession to supply-chain governance. Supply becomes

strategic because it determines not only economic resilience but also the capacity to shape the pace and terms of low-carbon transformation beyond national borders (Christofi et al., 2021).

The discussion also indicates that the energy transition generates new forms of dependency even as it is expected to reduce older ones associated with hydrocarbons. Dependence does not disappear when economies move away from oil and gas, but is restructured around the inputs required for electrification, storage, and renewable deployment. This produces a new map of vulnerability in which states may reduce exposure to fossil fuel volatility while becoming increasingly reliant on concentrated mineral sources, foreign refining hubs, or imported clean technologies. The transition therefore redistributes insecurity rather than eliminating it. In geopolitical terms, this matters because dependency in strategic sectors can translate into constrained policy choice, exposure to supply disruption, and reduced industrial autonomy. These conditions are especially visible where energy security and industrial upgrading depend on external access to critical components that cannot be substituted quickly. The low-carbon transition thus does not create a post-geopolitical order (Marhold, 2023). It reorganizes geopolitical relations through novel dependencies embedded in the infrastructures of decarbonization.

Such dependencies are distributed unevenly across different categories of states. Major industrial powers possess greater capacity to subsidize domestic production, build strategic reserves, diversify sourcing, and shape the regulatory frameworks governing strategic sectors. Resource-rich states hold leverage through ownership of mineral reserves, but this leverage varies according to their ability to move beyond extraction into processing and manufacturing. Middle powers often occupy an intermediate position, seeking to strengthen industrial resilience without fully controlling upstream or downstream segments of the supply chain. Developing import-dependent states face the greatest vulnerability because they must pursue decarbonization within conditions defined by external technological control and limited bargaining power. This differentiated landscape indicates that the energy transition does not produce a flat or inclusive global order. It generates layered opportunities and risks structured by unequal access to industrial infrastructure and policy capacity (Santiago-Delefosse et al., 2015). Strategic supply therefore becomes a key mechanism through which hierarchy is reproduced within the emerging low-carbon economy.

The securitization of energy transition policy further deepens this reordering process. Governments increasingly frame clean energy development through the language of resilience, autonomy, strategic independence, and national competitiveness rather than through climate mitigation alone. This reframing does not reject environmental objectives, but subordinates them to a broader logic in which supply reliability and industrial control become central political priorities. Strategic sectors are consequently subject to stronger intervention through subsidies, local content measures, export monitoring, investment review, and industrial alliance building. The shift from market efficiency toward security-oriented governance reflects a broader transformation in how states interpret the risks of transition. Climate policy becomes intertwined with geoeconomic strategy because the infrastructures of decarbonization are seen as too important to leave to market allocation alone. The energy transition is therefore governed not simply as an environmental necessity, but as a domain of strategic vulnerability and competitive positioning.

To clarify the core patterns identified in the analysis, Table 1 summarizes the principal dimensions through which strategic supply reshapes the geopolitics of energy transition.

Table 1. Strategic Supply and the Geopolitical Reorganization of the Energy Transition

Analytical Dimension	Observed Pattern	Geopolitical Implication
Critical minerals	Resource availability is geographically concentrated	Access to key inputs becomes a strategic concern
Processing and refining capacity	Downstream control is concentrated in limited industrial hubs	Industrial hierarchy deepens beyond raw resource ownership
Clean technology manufacturing	Production of batteries, solar components, and related technologies clusters in specific states	Technological dependence shapes political leverage
Energy security policy	States adopt subsidies, screening, stockpiling, and selective partnerships	Climate transition shifts toward security-centered governance
Position of state groups	Major powers, middle powers, and developing states face unequal capacities	The low-carbon order develops through differentiated inclusion
Global order	Supply chains are politicized and selectively reorganized	Decarbonization contributes to new geopolitical alignments

The table supports the broader argument by showing that the strategic significance of the energy transition extends across multiple layers of the supply system rather than resting on raw materials alone. It also clarifies that geopolitical power in the low-carbon era is exercised through the coordination of extraction, processing, manufacturing, and regulatory intervention. The concentration of refining and component production is particularly important because it reveals how influence can persist even where mineral deposits themselves are more widely distributed. This supports the article’s claim that the central issue is not scarcity in a narrow sense, but control over the infrastructures that convert resources into strategic capacity. The table also demonstrates that supply politics cannot be separated from governance politics. Security-oriented policy responses are part of the same reordering process through which states attempt to manage exposure and enhance leverage. In this way, the table provides a structured representation of how climate transition becomes embedded within a broader geopolitical logic of control, hierarchy, and differentiated participation.

The discussion resonates with earlier scholarship on energy geopolitics while also indicating a significant change in its underlying material basis. Traditional energy geopolitics centered on fossil fuel reserves, transport chokepoints, maritime security, and the strategic behavior of producers and consumers in hydrocarbon markets. Those concerns remain relevant in many parts of the world, particularly because fossil fuels continue to structure existing energy systems. Yet the low-carbon transition introduces a different configuration of power in which industrial processing, technological standards, and mineral-intensive supply chains take on growing significance. This does not mark a complete break from earlier patterns, since both old and new energy orders involve dependency, competition, and asymmetry. The difference lies in the forms through which these dynamics are organized. The political economy of strategic supply shifts the focus from energy commodities alone to the infrastructures and industrial ecosystems necessary for energy transformation. Energy transition geopolitics therefore extends rather than replaces the classic concerns of resource competition.

The discussion also deepens debates on geoeconomics and controlled interdependence. Existing literature has already argued that globalization does not remove power from economic relations, but often creates new channels through which states can exercise pressure and leverage. The energy transition provides a particularly clear illustration of this point because its success depends on supply chains that are transnational, technologically complex, and politically sensitive. Interdependence remains necessary for decarbonization, yet it is increasingly managed through selective partnerships, industrial protection, and strategic diversification. This creates a paradox in which global cooperation is

indispensable for climate goals, while geopolitical competition drives states to reduce vulnerability through unilateral or bloc-based arrangements. The resulting order is neither fully integrated nor fully fragmented. It is structured by conditional connectivity, where access to critical inputs and technologies is filtered through security concerns and strategic alignment. Such a pattern strengthens the interpretation that the new geopolitics of energy transition is best understood through the politicization of interdependence rather than through simple narratives of cooperation or conflict alone.

The theoretical implications are important for understanding how global order is being reconstituted in the low-carbon era. A geopolitical perspective that treats supply as an infrastructure of power offers greater explanatory depth than approaches focused only on market adjustment or environmental governance. Strategic supply matters because it shapes who can industrialize rapidly, who can insulate themselves from disruption, and who remains dependent on externally controlled systems. This makes supply chains politically constitutive rather than merely supportive of energy transition. The concept of security becomes central here, not only because states fear interruption, but because control over strategic supply affects long-term autonomy, bargaining power, and developmental capacity. The transition from climate discourse to security discourse is therefore not rhetorical alone. It signals a substantive shift in how the energy transition is governed and how order is organized around it. The emerging low-carbon system is shaped by struggles over infrastructural control as much as by commitments to emission reduction.

An unexpected complexity in the discussion concerns the persistence of older hierarchies within the supposedly transformative politics of green transition. Decarbonization is often presented as an opportunity to create a more sustainable and inclusive world economy, yet the organization of strategic supply suggests that new green industries may reproduce patterns of unequal value capture already familiar from earlier phases of global development. Resource-rich states may remain locked into extractive roles if they cannot expand refining and manufacturing capacity. Developing importers may become dependent on external providers of technology, finance, and strategic materials even while pursuing domestic decarbonization. At the same time, major industrial powers may use climate-related industrial policy to consolidate technological leadership under the justification of resilience and security. This complexity indicates that the transition is not automatically emancipatory in geopolitical terms. It may generate new opportunities, but those opportunities are filtered through pre-existing asymmetries in capital, technology, and institutional power. The green transition therefore contains both transformative promise and stratifying consequences.

Several strengths and limitations emerge from the present discussion. A major strength lies in the integration of climate transition debates with a geopolitical theory of strategic supply, which enables a clearer understanding of how decarbonization is embedded in broader struggles over power and order. This approach moves beyond narrowly technical treatments of supply chains by situating energy transition within questions of hierarchy, dependency, and security governance. It also clarifies the political significance of sectors often discussed separately, such as minerals, manufacturing, industrial policy, and energy resilience. At the same time, the discussion remains limited by its reliance on document-based analysis and by the rapidly changing nature of energy policy, technology development, and international competition. New supply arrangements, alliances, and policy tools may alter the strategic landscape faster than current frameworks can fully capture. Even so, these limitations do not reduce the analytical relevance of the central argument. They indicate the need for continued

examination of how low-carbon transformation interacts with the evolving structures of geopolitical power.

The broader relevance of the discussion lies in its implications for policy, governance, and future research. Governments pursuing decarbonization must navigate a tension between accelerating clean energy deployment and reducing strategic vulnerability in critical supply chains. This tension has important consequences for trade policy, industrial strategy, international cooperation, and the developmental prospects of states positioned differently within the global economy. Practical responses will require more than diversification alone, since issues of refining capacity, manufacturing ecosystems, financing, and institutional coordination are deeply interconnected. Future research should therefore examine comparative state strategies, regional supply architectures, and the political conditions under which resource-rich and industrializing countries can move beyond subordinate roles in the low-carbon economy. Closer attention is also needed to how energy transition governance affects digitalization, infrastructure finance, and social inequality across different national contexts. The emerging geopolitics of strategic supply will shape not only energy security, but also the terms on which climate transition is distributed across the international system. For that reason, the politics of decarbonization must be understood as part of the larger reorganization of global order under conditions of environmental and geopolitical change.

CONCLUSION

The global energy transition has become inseparable from the politics of strategic supply, as decarbonization increasingly depends on concentrated resources, industrial processing capacity, and technologically complex supply chains. The discussion has emphasized that the movement from climate-oriented policy to security-oriented governance reflects a broader reorganization of international power rather than a simple expansion of environmental commitment. Strategic supply now shapes how states manage vulnerability, pursue industrial competitiveness, and position themselves within the emerging low-carbon economy.

In this setting, the transition does not eliminate geopolitical tension associated with older energy systems, but relocates it to new domains such as critical minerals, refining infrastructure, clean technology manufacturing, and supply-chain coordination. New forms of dependence, selective interdependence, and differentiated inclusion therefore become central features of the evolving energy order. The broader significance of this argument lies in showing that the future of energy politics will be determined not only by the pace of decarbonization, but also by who controls the material and institutional foundations of that transition.

The article contributes to the field by integrating energy transition debates with a geopolitical understanding of strategic supply, hierarchy, and order formation. Existing scholarship has often examined decarbonization through the lenses of climate governance, technological innovation, or supply-chain risk, yet these approaches do not always explain how low-carbon transformation reshapes broader structures of international power. By placing strategic supply at the center of analysis, the discussion clarifies the political relationship between climate ambition, industrial policy, and geopolitical competition.

This perspective refines the meaning of energy security by demonstrating that it now extends beyond access to fuels and increasingly concerns control over processing, manufacturing, and

infrastructural coordination. It also contributes conceptually by showing that the low-carbon transition may reproduce or transform global hierarchy depending on how supply systems are organized and governed. Such an approach advances scholarship in geopolitics, international political economy, and energy studies by offering a more coherent framework for understanding decarbonization as a process of systemic geopolitical restructuring.

Future research should examine more closely how different groups of states respond to the strategic pressures generated by energy transition supply chains. Comparative analysis of major powers, middle powers, resource-rich states, and import-dependent developing countries would deepen understanding of how strategic supply shapes adaptation, bargaining capacity, and developmental opportunity. Greater attention is also needed to regional supply architectures, especially where states seek to balance industrial ambition, climate goals, and exposure to external dependency.

Another important direction concerns the long-term implications of green industrial policy for inequality, technological concentration, and the legitimacy of international governance arrangements. Research that connects mineral extraction, downstream manufacturing, financing structures, and technological standards would further strengthen the analytical precision of this field. Continued theoretical and empirical work is necessary because the geopolitics of strategic supply is likely to become even more central as the low-carbon transition accelerates and as states compete to define the institutional and material foundations of the post-carbon order.

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