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How Industrial Policy Is Shaping Battery Value Chains in the Global South

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Contents

Global South Center for Clean Transportation at UC Davis

Driving equitable, science-based transitions in energy and mobility

The **Global South Center for Clean Transportation** at the UC Davis Institute of Transportation Studies (ITS-Davis) supports advancement of clean transportation and energy transitions in developing countries. The center has a cross-cutting research portfolio across South Asia, Africa and Latin America, with strategic country-level programs in India, Mexico, Brazil, Indonesia and Kenya. It leverages ITS-Davis's global leadership in science-based, policy-driven solutions to strategically collaborate with state and national governments, NGOs, and industry, to promote zero-emission transportation policy including clean energy supply chains. The center serves as the founding member and secretariat of the Council for Critical Minerals Development in the Global South and the California-Africa Climate and Economic Partnership.

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Letter from the Editor

The idea behind Majority Mobility has been that if you look at only the world's largest markets, you end up with a skewed picture of what a sustainable and just transition to clean mobility requires. You miss the depth of the needs in practice, in the places where the majority live and where much of the material foundation of this transition begins.

This second issue reinforces that conviction.

The shift to electric vehicles is often framed as a climate story or a race to secure critical minerals. But for many countries, it is an opportunity for industrial reconfiguration and economic development where there was previously little room to move up the value chain. As batteries become central to transportation and energy systems, mineral resources take center stage. Yet, as we show in this issue, resources do not stay fixed. They shift and disperse. Over time, the question expands from who has them underground to who can capture the value and benefit along the way.

What this looks like in practice varies. In some countries, it shows up in trade policy and new export decisions. In others, in the development of processing capacity. In others still, in demand-driven industrialization or regional positioning within supply chains that are still taking shape.

The four articles in this issue explore these choices from different angles. From Indonesia's leverage-building strategy, to diverging regional industrial policy pathways, to mineral trade and circularity, to the fast-emerging zero-emission truck supply chain. Together, they show that industrial policy is not abstract. It is unfolding in real time.

This issue also introduces Market Watch, a new section where we will present a quarterly data snapshot to ground our discussions in market realities. This first installment offers a global baseline—a broad view of EV sales and production across Global South economies. In future issues, we will highlight specific geographies or particularly relevant market developments that deserve closer attention.

We are proud to continue building this initiative and to share the work of our growing network of collaborators. Thank you for being part of it. The conversation is evolving and so are the value chains shaping it.

—Francisco A. Parés Olguín
Editor, *Majority Mobility*
Deputy Director,
Global South Center for Clean Transportation, UC Davis

Figure 1: PT Indonesia Weda Bay Industrial Park, one of the largest battery-precursor processing facilities. Source: Author

Beyond Resource Extraction: How Indonesia Built Leverage in the Battery Value Chain

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Over the past few years, questions about who benefits from critical energy transition minerals have become central to global energy and geopolitical debates. And for good reason. History has shown that resource endowment alone does not necessarily translate into value-addition for countries and communities. In many cases, resource-rich countries have become export-dependent economies, a dynamic often described as the "resource curse," where a resource-rich country engages in unequal, rent-seeking relationships with dominant importers. These relationships in turn shape countries' local governance systems, predominantly around external demand, and leave them with limited control over their own development

Moving beyond this trap requires more than extracting minerals. It requires seizing value-addition opportunities to retain more economic activity, jobs, and decision-making power within the countries where resources are found, with local communities playing an active role. This means building capacity across the value chain, including processing, refining, and manufacturing.

The challenge, however, lies at the intersection of capacity, trade, and institutional maturity. Often, resource-rich countries face limited technical capacity and binding international trade commitments that often raise questions about domestic resilience and control over their resources. Can trade frameworks be shaped around producer-country priorities rather than the interests of dominant markets? Can free trade agreements leave room for local processing, domestic pricing mechanisms, or other tools that support more equitable development? And can trade rules account for the very unequal political and economic power that exists along global mineral value chains?

Indonesia's experience of successfully moving beyond extraction offers a concrete example of a value-addition strategy that redefined its positioning in the global energy transition economy. This perspective is built on our ongoing work at the Global South Center for Clean Transportation and a year of strategic engagement with Indonesia.

How Indonesia built leverage by integrating downstream ambition

Indonesia holds 42 percent of global nickel reserves and, over the past decade, has emerged as the world's largest nickel producer, accounting for roughly 75 percent of global supply. It achieved this position by expanding domestic processing capacity and moving decisively downstream. Since 2014, foreign direct investment in the sector grew from roughly USD 2 billion to over USD 70 billion, increasing the number of smelters from just two to more than 50 by 2025. This rapid build-out of processing capacity enabled a twelve-fold increase in exports of value-added nickel, as well as the production of battery-grade nickel suitable for electric vehicles. As a result, by the 2025, Indonesia had moved beyond materials processing into EV manufacturing itself, attracting global automakers and consolidating its negotiating power across the value chain.

This outcome was certainly not accidental. Rather, it reflected a deliberate, step-by-step approach to moving downstream and building leverage in the global energy transition economy.

1. Vision, commitment & discipline

Indonesia made a political decision to progressively ban the export of nickel ore, requiring that nickel be processed domestically and actively attracting investment to support that shift. This decision reflected a careful assessment of Indonesia's position in the supply chain, the leverage held by other actors, and Indonesia's technological and capital constraints.

2. Export control & downstream integration

Indonesia implemented its export controls gradually, tightening restrictions in phases—first between 2009 and 2014, and then more decisively between 2018 and 2020 for key battery materials. These measures were paired with deliberate investments in processing infrastructure, including production of battery-grade nickel. While export bans helped retain raw materials domestically, their more important effect was the rapid expansion of downstream capacity, which allowed nickel to be converted into higher-value products.

To support this shift, Indonesia streamlined permitting processes, introduced targeted regulations, and reformed land-use rules to attract investment. Implementation was centralized and increasingly digital, allowing policies to scale more quickly. Localization also became a priority, with tax and duty exemptions for capital equipment and locally sourced components designed to encourage domestic production .

3. Redefining dominance in the supply chain

Strategic partnerships and stockpiling in London Metal Exchange (LME)/Shanghai Futures Exchange (SHFE) gives Indonesia a dominant position and leverage for price-setting. Its nickel production is increasingly outpacing global nickel demand. This further mitigated its dependency risks, improved visibility, made downstream investments less risky and more attractive to financiers, strengthening investor confidence and supporting steady capital flows into processing facilities.

What constrains other Global South countries?

Indonesia is not the first country to experiment with resource protection or industrial policy. What sets it apart is the consistency and sequencing with which those choices were applied. Many Global South countries also face deep and persistent constraints, including rapid technological change that outpaces regulation, shifting political priorities that disrupt policy continuity, weak institutional frameworks, and asymmetric geopolitical leverage. However, Indonesia's experience suggests that moving up the value chain is about making deliberate decisions and maintaining them long enough for results to compound. Scale, leverage, and credibility were built through sustained commitment, institutional coordination, and a willingness to absorb short-term disruption in pursuit of longer-term gains.

Ultimately, moving downstream for value addition is a political and institutional exercise. Leadership matters. Vision matters. Discipline matters. And for countries seeking to secure lasting value from the energy transition, the most important question may be whether they are willing to make and hold those decisions over time.

Batteries Without Borders: Trade, Circularity, and the Future of Critical Mineral Security

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Note: This article synthesizes key results from the 2025 peer-reviewed scientific article "Who Will Have Enough? Battery Mineral Demand and Sufficiency in Vehicle Producing Countries" published in Environmental Science & Technology. *Readers seeking detailed methodology and full results should consult the full study.*[1]

Multiple countries have adopted ambitious electric vehicle (EV) deployment targets as part of their climate strategies and goals for decarbonizing transportation.[2,3] These targets are causing increased demand for lithium-ion batteries (LIBs) and the critical energy transition minerals they contain, such as lithium, cobalt, nickel, and graphite.[4] While global reserves of these minerals indicate that they are sufficient in aggregate to supply demand forecasts,[5] their geographic concentration and the structure of EV supply chains create significant regional imbalances.

Battery Minerals Are Needed Where Vehicles Are Built

Most assessments allocate EV mineral demand based on where vehicles are sold.[6,7] This obscures where mineral demand actually is. Batteries are manufactured and installed during vehicle assembly, meaning that mineral requirements follow vehicle production geography rather than final consumption. EV uptake drives demand, but global manufacturing patterns determine where that demand materializes.

As a result, "vehicle producer" countries that assemble far more vehicles than they consume—such as Japan, Mexico, Germany, or South Korea—face substantial mineral requirements even if domestic EV adoption is moderate. Conversely, vehicle import-dependent markets such as Australia or Saudi Arabia may appear mineral-intensive in sales-based accounting but outsource much of the mineral-intensive production process.

This spatial mismatch has important implications. Many leading vehicle producers have limited domestic access to lithium, nickel, cobalt, or graphite, while mineral reserves are concentrated in regions with a relatively minor vehicle manufacturing industry, particularly in South America, Africa, and Oceania. Mineral security therefore depends not only on demand growth, but on manufacturing concentration and trade relationships.

Figure 1 illustrates how different vehicle market configuration—export-oriented producers, self-contained markets, import-dependent markets, and trade hubs—shape the distribution of embedded minerals. For example, Belgium's role as a major

[1] Busch P, Parés Olguín F, Tal G, Kendall A. (2025) Who Will Have Enough? Battery Mineral Demand and Sufficiency in Vehicle Producing Countries. Environmental Science & Technology. 59(45):24392–24403. https://doi.org/10.1021/acs.est.5c12420
[2] UK Department of Transport. "Government Sets Out Path to Zero Emission Vehicles by 2035, March 30." (2023) UK Department of Transport. https://www.gov.uk/government/news/government-sets-outpath-to-zero-emission-vehicles-by-2035
[3] Sathiyan SP, Pratap CB, Stonier AA, Peter G, Sherine A, Praghash K, Ganji V. Comprehensive Assessment of Electric Vehicle Development, Deployment, and Policy Initiatives to Reduce GHG Emissions: Opportunities and Challenges. IEEE Access. 10:53614–53639.
[4] International Energy Agency. Global Critical Minerals Outlook 2024. (2024) https://www. iea.org/reports/global-critical-minerals-outlook-2024
[5] Watari T, Nansai K, Nakajima K. (2021) Major Metals Demand, Supply, and Environmental Impacts to 2100: A Critical Review. Resources, Conservation, and Recycling. 164(105107). https://doi.org/10.1016/j.resconrec.2020.105107
[6] Baars J, Domenech T, Bleischwitz R, Melin H. E, Heidrich O. (2021) Circular Economy Strategies for Electric Vehicle Batteries Reduce Reliance on Raw Materials. Nature Sustainability 4(1):71–79. https://www.nature.com/articles/s41893-020-00607-0
[7] Alonso E, Pineault D, Nassar NT. (2023) Streamlined approach for assessing embedded consumption of lithium and cobalt in the United States. Journal of Industrial Ecology. 27(1):33–42. https://doi.org/10.1111/jiec.13337

European port makes it a hub for used vehicle exports despite its relatively small domestic market, while Australia represents the opposite case: a high-income economy with virtually no domestic vehicle production and complete reliance on imports. Even as the United States has a major vehicle manufacturing industry, its large consumption requires imports, and it is an important exporter of used vehicles globally. Although the figure reflects overall light-duty vehicle dynamics in 2024, these structural patterns provide a useful proxy to understand how EV-related mineral flows are likely to evolve.

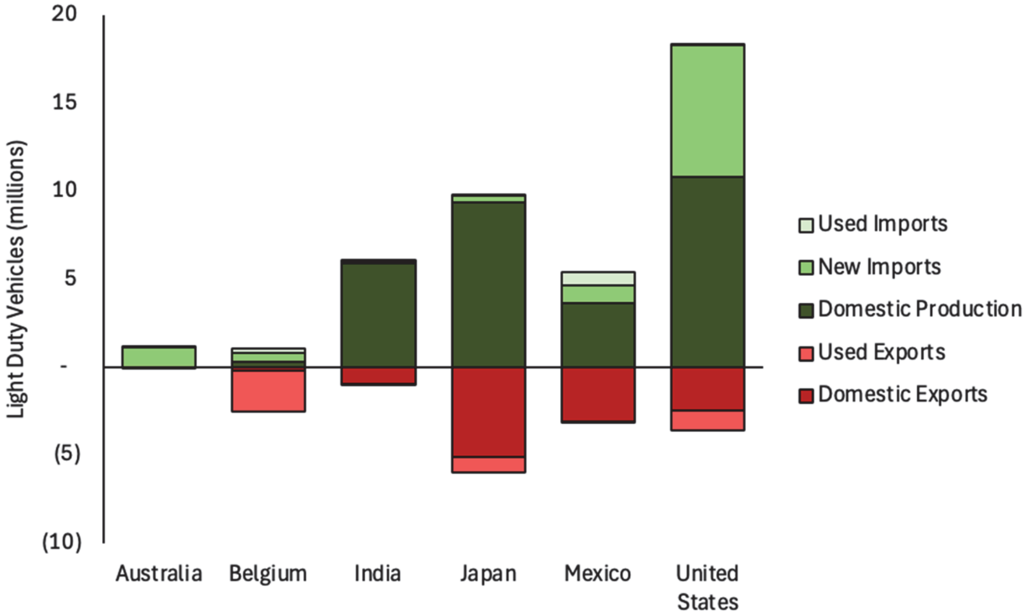


Figure 1. *Light-duty vehicle production and trade balances for select countries (2024). Bars show domestic vehicle production, and new and used vehicle imports and exports. These structural differences provide a proxy for how EV-related mineral demand will be geographically distributed as electrification expands.*[8,9,10]

Used Vehicle Trade Further Redistributes Embedded Minerals

Mineral sufficiency is also shaped by where vehicles reach the end of their useful life. After roughly 8 to 12 years, EVs increasingly enter global second-hand vehicle markets, where trade flows are often poorly documented. For example, empirical evidence suggests that the United States exports far more used vehicles to Mexico than is captured in official statistics, with similar gaps observed in other regions,[11] especially across land borders. Therefore, even with strong domestic recycling policies, countries that export used vehicles may recover only a fraction of the minerals embedded in the batteries of their vehicle fleet. At the same time, countries that historically rely on used vehicle imports are beginning to receive growing volumes of used EVs, creating an opportunity to recover valuable battery minerals domestically but also a risk of accumulating unmanaged battery waste if collection and recycling systems are not in place.[12]

Mineral sufficiency depends not only on global resource availability, but on production geography, trade patterns, and vehicle lifecycles. Failing to account for these factors risks impacting mineral and energy security and shifting environmental burdens across borders.

[8] Busch P, Pares F, Chandra M, Kendall A, Tal G. (2024) Future of Global Electric Vehicle Supply Chain: Exploring the Impact of Global Trade on Electric Vehicle Production and Battery Requirements. Transportation Research Record. 2678(11): 1468–1482. https://doi.org/10.1177/03611981241244797

[9] Pares Olguín F, Iskakov G, Kendall A. (2023) US-Mexico Second-Hand Electric Vehicle Trade: Battery Circularity and End-of-Life Policy Implications. Transportation Research Part D: Transportation and Environment. 125(103934). https://doi.org/10.1016/j.trd.2023.103934

[10] International Transport Forum (ITF). Used Vehicles Dashboard. https://www.itf-oecd.org/used-vehicles-dashboard.

[11] Pares Olguín F, Iskakov G, Kendall A. (2023) US-Mexico Second-Hand Electric Vehicle Trade: Battery Circularity and End-of-Life Policy Implications. Transportation Research Part D: Transportation and Environment. 125(103934). https://doi.org/10.1016/j.trd.2023.103934

[12] Pares Olguín F, Iskakov G, Kendall A. (2025) Trade, extended use, and end of life in the Global South: A regionally expanded electric vehicle life cycle assessment. Journal of Industrial Ecology. 29:1167-1184. https://doi.org/10.1111/jiec.70041

Evidence from a Global Mineral Sufficiency Model

We applied a dynamic material flow analysis[13] to four key battery minerals—lithium, nickel, cobalt, and graphite—across the light-duty EV battery value chain, from extraction to end-of-life (EOL). The model tracks mineral flows across 65 countries and regions from 2024 to 2050, accounting for where minerals are extracted, where EVs are assembled, where vehicles are sold, and where they ultimately reach EOL.

Figure 2 presents parallel coordinate plots illustrating how mineral volumes shift across four stages of the value chain. Each line represents a country. The first point on the x-axis shows mineral production in 2024, serving as a baseline of current supply (mineral production is not forecasted). The second point shows projected mineral requirements for EV production in 2050, indicating where vehicle manufacturing demand occurs. The third point represents minerals embedded in EVs sold in 2050, and the fourth shows the potential volume of minerals recoverable in countries where they reach their EOL (considering used vehicle exports).

The figures trace the redistribution of minerals from concentrated extraction regions to manufacturing hubs, consumer markets, and ultimately recovery locations. Primary mineral production is geographically narrow and concentrated in a small group of countries. Cobalt production is dominated by the Democratic Republic of Cong, graphite by China, lithium primarily by Australia, China, and the Lithium Triangle (Chile and Argentina). Nickel is overwhelmingly dominated by Indonesia, followed by a distant second tier including Russia, Canada, China, Australia, and Brazil.

EV manufacturing, by contrast, is more diversified but still centered in major vehicle-producing economies—China, the United States, Germany, Japan, India, Mexico, and South Korea—which together account for roughly three-quarters of global vehicle output.[14] These countries function as transformation hubs, embedding minerals into vehicles that are then redistributed globally through trade. While China and the United States stand out as the largest single markets, many other countries exhibit significant demand with relatively comparable mineral inflows.

EOL dynamics further redistributes battery minerals, particularly to countries in the Global South. Kenya exemplifies this pattern, as most of its future mineral recovery potential derives from imported used vehicles rather than domestic manufacturing or new vehicle imports. Mexico presents another interesting case. Although it is a major vehicle manufacturer, it exports most of its production, reabsorbing mineral stocks later through used vehicle imports.

A critical implication of these patterns is that global mineral sufficiency does not translate into national sufficiency. While aggregate reserves are sufficient to support EV deployment through mid-century, mineral access is highly asymmetric at the country level. As EV adoption grows, mineral stocks shift from concentrated underground deposits to increasingly dispersed in-use and EOL vehicle pools. Mineral security therefore emerges less as a question of global geological scarcity than of trade relationships and industrial geography, with EOL governance and recycling capacity becoming as strategically important as primary mining.

[13] Busch P, Parés Olguín F, Tal G, Kendall A. (2025) Who Will Have Enough? Battery Mineral Demand and Sufficiency in Vehicle Producing Countries. Environmental Science & Technology. 59(45):24392–24403. https://doi.org/10.1021/acs.est.5c12420

[14] International Organization of Motor Vehicle Manufacturers. (2023) "OICA Sales and Production Statistics." https://www.oica.net/category/ production-statistics/2023-statistics/

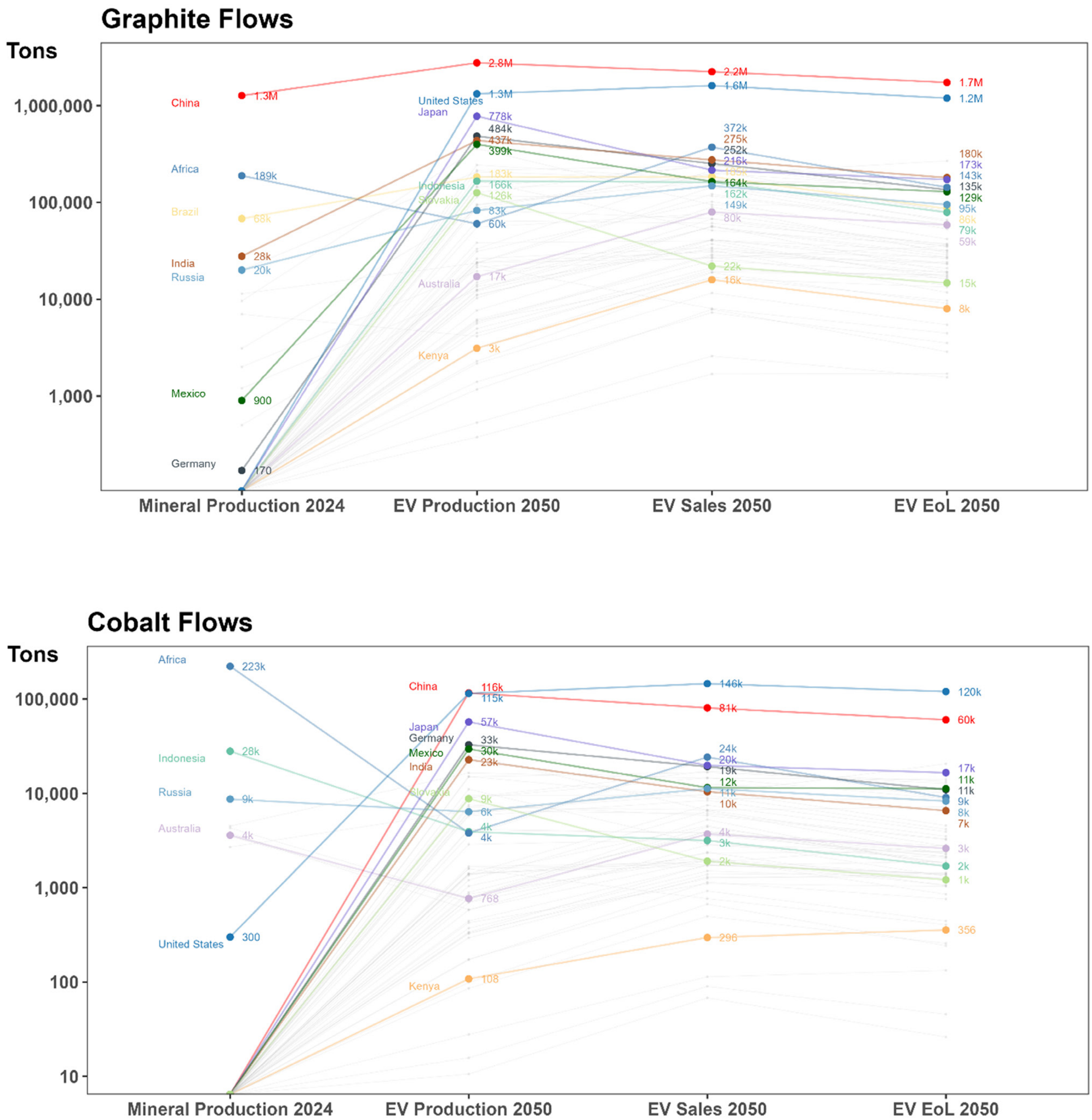
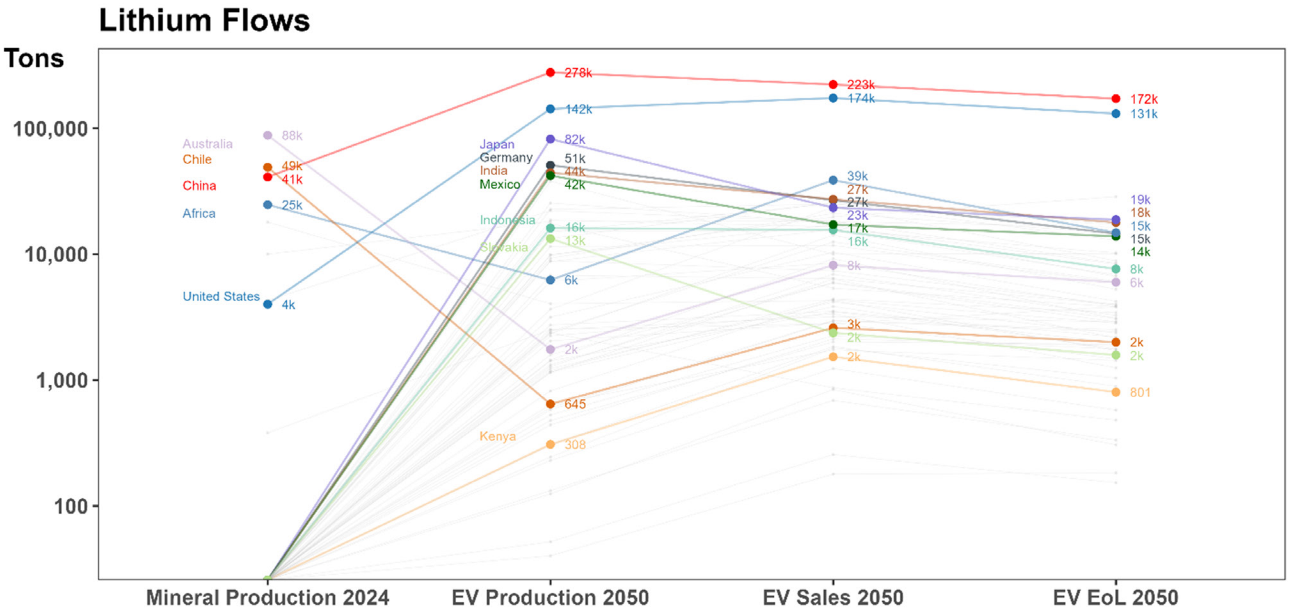


Figure2a: *Shifting volumes of critical minerals (graphite and cobalt) across the battery value chain in 2050. The first axis reflects 2024 production levels as a reference baseline, as the model does not include projections of future mineral production.*



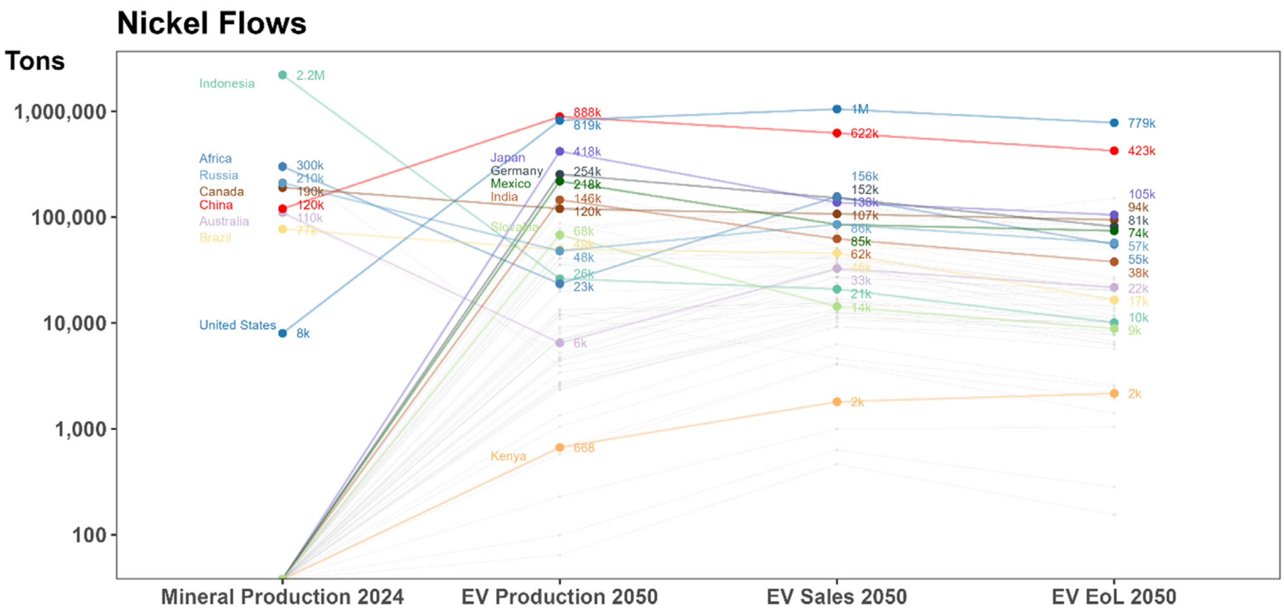


Figure2b: *Shifting volumes of critical minerals (lithium and nickel) across the battery value chain in 2050. The first axis reflects 2024 production levels as a reference baseline, as the model does not include projections of future mineral production.*

Policy Implications

As the global EV market matures, mineral security will increasingly depend on trade patterns, production geography, and lifecycle management systems.

Most major EV-producing countries face structural mineral deficits that cannot be resolved through domestic reserves or recycling alone. Demand-side measures—including smaller batteries, less mineral-intensive chemistries (such as lithium-iron-phosphate), extended battery lifetimes, dense charging infrastructure, and high recycling rates—can substantially reduce mineral pressure. However, stable international mineral access will be needed as part of long-term EV industrial strategy.

Circular economy infrastructure must be aligned with actual vehicle trade flows. Recycling systems depend on where batteries reach EOL, not where vehicles are produced or sold. Battery passports, cross-border EOL agreements, regional recycling hubs, and strengthened reverse logistics systems are essential to prevent material loss and unmanaged waste.

Given the uneven distribution of mineral reserves, manufacturing capacity, and EOL battery flows, policy priorities differ across country groups. The implications fall into three broad categories:

High- and Middle-Income Vehicle-Producing Countries

Governments should adopt long-term mineral security strategies that integrate trade agreements, upstream investment, and recycling mandates. Promoting smaller-battery EVs and lithium-iron-phosphate chemistries can reduce mineral exposure, while battery passports for both domestic sales and exports can improve traceability and reduce material leakage.[15] Supporting global EOL data-sharing systems will further strengthen planning and coordination.

Lower-Income EV-Importing Countries

Countries that import large volumes of used EVs will increasingly receive EOL EV batteries. With appropriate regulation and investment, these flows can support recycling industries, job creation, and materials recovery.[16] Without clear frameworks, however, battery EOL poses risks of environmental harm and informal disposal. Establishing EOL battery management laws aligned with extended producer responsibility, strengthening import data systems, and partnering on safe recycling infrastructure with international partners are early priorities.

Multilateral and Regional Bodies

Regional recycling hubs, harmonized battery passports,[17] safety protocols, customs data, and technical capacity-building are critical to align mineral recovery with true global trade dynamics. Improved transparency in used vehicle and battery flow data will reduce the risk of unmanaged waste and support evidence-based policy.

Conclusions

While global mineral reserves are sufficient to meet 2025–2050 light duty EV demand, national-level mineral deficits pose persistent challenges for many manufacturing economies. At the same time, second-hand vehicle trade is redistributing future mineral stocks to lower-income countries, creating both risks and opportunities.

A resilient and just transition to EVs requires coordinated international action, strategies to reduce demand, robust circular-economy policies, and transparent battery tracking across borders. With the right policies, electrification can reduce extraction impacts, strengthen supply-chain resilience, and ensure that the benefits of electric mobility are shared more broadly across regions.

[15] International Energy Agency (IEA). (2022) "Battery Waste Management Rules 2022." https://www.iea.org/policies/25166-battery-waste-management-rules-2022.

[16] Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. (2025) "Techno-economic viability of second-life applications for electric vehicle batteries in Kenya." https://changing-transport.org/wp-content/uploads/2025_Second-Life-Applications.pdf

[17] European Union. (2023) Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries. Official Journal of the European Union. L 191:1–117. https://eur-lex.europa.eu/eli/reg/2023/1542/oj

Mapping the Battery Mineral Economy: Industrial Policy Pathways in the Global South

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Introduction

The major uses of batteries have shifted from auxiliary devices, such as consumer electronics and backup power, to energy systems and manufacturing. The resultant growth of battery demand has repositioned critical minerals—such as lithium, nickel, cobalt, manganese, and graphite—at the center of industrial policy debate across the Global South. Governments are increasingly focused on how these minerals are extracted, processed, and used, as they aim to upgrade their industries, improve trade relations, and become more competitive. Across Asia, Latin America, and Africa, governments have instituted a range of industrial policies to capture greater value from these resources.[1]

Despite a shared emphasis on downstream development, industrial policy responses across the Global South have diverged substantially in form and ambition. In some cases, downstream strategies are anchored in mineral processing and refining, in others, they prioritize chemical conversion or production of battery grade materials. A third set of approaches focuses more on building demand-driven industrial ecosystems, which often rely on imported mineral inputs.[2] Understanding these differences is essential to assess how industrial policy is shaping Global South value chains in the new battery economy.

This article compares industrial policies related to critical minerals across the Global South, focusing on battery minerals (specifically those used in lithium-ion battery technologies).

Comparative overview of industrial policies for battery minerals

Table 1 presents the industrial policy matrix used in the analysis, organizing Global South regions across key dimensions of battery mineral value-chain positioning. The matrix highlights differences in where policy intervention is concentrated along the value chain and the extent to which downstream activities are pursued across regions.

Southeast Asia: Broad downstream mandates with differentiated potential

Southeast Asia is one of the most dynamic regions in the battery mineral economy, marked by strong downstream mandates across multiple countries. Governments increasingly link mineral extraction to domestic processing, materials production, and in some cases, battery and electric vehicle manufacturing. While the goal of capturing value beyond raw mineral exports is clear, the potential and execution of these strategies vary widely across these countries.

A defining feature of Southeast Asia's approach is state intervention to steer mineral value chains. Licensing regimes, export controls, and investment conditions have been deployed to encourage domestic processing, most visibly in nickel.[3] Indonesia's ban on raw nickel exports and its requirement that mining can be tied to domestic smelting capacity has rapidly

[1] United Nations Industrial Development Organization. (2024) "Industrial Development Report 2024: Turning Challenges into Sustainable Solutions." The New Era of Industrial Policy. UNIDO. https://www.unido.org/sites/default/files/unido-publications/2024-06/Industrial%20Development%20Report%202024.pdf
[2] Shivani, Khan, S., & Ramji, A. (2025). "How Policy Instruments Are Reshaping Critical Energy Transition Minerals (CETM) Landscape Across Regions?" Global South Center for Clean Transportation, UC Davis. https://escholarship.org/uc/item/5wj570b8#main
[3] Bria, E., Castolina, A., Tereshchenko, P., Allan, D., & Nagpal, D. (2025) "ASEAN Mineral: Policy and Investment Guidebook." Sustainable Energy for All.

Table 1: Industrial Policy Matrix for Battery Minerals in the Global South

Themes	Sub-Themes		Southeast Asia	Latin America	Africa	South Asia
Strategic Framing of Battery Minerals	A.1.	Battery minerals designated as strategic	Explicit	Explicit	Explicit	Explicit
(How minerals are positioned in national and regional industrial strategies)	A.2.	Integration of minerals into industrial policy	Explicit	Selective	Selective	Explicit
	A.3.	Long-term vision beyond extraction	Explicit	Selective	Selective	Selective
	A.4.	Centralization of mineral policy authority	Selective	Selective	Explicit	Selective
	A.5.	Use of minerals for geopolitical leverage	Selective	Marginal	Selective	Explicit
Downstream Policy Orientation	B.1.	Downstream mandates	Explicit	Explicit	Explicit	Explicit
(Intent and mandates, not outcomes)	B.2.	Focus on processing/refining	Explicit	Selective	Selective	Marginal
	B.3.	Focus on chemical conversion	Selective	Explicit	Marginal	Selective
	B.4.	Focus on materials/battery ecosystems	Selective	Selective	Marginal	Explicit
	B.5.	Alignment with EV/battery demand growth	Explicit	Selective	Selective	Explicit
Processing Potential	C.1.	Mineral beneficiation beyond concentrates	Explicit	Selective	Marginal	Marginal
(What is materially achieved on average in the region)	C.2.	Refining to battery-grade materials	Selective	Selective	Marginal	Marginal
	C.3.	Chemical conversion capacity	Selective	Explicit	Marginal	Marginal
	C.4.	Integration with downstream manufacturing	Selective	Marginal	Marginal	Selective
	C.5.	Scale and commercial viability	Selective	Selective	Marginal	Selective
Trade and Market Intervention	D.1.	Export controls on raw minerals	Explicit	Marginal	Explicit	Marginal
(How states intervene in mineral trade flows)	D.2.	Conditional export approvals	Explicit	Marginal	Selective	Marginal
	D.3.	Use of tariffs/fiscal tools	Selective	Marginal	Selective	Marginal
	D.4.	Reliance on trade agreements for access	Selective	Selective	Selective	Explicit
	D.5.	Stability of trade policy regime	Selective	Selective	Marginal	Selective
Investment Governance and Capital Mobilization	E.1.	Clarity of investment rules	Selective	Selective	Marginal	Selective
(Ability to attract and steer long-term capital)	E.2.	Use of investment conditionalities	Explicit	Selective	Selective	Marginal
	E.3.	Public-private coordination	Selective	Selective	Marginal	Selective
	E.4.	Investor confidence in policy continuity	Selective	Selective	Marginal	Selective
	E.5.	Dependence on foreign capital	Explicit	Explicit	Explicit	Explicit
Institutional Capacity and Policy Delivery	F.1.	Administrative enforcement capacity	Selective	Selective	Marginal	Selective
(Execution, coordination, and learning)	F.2.	Inter-ministerial coordination	Selective	Marginal	Marginal	Selective
	F.3.	Ability to adapt policy overtime	Selective	Selective	Marginal	Selective
	F.4.	Technical oversight of processing activities	Selective	Selective	Marginal	Selective
	F.5.	Policy coherence across mineral and industrial domains	Selective	Marginal	Marginal	Selective
Regional and External Coordination	G.1.	Inter-regional policy coordination	Selective	Marginal	Marginal	Marginal
(Beyond national policy silos)	G.2.	Cross-border value chain planning	Selective	Marginal	Marginal	Marginal
	G.3.	Strategic bilateral partnerships	Explicit	Selective	Explicit	Explicit
	G.4.	Collective bargaining potential	Selective	Selective	Marginal	Selective
	G.5.	Alignment with global industrial blocs	Selective	Selective	Selective	Explicit

Source: *Authors compilation*

Note: ***Explicit****, sustained and intentional policy engagement in terms of implementation and documentation;* ***Selective****, targeted, partial or uneven intervention; and* ***Marginal****, limited implementation / existence, early-stage engagement, or absent.*

The regional profiles in the table are informed by policy developments and industrial strategies in a subset of Global South economies. For Southeast Asia, this includes Indonesia, the Philippines, and Thailand; for Latin America, Chile, Argentina, Brazil, and Mexico; for Africa, the Democratic Republic of Congo, Zimbabwe, Nigeria, Ghana, Kenya, and Morocco; and for South Asia, India and selected neighboring economies. Countries are referenced illustratively to capture dominant regional patterns rather than to provide exhaustive coverage.

expanded processing and refining capacity, reorienting nickel supply.[4] Other countries, including the Philippines, are encouraging limited downstream beneficiation (the processing of mineral ore to increase its economic value), while they continue to rely on mineral exports for revenue.[5]

At the same time, not all Southeast Asian economies rely on mineral endowments. Countries with limited mineral endowments, such as Thailand, have pursued downstream roles by positioning themselves as hubs for battery assembly, components manufacturing, or electric vehicle production. These aims are supported by industrial infrastructure, trade openness, and integration with global manufacturers.[6] These varied national approaches have produced a region with high downstream ambition, largely unfolding through national strategies rather than a shared ASEAN-wide framework.

Latin America: Downstream anchored in chemical conversion

Latin America's industrial policy response to the battery ecosystem is centered on lithium and characterized by a chemicals-focused downstream pathway.[7] Across the region, governments have articulated ambitions to move beyond raw materials exports yet have largely avoided restrictive trade measures.[8] Instead, industrial policy has focused on shaping how lithium is converted into higher-value chemical forms such as lithium carbonate and lithium hydroxide.

State involvement is significant but differentiated. As in the case of Chile,[9,10] public actors often play a steering role through strategic frameworks, partnerships, and selective participation, rather than direct operational control. This enables chemical upgrading while maintaining openness to foreign investment and export markets. Argentina, on the other hand, relies more on provincial governance and private capital, emphasizing investment facilitation over centralized control.[11]

Brazil and Mexico, while not lithium producers at scale, approach the battery economy from industrial strengths. Brazil uses a strategic minerals policy, alongside emerging legislation for critical minerals governance and targeted financing mechanisms—known as "incentivized bonds" (*Portaria Normativa MME nº 120*)—to support battery manufacturing, focusing on value-added processing.[12] Mexico leverages its manufacturing base and trade ties with North America to position itself within battery and electric vehicle supply chains.[13] In both the cases, downstream engagement is shaped by industrial capacity and trade integration.

Across Latin America, industrial policy is aimed at incremental upgrading within the existing trade structures, prioritizing battery-grade processing as the main site of value addition. Despite shared resource endowments, regional coordination remains weak. Lithium strategies are largely national in scope, and cross-border value chain planning is limited.[14] In sum, Latin America's downstream ambition is present but deliberately constrained, focused on specific segments rather than creating a fully integrated battery ecosystem.

Africa: High downstream ambition, constrained implementation

Africa occupies a critical position in global battery mineral supply, particularly for cobalt, manganese, and

[4] Salomon, M., Simanjuntak, F., Shafaie, A., & Heller, P. (2025) Indonesia's Energy Transition Ambitions: Nickel Downstreaming and Beyond. Insights. https://resourcegovernance.org/articles/indonesia-energy-transition-ambitions-nickel-downstreaming-and-beyond

[5] Bria, E., Castolina, A., Tereshchenko, P., Allan, D., & Nagpal, D. (2025) "ASEAN Mineral: Policy and Investment Guidebook." Sustainable Energy for All.

[6] Banerjee, A. (2025) Critical Industries, Critical Risks in ASEAN Supply Chains. Geopolitical Monitor. https://www.geopoliticalmonitor.com/critical-industries-critical-risks-in-asean-supply-chains/

[7] Orquera, E., Xu, G., Werner, T., Northey, S., Tiku, O., Giurco, D., & Matsubae, K. (2026) Lithium in Latin America: A dynamic material flow analysis and mapping CO2, water, and land footprints to 2050. Resources, Conservation and Recycling, 226, 108677. https://doi.org/10.1016/j.resconrec.2025.108677

[8] IntelliNews. (2026). "EU locks in access to South American lithium and critical minerals." https://www.intellinews.com/eu-locks-in-access-to-south-american-lithium-and-critical-minerals-421103/

[9] Government of Chile. (2023) "National Lithium Strategy: For Chile and its People." https://s3.amazonaws.com/gobcl-prod/public_files/Campa%C3%B1as/Litio-por-Chile/Estrategia-Nacional-del-litio-EN.pdf

[10] Ghorbani, Y., Zhang, S. E., Bourdeau, J. E., Chipangamate, N. S., Rose, D. H., Valodia, I., & Nwaila, G. T. (2024) The strategic role of lithium in the green energy transition: Towards an OPEC-style framework for green energy-mineral exporting countries (GEMEC). Resources Policy, 90, 104737. https://doi.org/10.1016/j.resourpol.2024.104737

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[12] Dougherty, E., MacGillivray, D., & Monteiro, E. (2025) Bringing the Battery Value Chain to Brazil: A Transformational Little Piece of Legislation. Latin America Notes. https://www.hsfkramer.com/notes/latamlaw/2025-posts/bringing-the-battery-value-chain-to-brazil-a-transformational-little-piece-of-legislation

[13] Pares Olguin, F., & Hwang, R. (2025) Tariffs, Transitions, and Trade: Mexico's EV Gambit. Transportation & Climate Blog. https://its.ucdavis.edu/blog/tariffs-transitions-and-trade-mexicos-ev-gambit

[14] United Nations Conference on Trade and Development. (2025) "Harnessing regional integration and green industrial policy for enhancing sustainable development in Latin America." https://unctad.org/system/files/official-document/presspb2025d1_en.pdf

graphite.[15] In recent years, many African countries have adopted downstream mandates and beneficiation requirements, signaling a clear intent to move beyond extractive models.[16]

Africa is not monolithic. The contrast between cobalt-rich economies such as the Democratic Republic of Congo, where beneficiation efforts face logistical and governance challenges, and countries like Morocco, which position themselves as processing and manufacturing hubs despite limited mineral endowment, highlights the diversity of downstream pathways.[17]

Nigeria and Ghana are mineral-producing countries exploring downstream opportunities while managing largely extractive sectors. Policy frameworks emphasize local value addition and industrial linkages, but processing remains modest.[18,19] Kenya shows a different pathway: leveraging renewable energy potential, recycling, and industrial zones to position itself as a future processing or manufacturing hub.[20,21]

In these cases, trade access, logistics, and policy coordination matter as much as resource availability. Overall, Africa's battery mineral strategies reflect high ambition and strong policy control but have produced uneven results in terms of industrial value capture, processing capacity, and contribution to employment.[22] While industrial policy has reshaped bargaining power over resources, broader structural transformation (from extractive dependence toward diversified industrial production) remains a longer-term challenge.

South Asia: Demand-driven downstream ambition without mineral leverage

South Asia presents a distinct configuration within the Global South battery economy. Unlike resource-rich regions, it has an industrial policy driven by rapidly growing battery and electric vehicle demand rather than mineral abundance. Governments, particularly in India, have adopted strong downstream mandates tied to battery manufacturing, recycling, and materials development, even as domestic mineral availability remains limited.

India's Production-Linked Incentive Scheme for Advanced Chemistry Cell (PLI-ACC) manufacturing, [23] alongside battery recycling regulations under the Battery Waste Management Rules (2022),[24] shows a downstream-first approach anchored in market creation. Though still nascent, Sri Lanka's approach to the battery sector emphasizes recycling and circularity-based activities—such as battery recovery and material reuse—as an entry point into the regional value chain. [25] In contrast, Nepal demonstrates how aggressive electric vehicle adoption can shape regional battery demand even in the absence of domestic manufacturing.[26]

The region's approach highlights a crucial dimension of the new battery economy: downstream industrialization does not always originate from mineral control. In some cases, it is driven by consumption, industrial scale, and strategic trade alignment. This model carries different risks and dependencies from upstream supply, but it also expands the range of industrial policy pathways available to Global South economies.

[15] Mitchell, J. (2024, October 9). Africa's critical role in the global battery mineral value chain. IntelliNews. https://www.intellinews.com/africa-s-critical-role-in-the-global-battery-mineral-value-chain-347168/
[16] International Energy Agency. (2025) "Stepping Up the Value Chain in Africa: Minerals, materials and manufacturing." https://iea.blob.core.windows.net/assets/8e98c60a-41e9-4e5c-9299-81e79c267a27/SteppingUptheValueChaininAfrica.pdf
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[22] Zalk, M. (2024). Prospects for Development and Integration of African Battery Value Chains. Africa Policy Research Institute. https://afripoli.org/projects/green-minerals/prospects-for-development-and-integration-of-african-battery-value-chains
[23] Ministry of Heavy Industries. (2022) "Allotment made for 50 GWh of battery capacity to 4 successful bidders for incentive under (PLI) Scheme for Advanced Chemistry Cell (ACC) Battery Storage." https://www.pib.gov.in/PressReleasePage.aspx?PRID=1809037&reg=3&lang=2
[24] Ministry of Environment, Forest, and Climate Change. (2022) "Battery Waste Management Rules 2022." https://cpcb.nic.in/uploads/hwmd/Battery-WasteManagementRules-2022.pdf
[25] Ministry of Transport and Highways. (2023) Draft Policy Framework and Implementation Plan: Transition to E-Mobility in Sri Lanka. Presentation of UNESCAP Assisted Study on Policy for Transition to E-Mobility. https://www.unescap.org/sites/default/d8files/event-documents/1.Ministry-of-Transport-SriLanka.pdf
[26] Prasain, K. (2024) Nepal shifts gears as EVs hit 73 percent of 4-wheeler imports. The Kathmandu Post. https://kathmandupost.com/money/2025/07/28/nepal-shifts-gears-as-evs-hit-73-percent-of-4-wheeler-imports

Implications: Rethinking value capture in the Global South

Broader insights that emerge from this regional comparison:

- Downstream ambition must be understood as pathway specific: Policies aimed at value capture differ not only in intent but in where along the value chain they intervene. Rethinking value capture therefore requires moving away from uniform expectations of beneficiation toward sequencing downstream activities in line with existing industrial capabilities and market conditions.
- Demand-led strategies reshape the geography of value: In several Global South regions, value capture is increasingly driven by domestic demand for batteries and electric mobility rather than mineral endowments. This shifts the locus of value creation toward market size, manufacturing scale, and regulatory frameworks, while redefining dependencies on trade and external supply. In these cases, value is created through market expansion, scaled manufacturing, and regulatory frameworks that enable local upgrading. This does not eliminate trade dependence, but strategically restructures it, shifting bargaining power and repositioning countries within global value chains.
- Trade relations become integral to value capture: Where mineral sourcing is external, access to stable trade channels, long-term supply arrangements, and strategic partnerships plays a central role in sustaining downstream industries. Value capture in such contexts is mediated through trade governance rather than extraction alone.
- State institutional capacity determines the durability of value capture: The ability to translate industrial ambition into sustained value creation depends on the capacity of state institutions governing minerals, industrial policy, trade regulation, and investment oversight, to ensure policy coherence, administrative enforcement, and cross-sectoral coordination. Weak institutional capacity constrains value capture regardless of the chosen pathway.
- Regional coordination offers underused opportunities: Fragmented national strategies limit the scale and resilience of value capture in cross-border battery mineral value chains. Greater regional coordination could enable specialization, shared infrastructure, and collective positioning within global markets.
- Value capture should be assessed dynamically: Rather than measuring success by immediate downstream integration, value capture in the battery mineral economy is better understood as a process of gradual upgrading, learning, and repositioning over time.

The new battery economy is reshaping Global South value chains—but not along a single trajectory. Instead, it is producing a set of differentiated regional pathways, each shaped by distinct combinations of resources, institutions, and policy priorities. Understanding these differences is essential for assessing how industrial policy can translate mineral wealth and battery demand into durable economic outcomes.

Understanding Zero Emission Truck Manufacturing and Battery Supply Chain

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As governments push to electrify transport, supply chains have become the focus of strategy. The clean mobility transition is increasingly framed not just as a climate goal, but as an industrial development strategy shaping where batteries are made, which firms scale, and who captures value. Yet most supply-chain analysis still focuses on light-duty electric vehicles.[1] That leaves a major blind spot: trucks.

Zero-emission trucks (ZETs) are gaining momentum across developed and emerging markets, driven by regulation, early market movers, and industrial strategy.[2] The market is still nascent, but already substantial in scale. About 382,000 ZETs were sold globally between 2023 and 2025 Q3. Roughly 70 GWh of battery capacity was delivered in the same period. Average pack sizes are about 310 kWh for heavy duty trucks and 135 kWh for medium duty trucks. This is smaller than the light duty EV market, which deployed 2,247 GWh over the same period. However, ZETs are far more battery intensive. Typical packs are 3 to 5 times larger than those in light-duty vehicles, around 200 to 400 kWh versus 50 to 100 kWh. Scaling ZETs can therefore ramp battery demand quickly. It can also help countries capture industrial policy benefits sooner and in a more integrated way.

A policy brief that we recently published offers a first of its kind, data-driven map of global ZET sales, with regional details onChina, Europe, and the United States.[3] This also links truck to its battery suppliers to reveal where supply chains are concentrating, where they are diversifying, and what that means for industrial strategy in the new battery economy.

Global ZET Market Trends

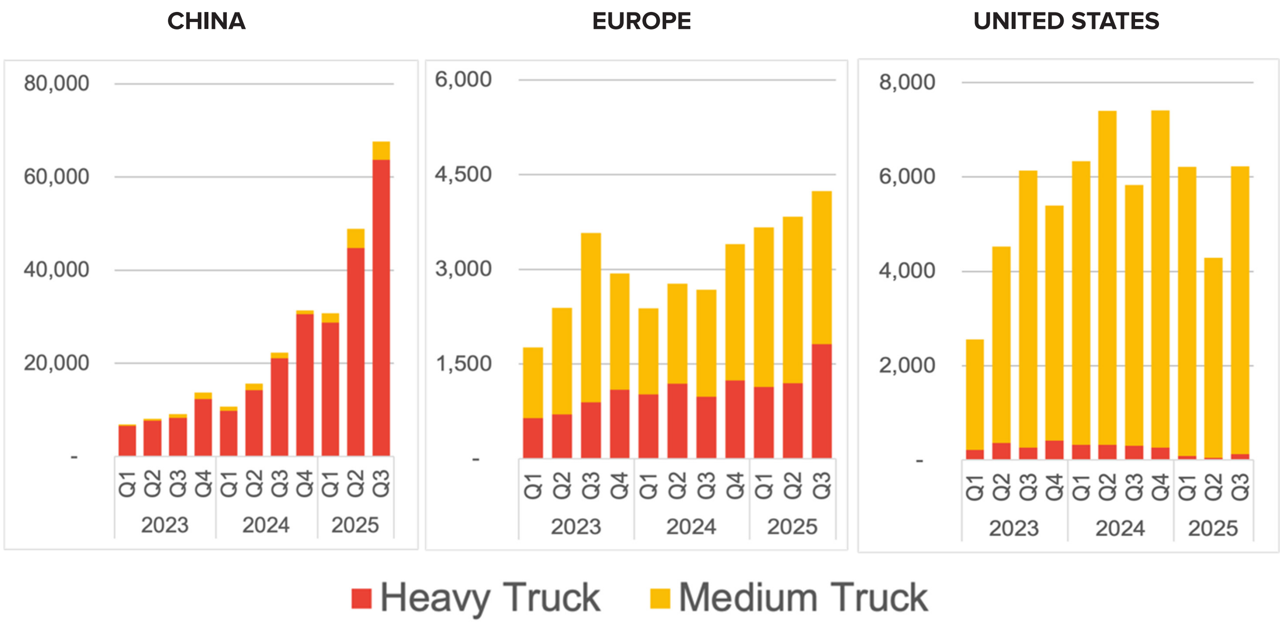

Figure 1. *Quarterly zero-emission truck sales by region, 2023–2025 (Q3)*
Notes: The figure shows quarterly medium- and heavy-duty zero-emission truck sales in China, Europe, and the United States from January 2023 through September 2025. Europe includes the EU-27 plus the United Kingdom.

[1] Jenn A, Chakraborty A, Hardman S, Hoogland K, Sugihara C, Tal G, Helveston J, Rich J, Jochem P, Plötz P. (2025) Supply-side challenges and research needs on the road to 100% zero-emissions vehicle sales. Progress in Energy. 7(2):022002. https://doi.org/10.1088/2516-1083/ada199

[2] Smart Freight Centre. (2025) Transition to Cleaner Road Freight Accelerates with Surge in Zero Emission Truck Adoption (press release; BloombergNEF and Smart Freight Centre). Smart Freight Centre. https://smartfreightcentre.org/en/about-sfc/news/new-bloombergnef-and-smart-freight-centre-report-highlights-accelerating-transition-in-road-freight-sector/

[3] Ramji A, Jamhar J. (2025). "Understanding Zero Emission Truck (ZET) Manufacturing and Battery Supply Chains." UC Davis Institute of Transportation Studies. https://escholarship.org/content/qt9j23v00w/qt9j23v00w.pdf

Figure 1 shows China dominates heavy duty ZET demand, accounting for 94 percent of sales. Medium-duty sales are more distributed, led by the United States at about 55 percent, with China at about 15 percent. India is the key emerging market. Medium- and heavy-duty ZET sales there are rising rapidly, and India sold more electric heavy-duty trucks than the United States did in 2025 Q1–Q3.

China remains the largest and fastest growing market. In 2025 January to September, China sold 147,388 medium- and heavy-duty ZETs, already 84 percent above full year 2024 sales of 80,021. Heavy-duty trucks made up 93 percent of China's 2025 sales. Competition is relatively broad, led by FAW at 18.1 percent, XCMG at 15.8 percent, SANY at 14.9 percent, and CNHTC at 10 percent. Construction and heavy equipment firms such as XCMG and SANY are now major heavy ZET manufacturers.

Europe's heavy-duty ZET market is growing steadily. Sales reached 11,240 units in 2024, up 5.4 percent year on year. In 2025 Q1 to Q3, sales were about 11,743 units, up 4 percent year on year. Daimler and Volvo remain key players, with Ford leading among American manufacturers in medium-duty and EVCO emerging. Sales are concentrated in Western Europe. Ten countries account for about 92 percent of 2025 Q1–Q3 sales. Germany leads at about 3,000 units and 25 percent share, followed by the UK, with the Netherlands surging to about 1,500 units and exceeding its 2024 full year total by 2025 Q3. France and Sweden round out the top five.

In the United States, 2025 Q1 to Q3 ZET sales total 16,734 units, driven almost entirely by medium-duty trucks. Heavy-duty sales remain minimal, with about 256 units in 2025 Q1 to Q3, a 73-percent year on year decline despite many delivery commitments. The medium-duty market is concentrated, with Rivian at about 45 percent, Ford 28 percent, and BrightDrop 16 percent—about 89 percent combined. In heavy-duty, BYD at about 28 percent and Volvo at about 27 percent lead a very small market. Even with restrictions on Chinese light duty EVs, BYD has still entered the US ZET market through direct imports.[4]

Who supplies the batteries?

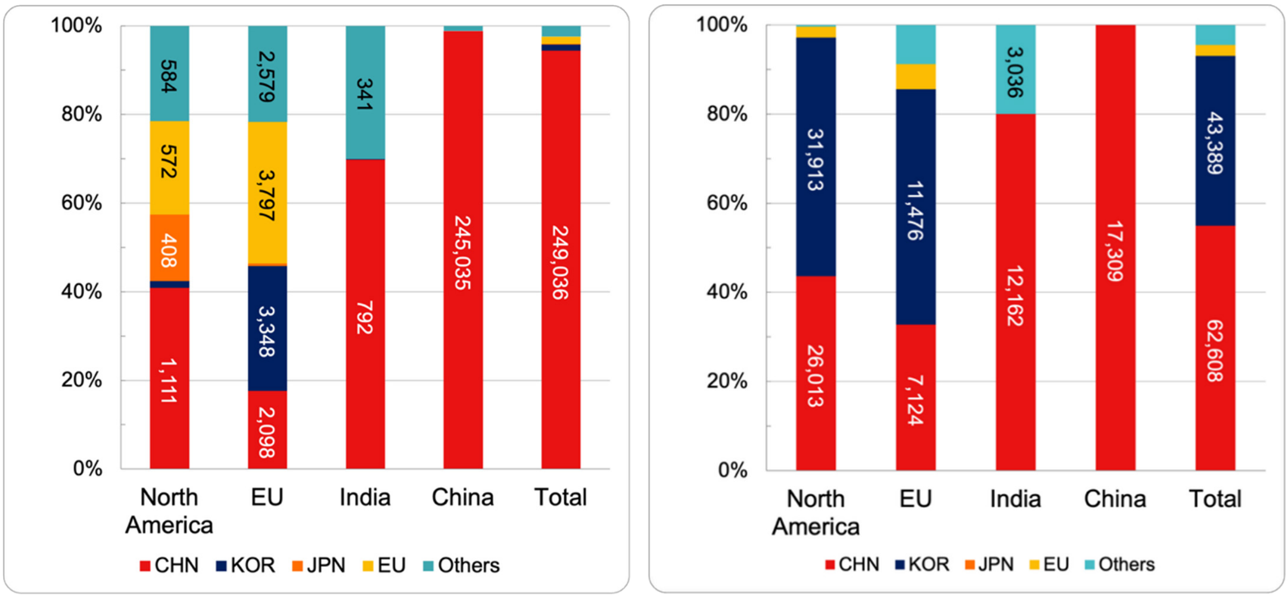

Figure 2. *Regional distribution of battery cell suppliers for heavy-duty (left) and medium-duty (right) zero-emission trucks. Notes: Battery cell suppliers are grouped into five categories: Chinese, Japanese, South Korean, European, and Others, where "Others" reflects limited public disclosure on supplier origin.*

To understand ZET supply chain risk, one must look at two layers. First, who manufactures the truck. Second, who supplies the battery cells. Even when trucks are assembled domestically, the battery is often imported. That is either because local cell production is insufficient, or because there are no domestic suppliers for the chemistry the vehicle manufacturer has chosen.

Chemistry choices drive dependency. Because lithium-iron-phosphate batteries dominate ZET deployments, reliance on Chinese cell suppliers will remain high,

4 Ramji A, Jamhar J. (2025) "Understanding Zero Emission Truck (ZET) Manufacturing and Battery Supply Chains." UC Davis Institute of Transportation Studies. https://escholarship.org/content/qt9j23v00w/qt9j23v00w.pdf

given the current global concentration of lithium-iron-phosphate battery cell production, until large scale production outside China ramps up. The same dynamic shows up in market entry. BYD's growing presence in the United States truck market and its ability to remain competitive even under tariffs increase exposure to Chinese supply chains across the broader ecosystem. Figure 2 shows the extent to which ZET sales in the United States, Europe, India, and China depend on different battery cell supplier origins.

India's ZET manufacturing is the most dependent on battery cell from China. Around 70 to 80 percent of medium- and heavy-duty ZET sales depend on Chinese battery cells. Europe shows a more diversified picture, especially in heavy-duty trucks. For medium-duty ZETs, Europe relies heavily on South Korean suppliers at about 50 percent, followed by Chinese suppliers at about 32 percent. For heavy-duty ZETs, Europe has the lowest Chinese cell dependence among major regions, with European and South Korean suppliers taking the lead. The United States is closer to Europe's profile, as its medium-duty trucks are largely supplied by South Korean cells at roughly 50 percent and Chinese cells at roughly 45 percent. Heavy-duty trucks still show meaningful dependence on Chinese batteries at around 40 percent. Battery supplier dependencies among vehicle manufacturers are covered in detail in the policy brief.[5]

Policy Implications

The analysis summarized here from the policy brief highlights several policy implications for governments seeking to scale zero-emission trucks while managing industrial competitiveness and supply-chain risk. These considerations are particularly relevant as ZET markets move from early adoption toward larger-scale deployment.

1. **Policy certainty is foundational:** Policy certainty for ZET market growth provides the foundation for any industrial strategy. Well designed and durable ZET policy can scale battery demand and key EV components, de-risk investment, and increase the likelihood of domestic manufacturing.
2. **Chinese scale intensifies supply-chain risk:** As Chinese manufacturers rapidly scale ZETs, alongside their dominance in light-duty EVs, their competitiveness and control over global supply chains will deepen. This raises strategic risks for other major automotive manufacturing regions, including the United States, Europe, and India.
3. **Non-traditional manufacturers can move quickly:** The entry of construction and heavy-equipment firms into ZET manufacturing shows that non-traditional players can scale rapidly when use cases are deployment-ready. Similar shifts could emer
4. **Battery chemistry choices are performance-driven:** Battery chemistry choices made by vehicle manufacturers are shaped primarily by performance, reliability, and cost rather than by trade concerns. Europe's medium-duty segment, for example, favors nickel-manganese-cobalt chemistries to meet duty cycles with smaller, cost-optimized battery packs. At the same time, lithium-iron-phosphate and Chinese cell suppliers remain dominant, despite efforts by other countries to reduce dependence.
5. **Trade-offs between speed and competitiveness must be addressed:** Policymakers must decide what trade-offs they are willing to make between rapid ZET deployment and industrial competitiveness. Restricting Chinese suppliers may protect domestic industry but can slow access to large lithium-iron-phosphate cell production. BYD's entry into the US ZET market through imports raises additional questions around market access, national security, and cyber security. One possible path forward may be through joint ventures with appropriate safeguards, between China and countries seeking to build domestic capacity. Europe and India are already exploring approaches that require Chinese firms to enter joint ventures with domestic companies and require the appointment of local talent to senior roles, to enable skills transfer.[6]

Finally, policymakers should track market growth and supplier relationships continuously. Emerging markets such as India, with rapid growth in medium-duty ZET sales in 2025, may create near term opportunities for collabora tion and new market access across regions. The core need is alignment between demand-side and supply-side strategies, so industry can invest at scale while governments manage geopolitical constraints.

5 Ramji A, Jamhar J. (2025) "Understanding Zero Emission Truck (ZET) Manufacturing and Battery Supply Chains." UC Davis Institute of Transportation Studies. https://escholarship.org/content/qt9j23v00w/qt9j23v00w.pdf

6 European Commission. (2024) "EU and Indian Start-ups pitch for enhanced cooperation in EV battery recycling technologies under EU-India TTC." Directorate-General for Research and Innovation. https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/eu-and-indian-start-ups-pitch-enhanced-cooperation-ev-battery-recycling-technologies-under-eu-india-2024-06-20_en

MARKET WATCH

From Adoption to Production: Global South's Expanding EV Footprint

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In 2025, global sales of passenger electric vehicles (EVs) reached 20.7 million units, a 21% annual growth.[1] The market continues to be dominated by China, which accounted for ~63% of global light duty passenger electric vehicle (EV) sales, followed by the European Union (~14%) and the United States (~7%). However, in recent years, countries from the Global South (excluding China) have begun to emerge as key markets in the global EV transition.[2] Their growing role in both demand and manufacturing signals an important structural shift.

Global South countries (excluding China) contributed 5% of global electric passenger vehicle sales

Electric light duty passenger vehicle sales across 13 Global South countries doubled in 2025 compared to the previous year, reaching 0.96 million units. These countries made up ~5% of global EV sales in 2025, compared to negligible sales in 2020. Figure 1 presents the EV sales share in key markets. Figure 5 and Tables 1-3 provide more detailed country-level market trends.

India and ASEAN[3]: Key Asian markets (excluding China) witnessed a 112% annual growth in 2025 EV passenger vehicle sales, reaching a total volume of 0.66 million units. In absolute volume terms, Vietnam led the charge with 175,492 units sold in 2025, followed by India (168,972), Thailand (138,826) and Indonesia (110,451). Although low volumes, the Philippines recorded the highest growth in the region, a five-fold increase in 2025 over 2024.

The key difference lies in the EV sales shares. Vietnam, Thailand and Indonesia reached 40%, 31% and 19%, respectively, in 2025—levels comparable to those of several European markets (EU was 27% in 2025), underscoring the speed of electrification in these economies. In contrast, India had the lowest EV sales shares (4%), behind Malaysia (7%) and Philippines (5%) in 2025.

[1] Passenger vehicles include all light duty vehicles used for personal mobility and EVs refer to Battery electric and Plug-in Hybrid electric cars
[2] Global south countries assessed in the article are India, Indonesia, Thailand, Vietnam, Malayasia, Philippines, Mexico, Brazil, Colombia, Chile, South Africa, Ethiopia and Kenya
[3] ASEAN – Countries included are Indonesia, Thailand, Philippines, Vietnam and Malaysia

Latin America: The combined electric car sales across Colombia, Mexico, Chile, and Brazil grew by ~78% year-on-year in 2025. Brazil remains the largest EV market in the region, with 179 thousand units sold in 2025, followed by Mexico at 90 thousand units. Colombia and Chile each recorded close to a doubling of electric car sales in 2025, reaching 8.5 thousand units and 21.4 thousand units, respectively. In terms of EV sales share, Colombia led with 10.2%, followed by Brazil (9%) and Chile (4%).

Africa: Combined electric car sales across South Africa, Ethiopia, and Kenya were over 5 thousand units in 2025. With low volume markets, high dependence on used vehicle imports, these markets saw EV sales shares well below 1% in 2025.

Across these countries, a combination of fiscal incentives, tax exemptions, and trade policies are driving EV markets. In most ASEAN and Latin American countries, the EV transition is led by direct Chinese imports–91% of EV sales in Brazil, 85% in Mexico, over 75% in Thailand, Indonesia and South Africa. Vietnam stands out as a significant exception where over 99% of the market is driven by VinFast, a domestic automaker.

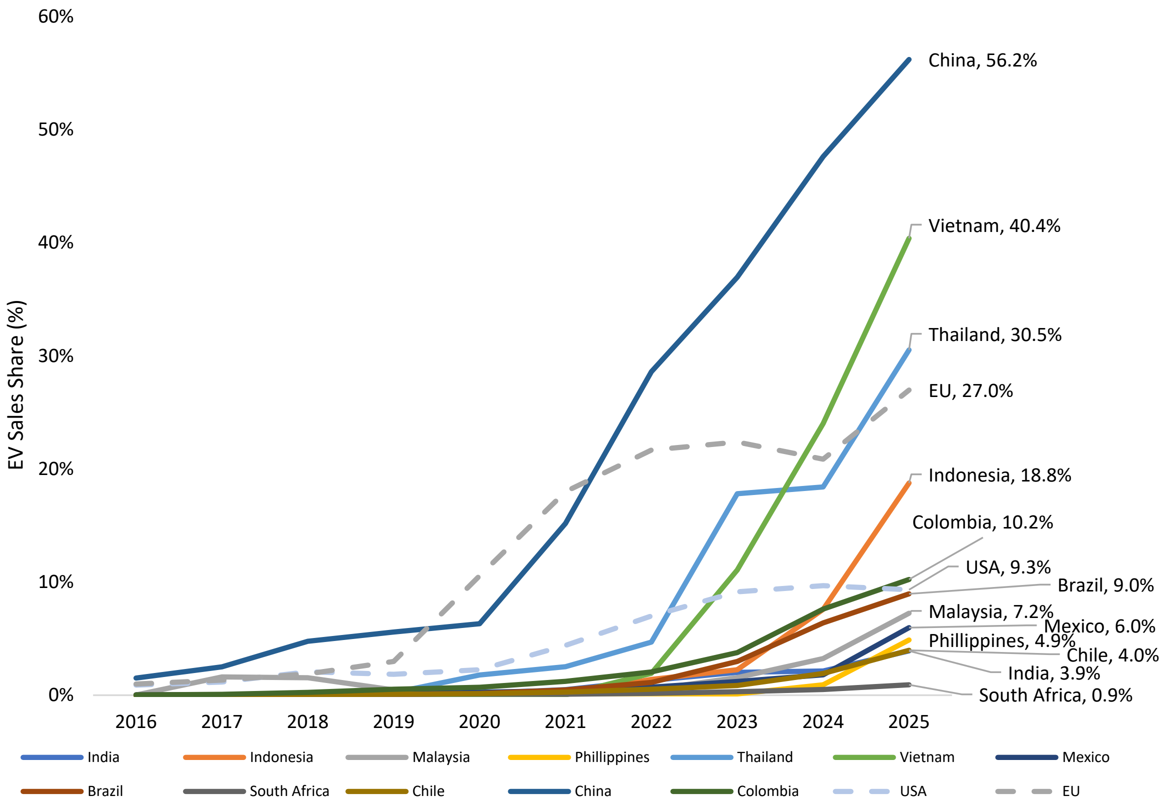

Figure 1. *Light-duty passenger EV sales shares in key markets, 2016–2025*

In Brazil, EV growth has been supported by tax reductions and exemptions to key levies such as IPI and ICMS, along with clean technology incentive programs.[4] Earlier measures, including the removal of import tariffs on electric vehicles, also helped improve affordability. Mexico has introduced substantial income tax deductions for EV purchases and exemptions from federal taxes such as IEPS and ISAN.[5] In Colombia, municipalities are empowered to introduce localized incentives, including discounts on vehicle registration fees, reductions in local taxes, preferential parking rates, and other exemptions aimed at lowering the total cost of ownership for EV buyers. Chile has implemented temporary reductions in registration fees for EVs.

[4] Tax on Industrialized Products (IPI) and the Tax on the Circulation of Goods and Services (ICMS)

[5] IEPS: Federal excise tax on specific goods and fuels and ISAN: Federal tax on the purchase of new vehicles.

Battery electric vehicle shares dominate EVs in Asia while plug-in hybrids dominate in Latin America

In India and Vietnam, the EV market consists of about 100% battery electric vehicles (BEVs). In Indonesia, Malaysia, Thailand and Colombia, plug-in hybrid electric vehicles (PHEVs) make up less than 15% of EV sales, with PHEV shares falling from over 70% in 2021-22 (except in Indonesia).

In terms of both volumes and shares, Brazil and Mexico lead among the countries assessed in this analysis. PHEV sales made up 56-58% of total EV sales in both countries, with the difference being that Mexico saw a growth in PHEV shares from about 26% in 2021, whereas Brazil saw the market decline from a share of 72% in 2021. In contrast, PHEV 2025 shares were around 40% in China, 35% in the EU, and 22% in the US (Figure 2).

Lower-volume markets—such as in South Africa, Chile, and Colombia—each recorded fewer than 3,500 annual PHEV sales in 2025; however, strong year-on-year growth in these markets indicates an emerging potential for PHEVs. Notably, no PHEV sales were recorded in African countries like Kenya and Ethiopia.

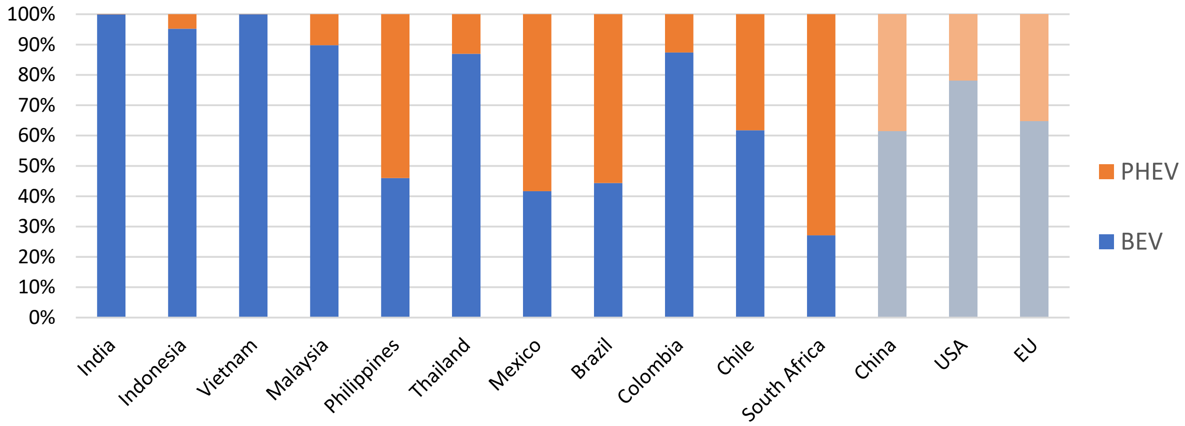

Figure 2. *BEV vs PHEV shares in key global south markets, 2025 (Faded bars on the right represent US, China and EU as reference markets for comparison.)*

Global South (excluding China) share in EV passenger vehicle manufacturing reaches 3%

A total of 20.9 million light duty passenger EVs were produced globally in 2025. China accounted for 72% of total production, followed by the European Union at 15% and the United States at 5%. Global South countries (excluding China) contributed around 3.1% of total EV production in 2025, from 1% in 2020 (**Figure 3**).

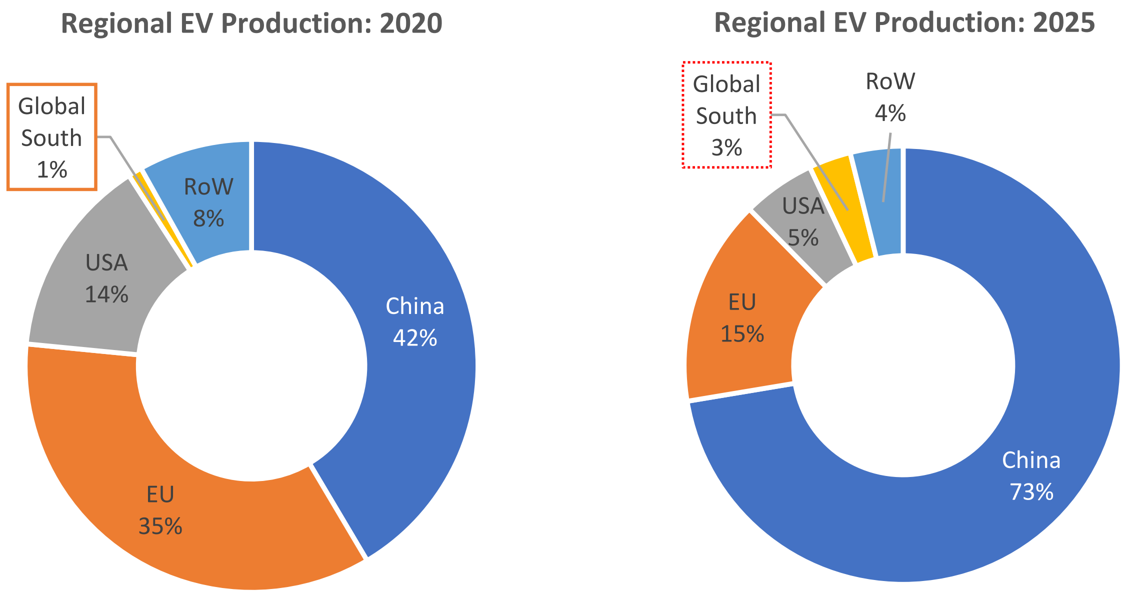

Figure 3. *Regional EV production in 2020 and 2025*

This twenty-fold increase in EV production in the Global South outside of China, marks a significant opportunity for countries to leverage industrial policy ambitions. This shift reflects growing localization efforts, foreign direct investment, and the strategic positioning of emerging economies within the evolving global EV supply chain.

Among the Global South countries considered, Mexico, Vietnam, India, and Thailand have emerged as major EV producing nations in 2025 (Figure 4). While Mexico produces the largest volume of EVs, most of these are exported to the US and Canada as part of the USMCA trade bloc, and most EVs sold in Mexico are Chinese imports.

Vietnam is the second-largest EV producer among major Global South countries. EV production increased nearly six-fold between 2022 and 2025, driven primarily by domestic manufacturer VinFast. While most of the production is sold domestically, exports are gradually expanding to Indonesia, India, and North America.

India's EV production is largely driven by domestic automakers, with Tata Motors and Mahindra & Mahindra Ltd. accounting for nearly 90% of total production. India is also gradually expanding its EV exports, primarily to Indonesia and Nepal, with a smaller volume of exports to Western Europe and Africa.

Thailand's almost four-fold increase in annual EV production was largely accounted for by BYD's local manufacturing facility in the country. Since mid-2025, Thailand has also allowed exports of locally produced EVs to count toward localization requirements, providing manufacturers greater flexibility while strengthening the country's position as a regional EV production hub.

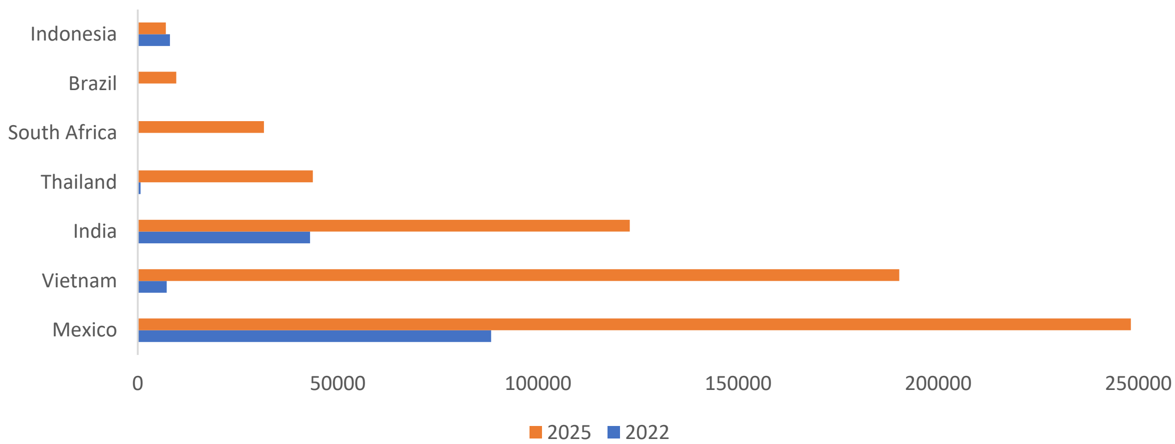

Figure 4. *Country-wise EV production in 2022 and 2025*

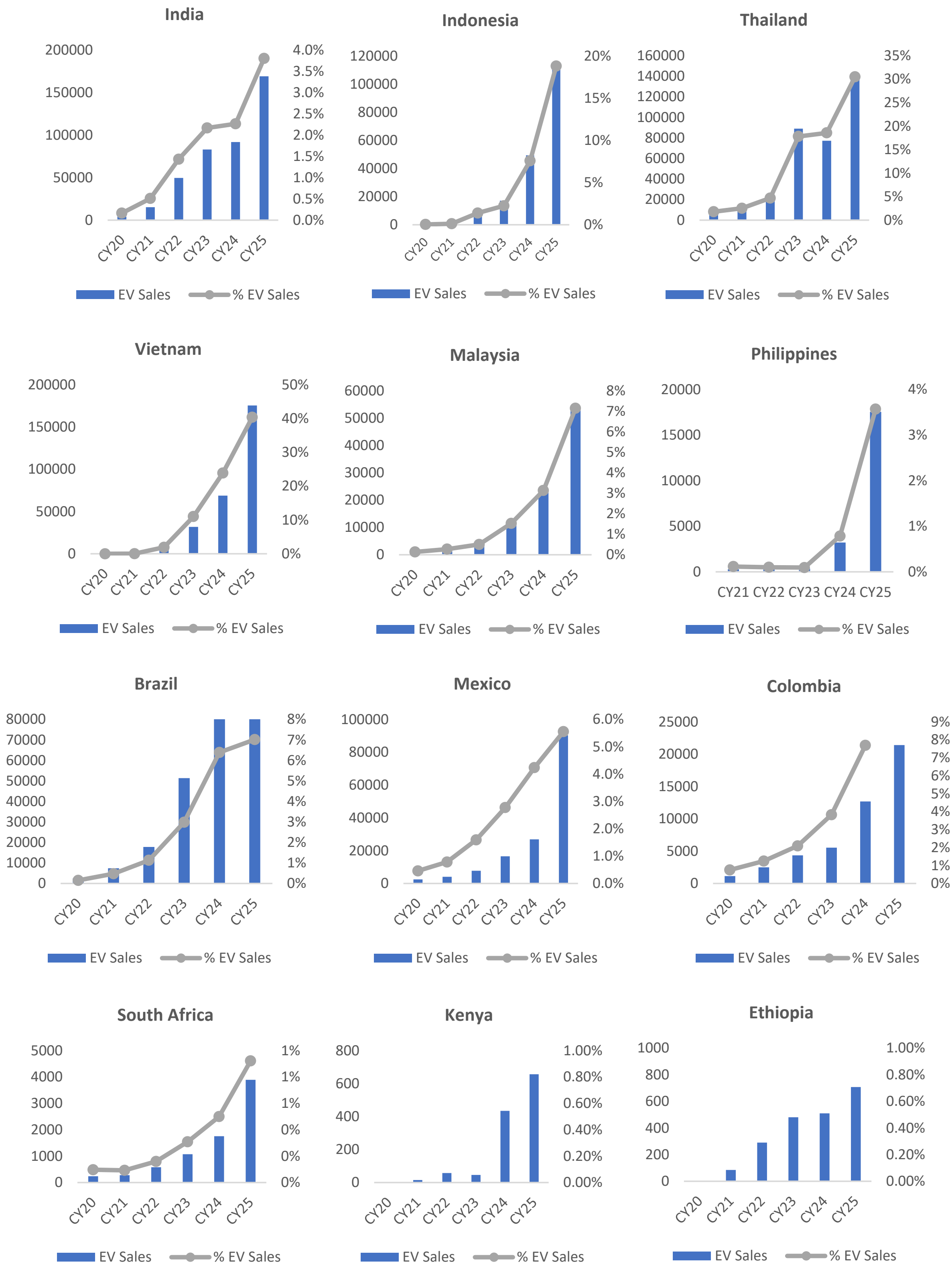

Figure 5. *Country wise EV sales and EV sales share*

Global South Data Tracker

Table 1. Total Light-duty Passenger Sales ('000 units)

Region	Country	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Asia	India	2967	3229	3395	2962	2417	3082	3792	4101	4275	4314
ASEAN	Indonesia	857	830	859	769	378	644	764	762	651	589
ASEAN	Thailand	378	446	504	582	381	357	444	500	420	455
ASEAN	Vietnam	160	147	186	230	307	300	377	287	287	435
ASEAN	Malaysia	512	512	530	547	474	452	637	714	727	748
ASEAN	Philippines	285	362	284	289	169	199	254	323	352	359
LATAM	Mexico	1604	1530	1186	1315	949	1015	1086	1361	1496	1511
LATAM	Brazil	1688	1856	2102	2262	1616	1558	1577	1721	1948	1997
LATAM	Chile	229	269	314	279	187	296	295	210	209	213
LATAM	Colombia	216	204	225	230	163	204	212	147	167	209
Africa	South Africa	361	368	364	354	246	304	363	348	351	422
Asia	China	23050	23969	23111	21166	20071	21323	20701	21887	23567	23441
North America	USA	17559	17241	17335	17049	14541	15032	13878	15644	15995	16261
Europe	EU	11937	12574	12772	13014	9931	9691	9246	10525	10611	10803

Table 2: Light-duty Passenger EV Share of new sales (%)

Region	Country	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Asia	India	0%	0.01%	0.04%	0.03%	0.2%	0.5%	1.3%	2.0%	2.1%	3.9%
ASEAN	Indonesia	0%	0.01%	0%	0.02%	0.04%	0.1%	1.4%	2.2%	7.6%	18.8%
ASEAN	Thailand	0.02%	0.05%	0.18%	0.23%	1.8%	2.5%	4.7%	17.8%	18.4%	30.5%
ASEAN	Vietnam	0%	0%	0%	0%	0%	0.0%	1.9%	11.1%	24.0%	40.4%
ASEAN	Malaysia	0.02%	1.61%	1.54%	0.46%	0.1%	0.3%	0.5%	1.6%	3.2%	7.2%
ASEAN	Philippines	0%	0%	0.00%	0.12%	0.2%	0.1%	0.1%	0.1%	0.9%	4.9%
LATAM	Mexico	0.01%	0.03%	0.04%	0.10%	0.3%	0.4%	0.7%	1.2%	1.8%	6.0%
LATAM	Brazil	0%	0%	0.01%	0.06%	0.2%	0.5%	1.1%	3.0%	6.4%	9.0%
LATAM	Chile	0%	0.02%	0.03%	0.08%	0.1%	0.3%	0.5%	0.9%	1.9%	4.0%
LATAM	Colombia	0.02%	0.07%	0.25%	0.53%	0.7%	1.2%	2.1%	3.8%	7.6%	10.2%
Africa	South Africa	0.04%	0.05%	0.03%	0.09%	0.1%	0.1%	0.2%	0.3%	0.5%	0.9%
Asia	China	2%	2.51%	4.77%	5.58%	6.3%	15.2%	28.6%	36.9%	47.6%	56.2%
North America	USA	1%	1.16%	2.07%	1.85%	2.3%	4.4%	7.0%	9.1%	9.7%	9.3%
Europe	EU	1%	1.33%	1.89%	2.98%	10.6%	18.0%	21.7%	22.4%	20.9%	27.0%

Table 3: Light-duty Passenger BEV Share of Total EV Sales (%)

Region	Country	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Asia	India	0.0%	92.6%	100.0%	99.1%	98.9%	99.7%	100.0%	99.7%	99.9%	99.9%
ASEAN	Indonesia	0.0%	37.2%	87.5%	62.2%	84.1%	95.9%	99.3%	99.1%	99.7%	95.2%
ASEAN	Thailand	60.2%	37.8%	23.3%	68.7%	25.0%	21.6%	47.7%	86.6%	88.5%	87.0%
ASEAN	Vietnam	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	99.7%	99.8%	99.9%	100.0%
ASEAN	Malaysia	100.0%	1.7%	0.8%	1.7%	13.0%	23.0%	42.8%	83.3%	94.3%	89.8%
ASEAN	Philippines	0.0%	0.0%	0.0%	99.2%	97.8%	75.0%	83.1%	83.3%	68.8%	46.0%
LATAM	Mexico	76.0%	67.5%	49.2%	66.5%	75.1%	73.9%	89.2%	87.2%	73.1%	41.7%
LATAM	Brazil	55.6%	100.0%	22.0%	5.8%	27.8%	27.9%	43.0%	36.2%	49.3%	44.4%
LATAM	Chile	0.0%	75.0%	53.5%	63.6%	62.8%	59.8%	70.5%	72.9%	75.3%	61.7%
LATAM	Colombia	52.8%	62.2%	44.4%	62.6%	58.8%	33.4%	44.0%	64.2%	83.2%	87.4%
Africa	South Africa	62.9%	72.6%	66.7%	51.7%	37.7%	74.7%	75.7%	75.1%	66.6%	27.1%
Asia	China	75.5%	80.9%	75.1%	79.8%	81.2%	80.8%	74.5%	66.8%	56.6%	61.5%
North America	USA	53.6%	53.4%	65.9%	74.1%	78.1%	73.1%	80.5%	79.9%	79.6%	78.2%
Europe	EU	47.7%	51.1%	56.6%	64.0%	51.3%	50.3%	56.0%	65.5%	65.6%	64.8%

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If you or your organization would like to contribute to a future edition of Majority Mobility, we welcome submissions and perspectives from across regions. Please reach out to us by email to continue the conversation.

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