POLICY BRIEF #65

Securing India's Critical Mineral Future: Geopolitical Foresight, Research Priorities, and Institutional Culture for Cobalt, Lithium, and Nickel

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Abstract

India’s clean energy transition, anchored in initiatives such as the National Electric Mobility Mission (NEMM), Production-Linked Incentives (PLI) for Advanced Chemistry Cells (ACC), and the rapid expansion of solar and grid-scale energy storage, rests heavily on access to critical minerals that the country does not currently control. Minerals such as lithium, cobalt, and nickel are indispensable to lithium-ion battery technologies and emerging energy storage systems. However, India remains almost entirely import-dependent for these resources, exposing its clean energy ambitions to significant supply chain vulnerabilities.

As India accelerates electrification across transport and power sectors, its sustainable energy future will depend not only on technological adoption and manufacturing capacity, but also on reshaping the upstream supply chains that underpin these technologies. Continued reliance on concentrated and geopolitically sensitive mineral markets risks embedding strategic vulnerabilities into India’s energy transition. Conversely, proactive interventions could enable India to build resilience, diversify supply sources, and enhance strategic autonomy.

This paper examines the geopolitical structures governing critical mineral markets and assesses how they shape India’s exposure to supply disruptions, price volatility, and strategic competition using the Dependency Risk Index (DRI). By analysing where and how India sources key minerals, the study identifies a layered risk profile encompassing resource concentration, trade dependencies, and geopolitical leverage. The paper argues that informed, data-driven policy design, spanning overseas mineral partnerships, domestic recycling, substitution, and international cooperation, will be central to mitigating these risks. Decisions taken in the current decade will play a decisive role in determining India’s energy sovereignty, industrial competitiveness, and global positioning in the geopolitics of electrification by 2030 and beyond.

Keywords: *Critical minerals, Dependency risk index, Mineral trade, Critical mineral geopolitics, Trade flows*

JEL Classification: *C15, F13, F14, Q34*

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Securing India's Critical Mineral Future: Geopolitical Foresight, Research Priorities, and Institutional Culture for Cobalt, Lithium, and Nickel

Amit Kumar

1. Introduction

India's clean energy ambitions, embodied in its National Electric Mobility Mission[1], Production-Linked Incentives for Advanced Chemistry Cells[2], and growing solar and grid storage programs, expend profoundly on mineral inputs, which it currently does not control. The successful shift towards a green energy India depends on the availability of critical minerals, such as Cobalt, lithium, and nickel, which are central to lithium-ion battery chemistries and grid-scale energy storage, as India is shifting from traditional coal and oil-based energy generation to renewable energy generation with an ambitious target of 50% by 2030[3]. The minerals that are essential for economic development and national security are considered critical minerals. The limited availability or concentration of extraction or processing in a few geographical locations makes it more critical for resource-constrained nations such as India[4].

India is 100 percent import dependent for 10 critical minerals[5] as shown in Table 1. The geopolitical structures of these mineral markets shape both vulnerabilities and opportunities. A focus on where and how India sources these minerals reveals a layered geopolitical risk profile that will help in informed data-driven policy design.

Table 1: Major countries of import for 15 key critical minerals

S. No.	Critical Mineral	Percentage (2020)	Major Import Source (2020)
1	Lithium	100%	Chile, Russia, China, Ireland, Belgium
2	Cobalt	100%	China, Belgium, Netherlands, USA, Japan
3	Nickel	100%	Sweden, China, Indonesia, Japan, Philippines
4	Vanadium	100%	Kuwait, Germany, South Africa, Brazil, Thailand
5	Niobium	100%	Brazil, Australia, Canada, South Africa, Indonesia
6	Germanium	100%	China, South Africa, Australia, France, USA
7	Rhenium	100%	Russia, UK, Netherlands, South Africa, China
8	Beryllium	100%	Russia, UK, Netherlands, South Africa, China
9	Tantalum	100%	Australia, Indonesia, South Africa, Malaysia, USA
10	Strontium	100%	China, USA, Russia, Estonia, Slovenia
11	Zirconium (Zircon)	80%	Australia, Indonesia, South Africa, Malaysia, USA
12	Graphite (natural)	60%	China, Madagascar, Mozambique, Vietnam, Tanzania
13	Manganese	50%	South Africa, Gabon, Australia, Brazil, China
14	Chromium	2.5%	South Africa, Mozambique, Oman, Switzerland, Turkey
15	Silicon	<1%	China, Malaysia, Norway, Bhutan, Netherlands

Source: Critical Minerals for India Report, Ministry of Mines, Government of India, 2023

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[1] https://www.pib.gov.in/newsite/printrelease.aspx?relid=116719

[2] https://heavyindustries.gov.in/en/pli-scheme-national-programme-advanced-chemistry-cell-acc-battery-storage

[3] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2209478&reg=3&lang=1

[4] https://mines.gov.in/admin/download/649d4212cceb01688027666.pdf

[5] idib

Minerals such as lithium, cobalt, nickel, vanadium, and niobium are entirely imported, with no meaningful domestic production. The imports are sourced from a limited and geographically concentrated set of countries, often involving a small group of dominant suppliers. Several minerals rely heavily on China either directly or indirectly, particularly through refined or intermediate products, while others depend on politically or economically sensitive regions. In many cases, supply chains pass through multiple countries, increasing exposure to trade disruptions, export controls, and geopolitical tensions.

A major source of geopolitical risk is the dominance of a small number of countries across mining, processing, and refining stages, most notably China, which exercises substantial control over global refining capacity and downstream value chains for several critical minerals. This concentration exposes India to supply disruptions stemming from export restrictions, diplomatic tensions, market manipulation, or global shocks. Recent experiences of pandemic-induced disruptions and the growing use of trade and resource policy as geopolitical tools have further underscored the fragility of mineral supply chains and the strategic costs of over-dependence.

Against this backdrop, India's critical minerals strategy is emerging as a pivotal component of its broader clean energy transition and geopolitical recalibration. The country's objectives extend beyond securing raw material access to building resilience across the value chain, encompassing exploration, extraction, processing, recycling, and international partnerships. Global assessments by institutions such as the International Energy Agency and the World Bank consistently highlight that without proactive diversification and domestic capacity building, mineral-importing countries face heightened exposure to price volatility, supply shocks, and strategic coercion.

This policy brief situates India's critical minerals dependency within this evolving geopolitical landscape. It examines how India's critical mineral demand intersects with global mineral markets, analyses domestic and international policy responses, and evaluates the constraints that continue to shape India's options. The paper argues that India's geopolitical risk exposure has catalysed a two-pronged approach: strengthening domestic exploration and production capabilities while simultaneously pursuing diversified and trusted international supply chains through strategic partnerships and diplomacy by developing worst case and a base case scenario.

2. Methodology

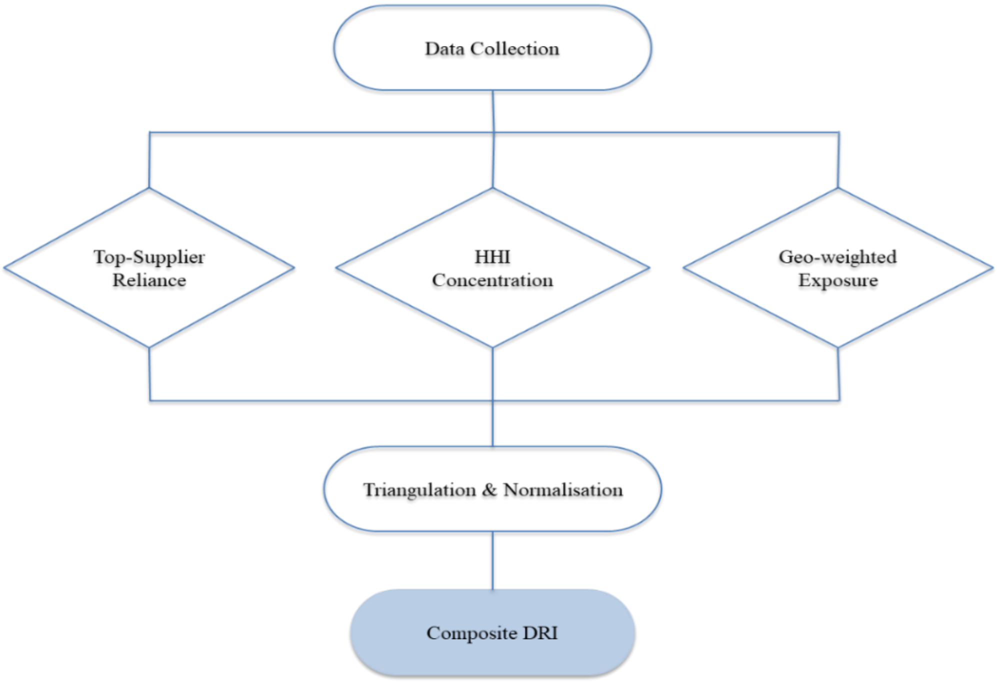
The Dependency Risk Index (DRI) evaluates beyond trade quantities to assess concentration risk, which occurs when one or two nations dominate exports of a crucial commodity or resource. This is especially important in areas such as critical minerals, energy technology, electronics, and medicines, where supply disruptions can halt production, increase prices, and jeopardise long-term growth goals. A high reliance risk can exacerbate balance-of-payments pressures and diminish developing nations' negotiating strength in global markets.

The DRI reported in this brief was calculated using a systematic analysis of India's trade exposure from importing essential minerals utilised in lithium-ion battery supply chains, as shown in Figure 1. The technique combines three analytical components: top supplier reliance, market concentration risk, and geopolitical exposure, to create a composite index of strategic vulnerability for each mineral under consideration.

First, import data for cobalt, lithium compounds and nickel intermediates were sourced from the World Integrated Trade Solution (WITS)[6] and the International Trade Centre (ITC)[7] trade statistics for the year 2024. All import figures were cleaned, and the top 20 exporters were filtered and aggregated by partner nation and presented as shares of India's total imports of that mineral category (refer to Table 1A of the annexure).

Second, top-supplier reliance was assessed based on the main partner country's import share. Increased reliance on a single supplier shows a greater sensitivity to bilateral interruptions. Third, the Herfindahl-Hirschman Index was used to assess overall concentration risk. The HHI was determined as the total of squared import shares across all exporting nations; HHI values were then categorised into Low, Medium, and High concentration risk bands according to the US Department of Justice classification thresholds[8].

Figure 1: Methodology adopted for calculating dependency risk index



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[6] https://wits.worldbank.org/Default.aspx?lang=en
[7] https://www.trademap.org/Country_SelProductCountry_TS.aspx
[8] Antitrust Division | Herfindahl-Hirschman Index

In the context of critical mineral imports, the HHI becomes an important indicator of trade dependency risk. A higher HHI means that imports are sourced from very few countries, increasing the likelihood that a disruption from any one major supplier could significantly impact India's clean energy supply chains. When the HHI is low, supply is more diversified across multiple countries, which improves bargaining power, strengthens supply security, and reduces exposure to geopolitical tensions. By calculating HHI for lithium, nickel, cobalt and other key battery inputs, India can clearly identify which mineral dependencies are most concentrated and therefore strategically risky[9].

The HHI also serves as a valuable tool for policymaking, helping decision-makers identify which critical minerals require urgent diversification through diplomatic outreach, targeted free trade agreements, and domestic industrial development in refining and recycling. Because it can be monitored over time, the HHI enables assessment of whether interventions are genuinely reducing supply concentration and strengthening resilience. In short, the Herfindahl–Hirschman Index provides a rigorous quantitative basis for evaluating supply-chain security and guiding India's strategic actions in the battery materials ecosystem.

Finally, a geopolitically weighted risk score was computed by assigning each supplier country a Business Climate Risk Score[10] reflecting international diplomatic alignment and strategic reliability. The import share of each country was multiplied by its geopolitical score, and the resulting weighted average was used to classify geopolitical exposure as Low, Medium or High. The DRI for each mineral was estimated using the Python programming language for data analysis, triangulating judgment based on all three components: top-supplier reliance, HHI concentration level, and geo-weighted exposure. This composite approach offers a more comprehensive view of supply risk, accounting for not just import concentration but also the resilience and strategic trust entrenched in supplier relationships.

3. Results and discussion

India's cumulative cobalt imports are on a steadily increasing trajectory, reflecting a sustained and growing reliance on external sources as shown in Figure 2. The imports are highly concentrated among a small group of exporters, with Belgium emerging as the largest supplier, followed by the United States, China, Norway, and Japan. A second tier of suppliers, including Canada, the Netherlands, France, and the United Kingdom, also contributes significantly, indicating strong reliance on advanced industrial economies and trading hubs. At the same time, the import in terms of quantity provides a different picture, where China leads with the highest 20-year import quantity of 3679501 tonnes, followed by Japan (198188 tonnes) and the United States (173374 tonnes). Overall, the distribution highlights a mix of refined-material suppliers and primary resource exporters, underscoring both geographic concentration and geopolitical exposure in India's import structure.

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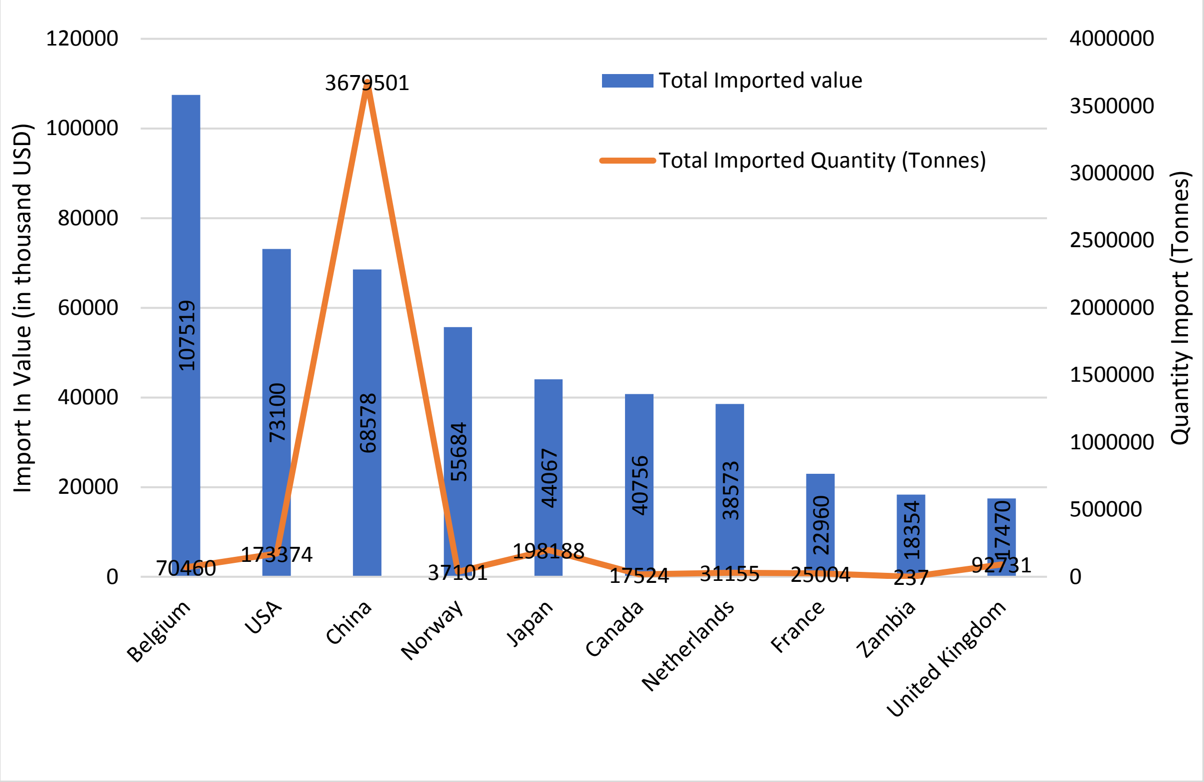
[9] https://doi.org/10.3389/fenrg.2022.1032000

[10] COFACE Country & Sector Risks Handbook 2025, Major Trends of The World Economy, Analysis and Forecasts for 160 Countries and 13 Sectors, https://www.coface.com/news-economy-and-insights/business-risk-dashboard/country-risk-map

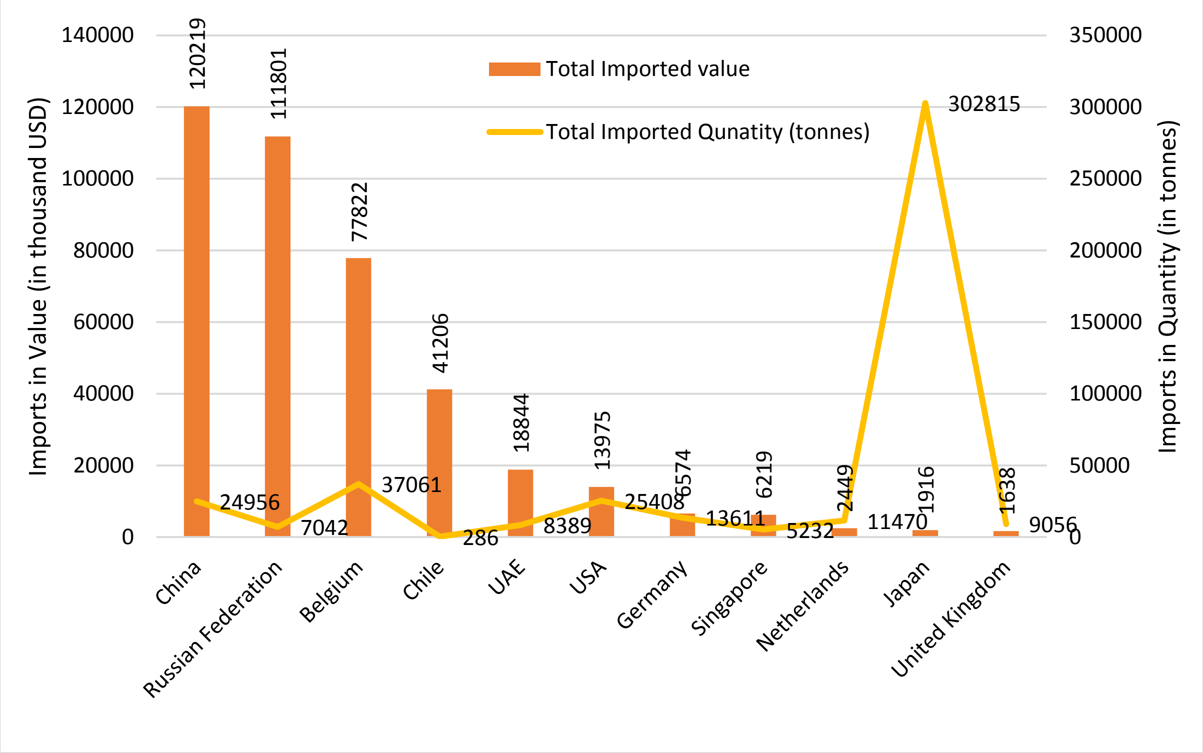
Figure 2: Country-wise Cobalt Imports



Source: Authors' construction using ITC & WITS trade data

Figure 3, on the other hand, illustrates a sharp and accelerating rise in India's cumulative lithium hydroxide imports, particularly in recent years. Lithium hydroxide imports are highly concentrated, with China and the Russian Federation together accounting for the largest share of import value, highlighting significant exposure to a narrow set of suppliers. Belgium and Chile form the next tier of major exporters, suggesting reliance on both processing hubs and primary lithium-producing countries. Imports from the United Arab Emirates and the United States are comparatively smaller, while the remaining suppliers contribute only marginal shares. The overall picture turns around when we observe the total imports in terms of quantity. Japan, being the top country supply 302815 tonnes of LiO/LiOH in last 20 years. The distribution underscores a high level of supplier concentration and geopolitical risk, given the dominance of a few countries in India's lithium hydroxide import profile.

Figure 3: Country-wise Lithium Oxide/Hydroxide Imports

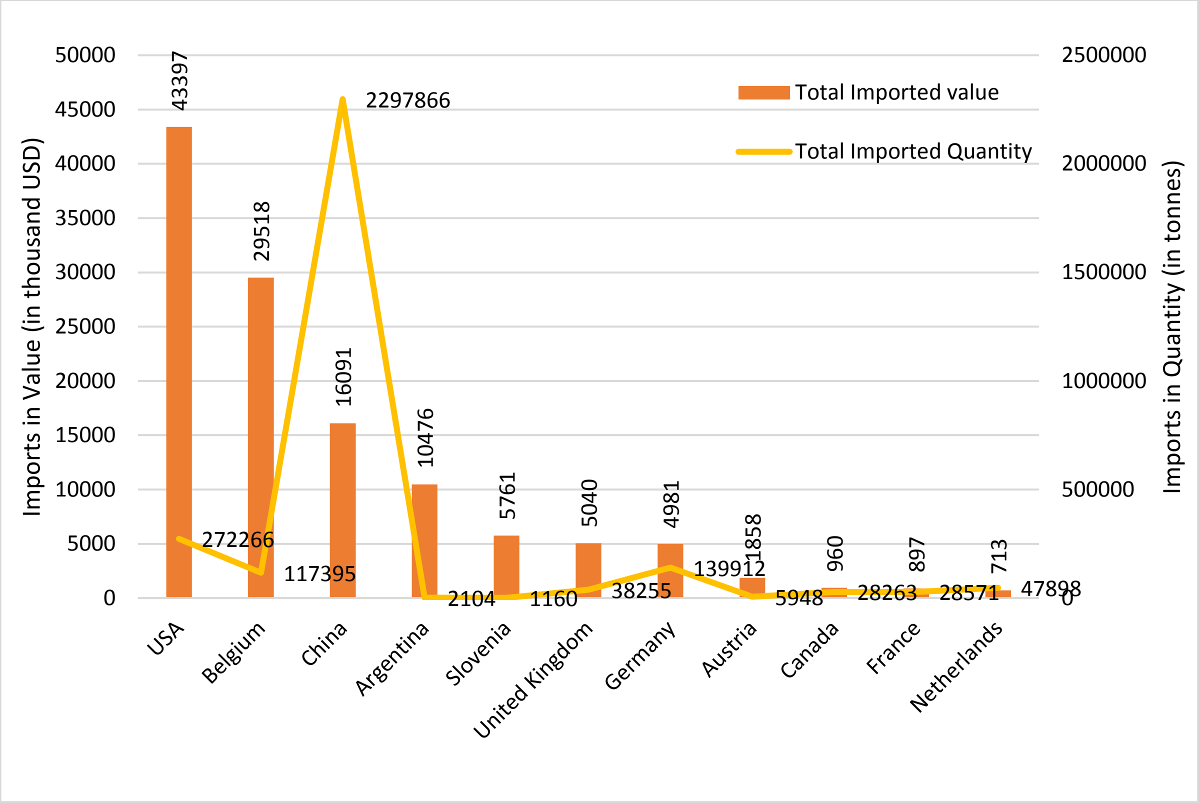


Source: Authors' construction using ITC & WITS trade data

Figure 4 depicts a consistent increase in cumulative lithium carbonate imports, albeit at a more moderate pace compared to lithium hydroxide. The graph illustrates clear differences between import value and import quantity across major supplier countries. The United States accounts for the highest import value at about USD 43.39 million, despite supplying a relatively modest quantity of around 277,000 tonnes, indicating higher unit-value imports. In contrast, China dominates in volume, exporting nearly 2297866 tonnes, while its total import value stands at approximately USD 16.1 million, suggesting bulk, lower-value shipments. Belgium shows a similar pattern, with imports valued at about USD 29.52 million but limited quantities of roughly 117,000 tonnes.

Mid-level suppliers such as Argentina (USD 10.47 million; 2,104 tonnes), Germany (USD 4.98 million; 139,912 tonnes), and the United Kingdom (USD 5.04 million; 38,255 tonnes) reflect more balanced trade profiles. Smaller contributors, including Austria, Canada, France, and the Netherlands, account for lower values and volumes. The data highlights a split sourcing strategy: high-volume imports from China alongside higher-value, lower-volume imports from advanced economies, underscoring opportunities for domestic value addition and supply diversification.

Figure 4: Country-wise Lithium Carbonate Imports

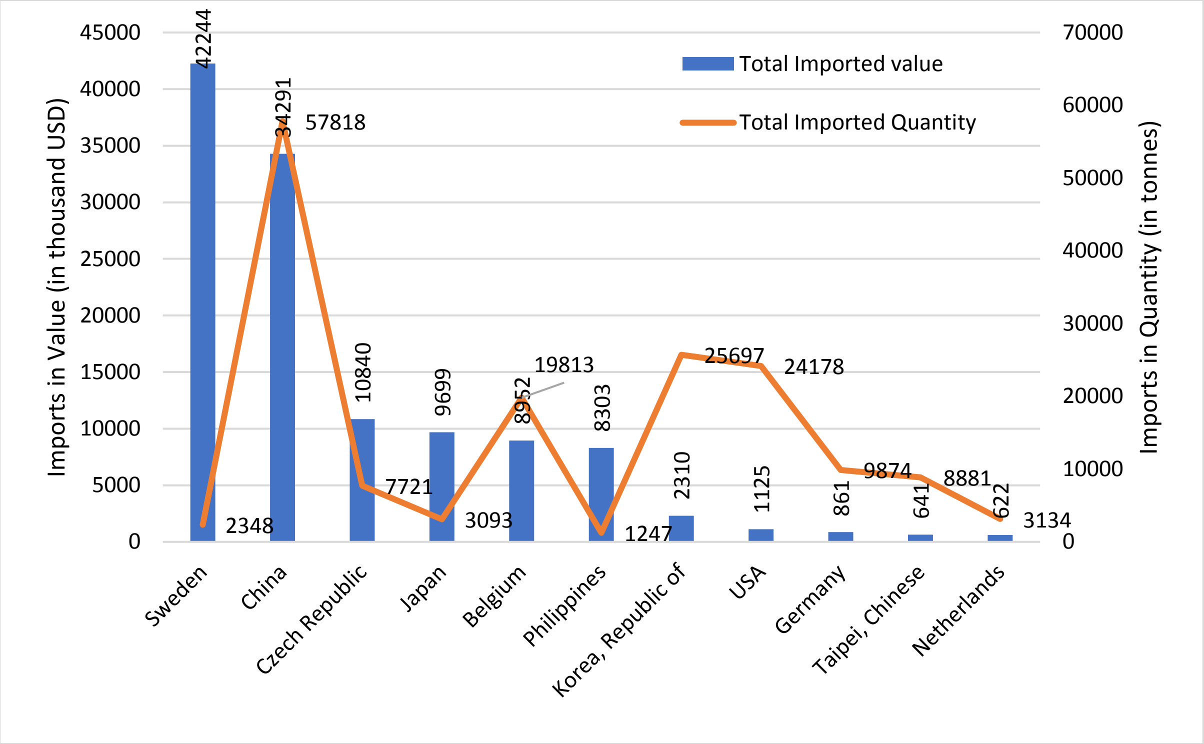


Source: Authors' construction using ITC & WITS trade data

Figure 5 shows a gradual yet persistent rise in India's cumulative nickel hydroxide imports, indicating growing demand from battery precursor and electrochemical applications. The graph highlights notable contrasts between import value and import quantity across major supplier countries. Sweden records the highest import value at around USD 42.24 million, while supplying a relatively smaller quantity (2,348 tonnes), indicating very high unit-value imports. China combines both scale and value, with imports worth approximately USD 34.29 million and quantities close to 57,818 tonnes, making it the largest supplier by volume for the last 20 years.

Several countries show moderate values with varied quantities. The Czech Republic accounts for imports valued at about USD 10.84 million with 7,721 tonnes, while Japan supplies roughly USD 9.69 million at lower volumes of 3,093 tonnes. Belgium and the Philippines contribute similar values, around USD 8.95 million and USD 8.30 million, but Belgium supplies much higher quantities (19,813 tonnes) compared to the Philippines (1,247 tonnes). Lower-value suppliers such as the US (USD 1.1 million; 25,697 tonnes) and Germany (USD 861,000; 24,178 tonnes) reflect bulk, lower unit-value imports. This represents a mix of high-value specialised sourcing and high-volume bulk procurement that India has made in the last 20 years.

Figure 5: Country-wise Nickel Hydroxide Imports



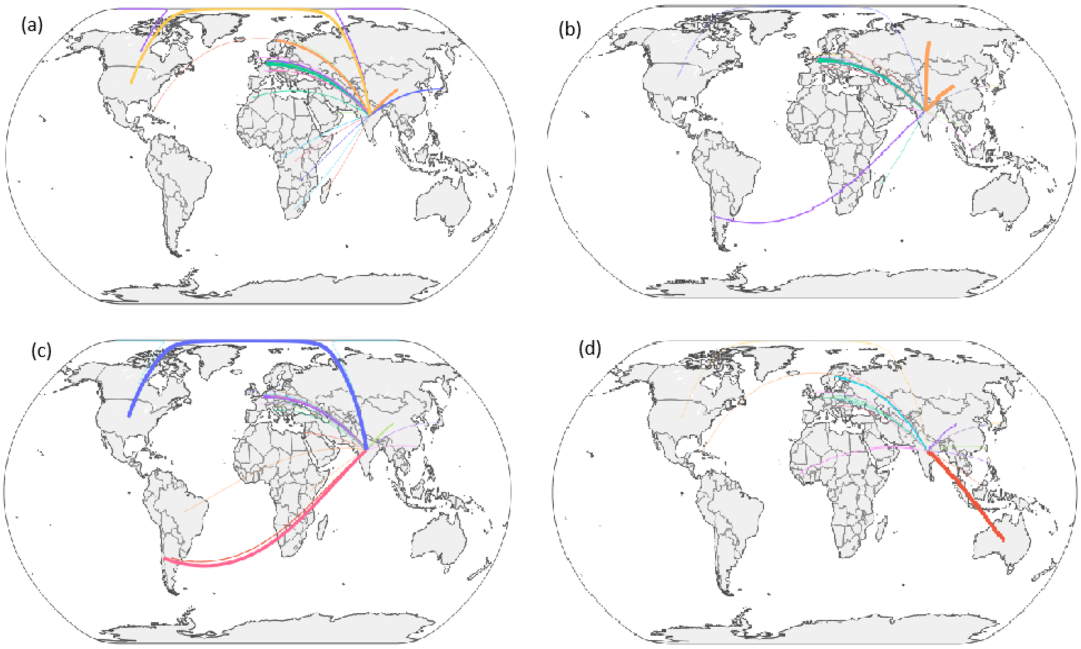
Source: Authors' construction using ITC & WITS trade data

Figure 6 presents an overview of the trade flow of each critical mineral considered in this study that India imports. The thickness of the trade lines represents the value of the import that is happening. The trade flow maps illustrate the global sourcing patterns of imports across four panels, highlighting both the geographical spread and intensity of international trade linkages. Across all panels, India imports these minerals via trade routes extending across North America, Europe, East Asia, Southeast Asia, and Oceania, underscoring its deep integration into global supply chains.

Figure 6 (a) and (c) show a highly diversified import structure, with strong flows from East Asia and Europe, alongside longer-distance linkages from North and South America. These routes indicate dependence on both nearby regional suppliers and distant markets for Cobalt and Lithium Carbonate. Figure 6 (b) reflects a more concentrated sourcing pattern, dominated by East and Southeast Asian corridors, suggesting reliance on regional production networks. Figure 6 (d) highlights sustained flows of Nickel Oxide/Hydroxide from Europe and East Asia, complemented by select connections from the Pacific region.

The trade pattern reveals a dual trade strategy: regional proximity-based sourcing for volume and cost efficiency, combined with long-haul trade relationships for specialised or high-value goods. The spatial distribution of flows also points to potential vulnerabilities, where disruptions along key corridors, particularly in East Asia or Europe, could have cascading impacts.

Figure 6: (a) Trade Flow of Cobalt, (b) Trade Flow of Lithium Oxide/Hydroxide, (c) Trade Flow of Lithium Carbonate, (d) Trade Flow of Nickel Oxide/Hydroxide



Source: Authors' construction using ITC & WITS trade data

The dependency risk analysis shows that India’s cobalt imports are relatively diversified in terms of supplier origin, as shown in Table 2 and Figure 6. Imports are primarily sourced from Belgium (26.98 percent), followed by the United States (26.64 percent), China (23.02 percent), and Japan (11.08 percent). This distribution yields a medium risk level on both top-supplier dependency and the Herfindahl-Hirschman Index (HHI)[11]. While the geopolitical weighted risk remains low, given that most suppliers, except China, are stable trade partners.

Even when sourcing cobalt from geopolitically aligned countries, India remains indirectly dependent on China, which controls over 75 percent of global cobalt refining capacity. This demonstrates that the vulnerability lies not only in where minerals are mined but also in who refines and processes them.

Table 2: Geopolitical overview of Cobalt, Lithium and Nickel supply chain in India

Mineral	Top Supplier	Top Supplier Share	DRI Level	HHI Risk	Geo-Weighted Risk
Cobalt	Belgium	26.98%	Medium	Medium	Low
Lithium (LiO/LiOH)	China	38.23%	High	High	Medium
Lithium Carbonate	USA	33.73%	High	Medium	Low
Nickel Hydroxide (NiOH)	Australia	56.83%	Critical	High	Low

Source: Authors' analysis on WITS and ITC data

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[11] https://www.justice.gov/atr/herfindahl-hirschman-index#:~:text=The%20term%20%E2%80%9CHHI%E2%80%9D%20means%20the,Guidelines%20%C2%A7%202.1%20(2023).

Lithium exposure further highlights this structural fragility. India imports lithium hydroxide and lithium oxide predominantly from China (38.23 percent), followed by Belgium (30.63 percent) and Russia (10.11 percent). Both dependency and concentration indicators classify lithium compounds as a high-risk segment, with geo-weighted risk assessments signalling medium exposure due to China's dominance and tightening control of midstream processing.

In lithium carbonate, the picture is slightly more diversified; imports from the United States lead at 33.73 percent, followed by China at 24.79 percent. The data suggests a high top-supplier risk and medium concentration risk, while geopolitical risk appears low. Yet here too, the structural vulnerability endures: China refines over 70 percent of global lithium chemicals[12], and other major suppliers increasingly align with US and EU "friend-shoring" objectives, raising future competition for access.

3.1 India's Strategic Case for Import Diversification: A Data-Driven Narrative

India's critical mineral demand is increasing at a constant rate. Initiatives, such as the Minerals Security Partnership, the Indo-Pacific Economic Framework, and the National Critical Mineral Mission, along with appropriate incentive mechanisms has shown India's commitment to energy transition. The government's joint venture, Khanij Bidesh India Ltd. (KABIL), has bought 15,703 hectares in Argentina for lithium mining, in addition to partnerships in Australia and Chile[13], and has created a significant impact to stabilise lithium supply.

On the other hand, India's critical mineral import structure reveals clear geopolitical vulnerabilities but also credible diversification pathways. Lithium compounds remain the highest-exposure segment: in 2024, India imported USD 120.22 million worth of lithium hydroxide from China, making China the number-one supplier by a large margin. Next-largest suppliers, Russia (USD 111.80 million) and Belgium (USD 77. 82 million), indicate that over 70 percent of LiOH imports come from just three countries, as shown in Table 1A of the annexure. This concentration aligns with a high top-supplier dependency and high HHI concentration risk identified in the Dependency Risk Index (DRI) assessment.

Nickel supply is even more fragile: Nickel hydroxide imports show 56.83 percent dependence on Australia, resulting in a Critical dependency classification. While Australia is geopolitically aligned, a single-geography reliance exposes India to Indo-Pacific maritime chokepoints and global trade shocks.

By contrast, cobalt import sources are already fairly diversified; Belgium (USD 9.67 million), the United States (USD 9.55 million), and China (USD 8.25 million) collectively account for less than 80 percent of imports, as shown in Table 1A of the annexure. This distribution yields

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[12] https://lithiumharvest.com/knowledge/lithium/the-lithium-mining-market/#:~:text=Too%20Concentrated%20to%20Be%20Resilient,of%20global%20output%20in%202024.

[13] PIB-2026

medium DRI and medium concentration risk. The strategic priority here is to reduce indirect exposure to Chinese midstream dominance (processing >75 percent of global cobalt).

3.2 What Diversification Achieves: Shock Absorption Scenarios

Strategic import diversification would shield India from supply disruptions, geopolitical tensions, and price volatility, ensuring stable access to critical minerals and maintaining momentum in domestic EV manufacturing and clean energy deployment.

Table 3 illustrates how strategic diversification of India's supplier portfolio can shift the HHI concentration levels for lithium hydroxide and nickel intermediates from High to Medium, significantly lowering exposure to single-point vulnerabilities and improving resilience across the midstream battery value chain. This shift is not merely a statistical improvement; it directly influences India's ability to withstand future supply disruptions.

Table 3: Importance of Strategic import diversification for India

Risk Event	Without Diversification	With Diversification
Lithium export bans (China/Russia)	Giga-factory shutdowns	Supply continuity via Chile, Australia, Argentina (KABIL Joint venture)[14]
Maritime disruptions	Nickel supply crisis	Land-based & diversified suppliers reduce disruption
Price spikes from geopolitical tensions	EV cost inflation & demand slowdown	Buffer via stable, multi-region contracts
Technology sanctions	Slow domestic manufacturing	Secure input flows through FTA and bilateral agreements supporting Aatmanirbhar initiatives

Looking ahead to 2030, the implications of such choices become stark. In a "supply-constrained scenario", India continues on a path of limited diversification and remains deeply reliant on China-dominated processing routes. Under such circumstances, any export restriction, geopolitical escalation, or maritime disruption could rapidly stall EV manufacturing, trigger sharp input cost escalation, and jeopardise national climate objectives. Conversely, under an "optimistic trajectory", effective diversification, anchored in alliances with lithium- and nickel-rich partners in Latin America, Southeast Asia, and the Indo-Pacific, ensures secure long-term access to refined materials and strengthens India's domestic industrial base. The decision to rebalance today's supply chains will therefore determine whether India's clean energy transformation becomes strategically autonomous or remains vulnerable to forces beyond its control.

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[14] PIB-2026

3.2.1 Supply-constrained Scenario 2030: Export Bans and the Collapse of India's Battery Ecosystem- Strategic Vulnerabilities

By the early 2030s, a new era of resource nationalism will reshape global critical mineral markets. Major resource-holding countries, seeking to maximise domestic value addition, impose stringent restrictions on the export of battery-grade lithium, nickel and cobalt. India's incremental and fragmented efforts to address supply vulnerabilities over the previous decade prove insufficient: despite production-linked incentives and initial Giga-factory investments, the country remains structurally dependent on imported midstream materials. According to WITS import data, India continues to source the majority of its battery-grade lithium and nickel chemical precursors from a highly concentrated supplier set, with Chinese firms either directly controlling or indirectly influencing processing routes. As a result, cell-manufacturing facilities operate at low utilisation rates due to feedstock shortages, and EV prices rise sharply as manufacturers resort to expensive imports of finished cells, undermining industrial policy objectives and slowing adoption trajectories.

Concurrent geopolitical instability in the Indo-Pacific, including heightened US–China rivalry, selective sanctions, and maritime disruptions, further constrains access to refined minerals. China tightens export controls and prioritises domestic downstream industries and aligned partners, while Latin American and Southeast Asian suppliers are already committed under long-term agreements to China, the United States, and the European Union. India, having delayed strategic mineral diplomacy, finds itself marginalised within global allocation hierarchies, widening the gap between ambition and capability.

Under these pressures, technology pathways become reactive rather than strategic. Indian manufacturers accelerate a shift to LFP and prematurely deploy sodium-ion chemistries to minimise exposure to constrained minerals, despite unresolved performance limitations. Investor confidence erodes, as the domestic battery ecosystem appears increasingly reliant on vulnerable segments of global supply chains. Firms reconsider large-scale investment, and several redirect capital to jurisdictions with secure access to upstream and midstream materials.

Policy responses shift into crisis-management mode, temporary tariff waivers, ad hoc cargo negotiations, and state-mediated procurement, rather than sustained industrial strategy. Social and political narratives question the credibility of India's clean-energy leadership, highlighting the asymmetry between manufacturing aspirations and weak mineral sovereignty. In this scenario, India's role in the global EV economy remains that of a price-taker: assembling imported technologies rather than shaping the material foundations of energy transition. Far from delivering strategic autonomy, the clean-energy shift becomes another arena where external geopolitical decisions constrain national outcomes.

3.2.2 Optimistic Scenario 2030: Strategic Autonomy through Alliances and Innovation

By the early 2030s, India will have transformed its import-dependency challenge into an industrial strength across the electric-mobility and stationary-storage sectors. Building on detailed import-dependency assessments, such as the data showing 38.23 percent of lithium hydroxide/oxide supply from China, and 56.83 percent of nickel hydroxide from Australia, India invests purposefully in domestic refining infrastructure for lithium and nickel chemicals and precursor production. These processing plants, located in mineral-processing zones in states such as Gujarat and Tamil Nadu, are co-financed through PLI schemes and global strategic-partner joint ventures with Japan, South Korea and Australia.

Simultaneously, India negotiates Free Trade Agreements (FTAs) and offtake-investment frameworks[15] with lower-risk jurisdictions in Latin America (Chile, Argentina), Southeast Asia (Indonesia, Philippines) and friendly OECD nations (Canada, Norway) to lock in a long-term supply of processed battery-grade intermediates. These deals include clauses for technology transfer, co-refining investment, traceability of ESG standards, and preferential access.

The result is a diversified supply chain: India's share of processed lithium compounds and nickel sulfate imports from previously narrow supplier pools falls significantly; the DRI for lithium and nickel moves from High/Critical to Medium/Low. Domestic cell-and-pack manufacturing ecosystems scale rapidly, aligned with India's "Make in India" and climate ambitions. Recycling infrastructure is industry-mature, turning end-of-life batteries into a domestic second source of critical minerals. Through this integrated approach of industrial upgrading, strategic diplomacy, and circular economy, India transitions from a cell-assembler to a midstream and upstream competitive nation, underpinning its clean-energy leadership, boosting industrial exports and reinforcing its geopolitical autonomy.

In 2030, credible material foundations underwrite India's clean energy ambitions. The country is not immune to shocks, but it is significantly more resilient: diversified in supply, embedded in alliances, and increasingly capable in the midstream segments that determine who captures value and who holds power, in the age of electrification.

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[15] https://csep.org/blog/beyond-self-reliance-indias-international-partnerships-on-critical-minerals/

4. Key Recommendations

- Secure Midstream Autonomy through Domestic Processing Capacity
- Pursue Strategic Mineral Diplomacy with Trusted Partners
- Develop a National Battery Recycling and Urban Mining Ecosystem
- Drive Innovation in Alternative Battery Chemistries
- Establish Strong Institutional Architecture for Supply Chain Agility
- Embed ESG-First Governance in Domestic Extraction

5. Conclusion

India is at a critical point in its renewable energy and industrial revolution. The capacity to eliminate strategic vulnerabilities in vital mineral supply chains is crucial to the country's success in electrifying mobility, boosting renewable energy, and developing innovative manufacturing capabilities. The data is clear: cobalt, lithium, and nickel dependence, particularly in midstream refining and precursor manufacturing, pose concentrated geopolitical risks that, if not handled, might delay or derail national climate and economic goals.

However, this period also represents a historic opportunity. With prompt policy interventions, India can transition from passive import dependency to active value-chain leadership by increasing local processing capacity, establishing trusted international mineral relationships, and boosting innovation in low-risk battery chemistries and recycling technology. A forward-thinking institutional design based on integrated governance and ESG-first development will be critical to maintaining this change.

India's sustainable energy future depends not just on increasing technological adoption, but also on altering the supply chains that support it. The next decade will determine whether India continues to import vulnerability or develops the strategic autonomy required to compete in the geopolitics of electrification. The decisions made now will determine the country's energy sovereignty, industrial competitiveness, and global impact in 2030 and beyond.

Annexure

Table 4A: Cobalt, Lithium and Nickel Imports by India in terms of value from the top 20 countries

S. No.	Exporters of Cobalt to India	Imported value in 2024 (in 1000 USD)	Exporters of LiOH to India	Imported value in 2024 (in 1000 USD)	Exporters of NiSO4 to India	Imported value in 2024 (in 1000 USD)
1	Belgium	9670	China	120219	USA	1731
2	USA	9549	Russian Federation	111801	Finland	1520
3	China	8249	Belgium	77822	China	1423
4	Japan	3972	Chile	41206	Italy	1364
5	Germany	970	United Arab Emirates	18844	Poland	1247
6	France	729	USA	13975	Thailand	655
7	South Africa	610	Latvia	6652	Turkey	367
8	Norway	548	Germany	6574	Spain	272
9	Canada	407	Singapore	6219	Korea Rep.	257
10	United Kingdom	400	Netherlands	2449	Japan	166
11	Finland	361	Japan	1916	Germany	118
12	Netherlands	257	United Kingdom	1638	Singapore	100
13	Switzerland	116	Korea, Republic of	1098	Argentina	90
14	Zambia	No trade happened	Hong Kong, China	815	United Kingdom	75
15	Morocco	No trade happened	Czech Republic	662	Malaysia	71
16	Congo	No trade happened	Switzerland	343	Austria	53
17	Congo, Democratic Republic of the	No trade happened	Indonesia	238	Brazil	48
18	United Arab Emirates	No trade happened	Madagascar	231	Sweden	47
19	Madagascar	No trade happened	Thailand	181	India	23
20	Bahamas	No trade happened	France	141	Russian Fed	18

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