

The Cost of Clean Cars:

Mapping Mining Harms in Europe's EV Supply Chains

Summary

In the fierce competition for expanding electric vehicle (EV) markets, major car manufacturers and battery producers in Europe and beyond are racing to secure long-term access to raw materials and mining operations worldwide. This scramble for lithium, cobalt, nickel, and other critical minerals is taking place largely out of the public eye, with activists warning of serious environmental and social risks in mining regions. The lack of transparency poses major challenges for car manufacturers, regulators, and civil society in the transition to green energy.

This policy brief pilots innovative data and methodologies to pierce through this opacity. For the first time, we connect European car manufacturers' EV lines directly to specific mining sites, many of them also sites of documented human rights violations. Our comprehensive end-to-end mapping of EV battery supply chains outlines serious risks to environmental and human rights that should be urgently addressed by policymakers and EV manufacturers.

The brief introduces a methodology for presenting evidence of risks in the EV supply chain, shifting the burden of proof to corporations at the end of the supply chain. After presenting our detailed preliminary analysis of European EV battery supply chains and their risk profiles, it concludes with actionable policy recommendations to enhance accountability and transparency.

Introduction

The demand for critical raw materials (CRMs) is surging, primarily because of the rapid expansion of electric vehicle (EV) battery production (IEA, 2024, p. 79). The global EV battery market is expected to be worth as much as USD 410 billion by 2030 and to consolidate into just 10 to 15 corporations capable of producing the massive volumes of high-quality, low-cost battery cells that EV manufacturers need (McKinsey, 2024). For battery producers, winning this race requires moving rapidly to sign long-term supply contracts with major car manufacturers, and to secure sufficient access to battery-material suppliers and mining operators (McKinsey, 2022). European car manufacturers are aggressively moving to EV production and integrating upstream operations as they struggle to compete with Chinese manufacturers, who have gained a significant market share through lower-cost EVs and advanced battery technology (Buzzoni and Schmidt, 2023). While the shift to electric forms of mobility is publicly framed as an environmental necessity, behind the scenes there is an intense corporate battle over control of the battery market that risks compromising environmental and human rights standards in the green transition.

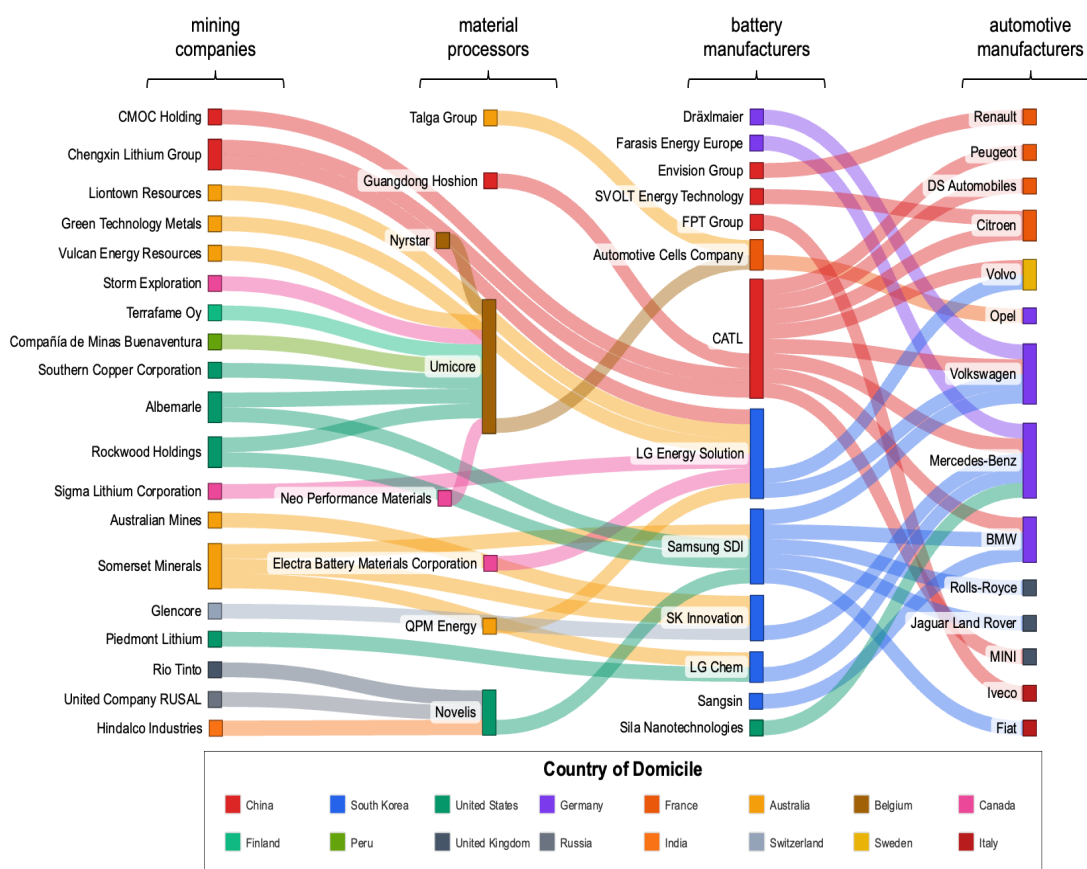
Advocacy groups warn that car manufacturers need to ensure that the accelerating demand for battery materials for their EV models does not lead to human and environmental rights violations in mining operations (Lead the Charge, 2023; Climate Rights International, 2024; Karombo and Mutandiro, 2025), but it is difficult to hold companies to account when critical mineral supply chains remain opaque. According to data from the Environmental Justice Atlas (Llavero-Pesquina, 2025), just 100 corporations are responsible for 20% of environmental conflicts worldwide. Crucially, however, the identity of the car manufacturers' suppliers, including the companies mining, refining and processing battery materials, is often treated as either commercially sensitive or administratively burdensome information to provide.

Voluntary reporting by car manufacturers is sparse. Even companies with dedicated raw-material reports do not disclose their suppliers (e.g. VW, 2025; Mercedes-Benz, 2024). Regulatory initiatives such as the European Union's Corporate Sustainability Due Diligence Directive (CSDDD) and its Battery Regulation face concerted political attempts to weaken their already weak due diligence and reporting obligations (Olivier de Leth, 2025; Transport and Environment, 2025). Internal traceability systems pursued by companies like Volvo (2019) prove that transparency in the supply chain is technically feasible. However, they narrowly frame problematic sourcing as bad materials accidentally leaking into supply chains, rather than deliberate business decisions within supply chains governed by car manufacturers through both formal contracts and informal influence.

Effective accountability, in our view, requires public scrutiny and binding, effective regulation of the specific corporate actors competing for dominance in the EV raw-material race: car manufacturers, battery producers, and mining companies, both local and global.

FIGURE 1

Major European automakers' battery material supply chains



Source: Authors' elaboration based on data from MarkLines (2025) and S&P Capital IQ Pro (2025).

Note: Company positioning reflects the primary business focus; several firms maintain vertically integrated operations extending to mining activities.

This policy brief fills this critical gap by mapping the complete EV battery supply chain ‘from model to mine’ for the first time. Drawing on MarkLines – a commercial database covering 8,454 suppliers across 300 car components, including battery cells – we identify 20 first-tier battery suppliers for major European car manufacturers and their 2024 EV model lines. We then trace these connections upstream via S&P Capital IQ Pro to identify sub-tier suppliers encompassing battery-material processors and the owners and operators of mining sites. And lastly, we cross-reference our supply-chain analysis with an original dataset on global mining conflict intensity developed in recent academic research (Marin and Palazzo, 2025).

The result is a novel end-to-end EV battery supply-chain mapping, which reveals problematic connections that car manufacturers must now address, and a methodology for presenting clear evidence of supply links to global mining sites that allows to shift the burden of proof to the corporations at the end of the supply chain (from now on “end users”).

EV battery supply chains: from model to mine

The first part of our supply-chain analysis focuses on mapping the backward linkages of major European EV manufacturers ‘from model to mine’. We begin by identifying the 2024 EV models offered by major European car manufacturers in the European market. This yields a list of some 70 models, which we narrow down further by focusing on recognisable ‘European’ brand names rather than the domicile of the ultimate owners. For each model, MarkLines provides the type of battery that powers it and the suppliers of the anode and cathode materials and the battery cells, packs, modules and systems used in its production. We then move further down the supply chain to identify sub-tier suppliers, stopping at the fourth tier or when encountering firms that are mainly engaged in mining operations or mine ownership.

Figure 1 depicts the preliminary result of this investigation, cut off at the third tier so as not to be overwhelmingly detailed. Further inter-firm linkages could be established by drawing on multiple supply-chain datasets (i.e. Bloomberg SPLC, Panjiva), but the overall shape of the network including major EV players already emerges from a single source (S&P Capital IQ Pro).

Country colour codes reveal the striking predominance of Chinese and South Korean battery manufacturers at the first tier, while Western (Australian, Canadian and US) mining companies outnumber their Chinese competitors at the second and third tiers. Most importantly for our purposes, this model-to-mine mapping establishes plausible links between European EV manufacturers and specific metals and mining companies – and thus represents a vital means to identify environmental or human rights risks in critical mineral supply chains (see Figure 2).

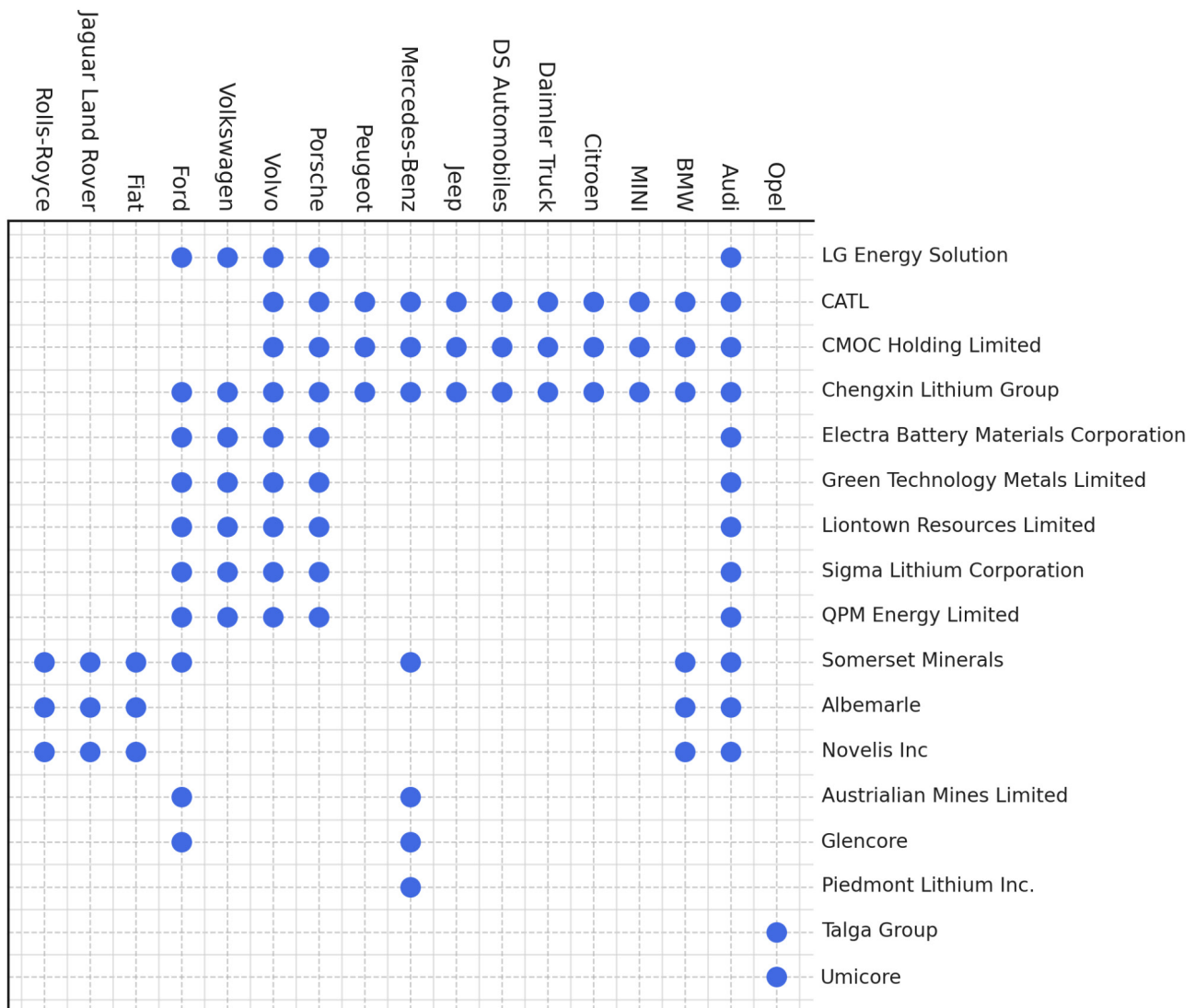
Our analysis also identifies new avenues for pursuing both case studies of individual mining operations and systematic risk assessment across the battery value chain.

Consider, for instance, the Kisanfu copper and cobalt mine. In operation since 2023, human rights researchers have identified it as one of numerous sites of forced labour in the Democratic Republic of the Congo (DR Congo) (Brehm and Magnusson, 2023). Our analysis shows that Chinese battery giant CATL has owned 23.75% of this operation since 2021, which at the time was one of the world’s largest sources of cobalt yet to be developed (Daly, 2021). CATL also sources materials from CMOC, the majority owner of the Kisanfu mine (71.25%) and the nearby, operationally integrated, Tenke Fungurume mine (CMOC, 2023, p. 1). As the critical EV supplier for European car manufacturers in 2024, our data show that CATL provides the batteries for the 2024 Porsche Macan, Volvo’s C40 Recharge, and Citroën’s e-C3, among others.

The Mercedes-Benz 2025 EQB 300 4MATIC offers another example. It is produced in Hungary and powered by a nickel manganese cobalt oxide cell supplied by SK On, the battery business unit of a major South Korean energy and chemical conglomerate. SK On was spun off and publicly listed in 2021 to raise the funds needed to expand its global battery market share (Kang and Kim, 2021). SK On in turn sources materials from Glencore – a commodity trading and mining company with worldwide operations, including several copper and cobalt mining sites in the DR Congo, and relationships with nickel suppliers based in Indonesia, where nickel extraction and processing is both causing environmental damage and human rights violations (Liljas, 2024). Glencore is also majority owner (73.1%) of the Nkana refinery and smelter in Zambia, producing copper and cobalt alongside enormous sulphur dioxide emissions, which are damaging local communities and the environment (EJ Atlas, 2025).

FIGURE 2

Key mining suppliers for European EV manufacturers



Source: Authors' elaboration based on data from MarkLines (2025) and S&P Capital IQ Pro (2025).

The proximity of European car manufacturers to suppliers linked to potential human rights violations shows that the supply chain connecting model to mine is shorter and less complex than often propagated. Moreover, it probably reflects deliberate business relationships rather than inadvertent failures in the supply chain. CATL is the legal co-owner of the mining operation, has contractual supplier arrangements with CMOC, and serves European customers directly through formal agreements. Glencore's cobalt-supply agreement with SK On is similarly a matter of public record. Our analysis suggests that such inter-firm relationships reflect a business model that intentionally disregards violations in lower tiers. And since it demonstrates that these links are readily traceable using commercially available datasets, the European car industry can no longer credibly claim ignorance or hide behind technical fixes.

In addition to such mine-specific investigations, we can also rank battery-material producers according to the intensity of mining conflicts in countries where they maintain major operations. This analysis builds on a global dataset categorising newspaper reports of conflict events according to high, medium, and low levels of intensity or 'polarisation' (Marin and Palazzo, 2025). Table 1 presents the number of high-polarisation incidents and their proportion as a percentage of all reported incidents for selected battery-material suppliers. Among these suppliers, CATL shows the highest percentage of high-polarisation incidents, whereas Glencore records the most high-polarisation incidents in absolute terms.

TABLE 1

Proportion and absolute number of 'high polarisation incidents' in countries where key mining suppliers operate

Mining suppliers	Countries active (mining projects)	High-polarisation incidents	
		Proportion	Number
LG Energy Solution	Australia (1), Indonesia (1)	22%	949
CATL	Dem. Rep. Congo (1), Indonesia (1)	37%	160
CMOC Holding Limited	Dem. Rep. Congo (2), China (4), Indonesia (1) Brazil (2)	25%	539
Chengxin Lithium Group	China (1), Ethiopia (2), Zimbabwe (1)	23%	197
Electra Battery Materials Corporation	Canada (6), USA (4), Australia (1)	22%	3541
Green Technology Metals Limited	Canada (5)	16%	435
Liontown Resources Limited	Australia (5)	20%	810
Sigma Lithium Corporation	Brazil (2)	18%	104
QPM Energy Limited	Australia (1), Papua New Guinea (1)	21%	863
Somerset Minerals	Canada (3), Ecuador (1)	16%	453
Albemarle	Australia (14), USA (6), China (4), Chile (2), Argentina (2)	23%	3579
Novelis Inc	India (23), Brazil (3)	21%	321
Australian Mines Limited	Australia (3), Brazil (1)	20%	914
Glencore	Canada (54), Australia (30), Chile (9), Dem. Rep. Congo (9), Argentina (7), Brazil (5), Italy (5), Peru (5), Bolivia (4), Zambia (4), Mauritania (3), South Africa (3), United Kingdom (3), USA (3), Egypt (2), Germany (2), Kazakhstan (2), New Caledonia (2), Philippines (2), Algeria (1), Belgium (1), Botswana (1), Dominican Republic (1), Ireland (1), Mexico (1), Norway (1), Papua New Guinea (1), Spain (1), Tunisia (1)	23%	5332
Piedmont Lithium Inc.	Canada (4), USA (2), Ghana (1)	24%	3712
Talga Group	Sweden (5), Australia (2)	20%	816
Umicore	Belgium (2), Finland (1), Germany (1), Norway (1), Peru (1)	22%	175

Source: Authors' elaboration based on data from S&P Capital IQ Pro and data and analysis developed in Marin and Palazzo (2025).

Note: 'High-polarisation' conflict events refer to newspaper reports of incidents involving the following actions: assault, coerce, fight, use unconventional mass violence, and veto (cited in Marin and Palazzo (2025)).

The analysis reveals previously hidden connections between European corporate ‘end users’ and global mining sites and conflicts worldwide. The data presented above highlight the risk that European EV manufacturers’ (alongside other companies’) demand for raw materials is leading to widespread harm and conflict across countries in which mining takes place.

Future work will more closely identify individual mining sites associated with these violations and connect these to specific European EV models, using the supply-chain analysis methods outlined above. Further work could also draw on alternative datasets to check for mining violations requiring companies’ and governments’ urgent attention. This includes the Business and Human Rights Resource Centre’s company tracker, the Good Jobs First violation tracker, or the Global Atlas of Environmental Justice.

Conclusion and Recommendations

This policy brief has demonstrated that an inter-firm, model-to mine methodology provides unprecedented insight into the backward linkages of EV battery supply chains. It has outlined a new transparency approach that firms, regulators, civil society, CSOs, non-government organisations (NGOs), and affected communities can use to confront environmental and human rights violations in supply chains for critical minerals. By mapping the connections between European EV manufacturers, battery suppliers, and processing and mining operations, our approach exposes previously opaque risks and responsibilities across the value chain.

Targeted policy action is essential to translate these insights into meaningful change. The following recommendations set out concrete steps for public policy making to enhance transparency and accountability during the transition to e-mobility and transportation in general.

1. Mandate full traceability of supply chains, due diligence, and import controls

- Require car manufacturers and battery producers to map and publicly disclose the entire supply chain for their key critical minerals via a global digital registry and advocate for effective mechanisms for access to justice and remedies to affected communities, workers and social movements.
- Strengthen and enforce the Corporate Sustainability Due Diligence Directive (CSDDD) to cover all critical mineral supply chains linked to EVs, including indirect suppliers.
- Support the adoption of a strong and effective UN legally binding instrument (the Binding Treaty) that imposes direct obligations to transnational corporations and guarantees joint and several liability across global value chains. This is essential to ensure accountability across global operations—particularly for European carmakers—whose activities extend beyond the reach of EU frameworks.
- Effective EU import controls. Require responsible sourcing policies, including measures and monitoring and proof-of-origin for all battery minerals, with penalties for non-compliance and judicial liability for companies involved in violations, and bans on firms or mining sites linked to severe and repeated violations.

2. Prioritize resource justice and public mobility over extractive green transitions

- Promote public transport over private electric vehicles (EVs) to reduce reliance on critical minerals and limit environmental and social harm from mining.
- Implement policies to reduce overall material and energy consumption in high-income regions like the EU, which already accounts for a disproportionate share of global mineral demand.
- Exclude companies involved in human rights or environmental violations from public procurement and national subsidies.
- Shift industrial and climate policy away from growth-based EV expansion and toward sufficiency, equity, and ecosystem integrity.

3. Enhance data collection and public reporting

- Establish an independent global observatory to monitor and publicly report on human and environmental violations across global supply chains in the minerals needed for EV batteries.
- Require annual public reporting by car manufacturers and EV battery producers on exposure to high-risk suppliers, with board-level accountability for risk mitigation and reparation processes.

4. Support and empower affected communities and human rights defenders

- Provide EU funding and diplomatic support for civil society groups, labour unions, and whistle-blowers in mining regions.
- Establish and guarantee accessible legal remedies and promote grievance processes along the supply chain that allow affected communities and workers to seek justice and compensation, including in all EU-linked mineral projects.

5. Integrate human rights and environmental protection into trade and industrial policy

- Make access to EU subsidies and industrial policy initiatives conditional on accessible and binding commitments to prevent human rights and environmental violations in supply chains.
- Eliminate investment protection clauses in trade and investment agreements that allow foreign investors to challenge domestic laws or regulations intended to protect public interest, including health, labor, and the environment.

References

- Buzzoni, L. and Schmidt, N. (2023). Needed for speed: European carmakers turn to mining to bypass China. InvestigateEurope, 26 October. <https://www.investigate-europe.eu/posts/european-carmakers-mining-lithium-batteries-china>
- Climate Rights International (2024). *Nickel Unearthed: The Human and Climate Costs of Indonesia's Nickel Industry*. <https://cri.org/reports/nickel-unearthed/>
- CMOC (2023). *2023 CMOC Kisanfu Mining Responsible Mineral Supply Chain Due Diligence Report*. <https://en.cmoc.com/upload-file/2024/0927/20240927025142812.pdf>
- Daly, T. (2021). 'CATL takes stake in China Moly cobalt mine for \$137.5 million'. Reuters, 21 April. <https://www.reuters.com/article/business/catl-takes-stake-in-china-moly-cobalt-mine-for-1375-million-idUSKBN2BY0BY/>
- EJ Atlas (2025). 'Glencore in Zambia'. <https://ejatlas.org/print/glencore-in-zambia>
- European Commission (2024). Corporate Sustainability Due Diligence Directive (2024/1760). https://commission.europa.eu/business-economy-euro/doing-business-eu/sustainability-due-diligence-responsible-business/corporate-sustainability-due-diligence_en
- Brehm, S. and Magnusson, H. (2023). 'Supply chain screening: Forced labour at Battery and Bus Manufacturers in China'. *Globalworks Lund AB*, June. <https://www.globalworks.se/wp-content/uploads/2023/06/forced-labour-electric-buses.pdf>
- International Energy Agency (2024). 'Global EV Outlook 2024: Moving towards increased affordability'. <https://iea.blob.core.windows.net/assets/a9e3544b-0b12-4e15-b407-65f5c8ce1b5f/GlobalEVOutlook2024.pdf>
- Kang, K.-M. and Kim, I.-G. (2021). 'SK Innovation to split battery unit in October, seeks IPO'. *The Korean Economic Daily*. <https://www.kedglobal.com/ev-batteries/newsView/ked202108040016>
- Karombo, T. and Mutandiro, K. (2025). 'Dangerous mines: A death at the bottom of the EV supply chain'. *Rest of World*, 8 July. <https://restofworld.org/2025/zimbabwe-lithium-mining-boom/>
- Lead the Charge (2023). 'Responsible sourcing of transition minerals', 3 June. <https://leadthecharge.org/solutions/actions/responsible-sourcing-of-transition-minerals/>
- Liljas, P.E. (2024). 'Cheap coal, cheap workers, Chinese money: Indonesia's nickel success comes at a price'. *The Guardian*, 11 April. <https://www.theguardian.com/world/2024/apr/11/cheap-coal-cheap-workers-chinese-money-indonesias-nickel-success-comes-at-a-price>
- Llaveró-Pesquina, M. (2025). 'Driving ecologically unequal exchange: A global analysis of multinational corporations' role in environmental conflicts'. *Global Environmental Change* 92 (July). <https://www.sciencedirect.com/science/article/pii/S0959378025000433?via%3Dihub>
- Marin, A., and Palazzo, G. (2025). 'Civic power in mining conflicts: barrier or catalyst for a just energy transition?' *Environmental Research Letters*, 20(5): 054030. <https://iopscience.iop.org/article/10.1088/1748-9326/adc74f>
- McKinsey & Company (2022). 'Capturing the battery value chain opportunity'. <https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/capturing-the-battery-value-chain-opportunity>
- McKinsey & Company (2024). 'Global Materials Perspective 2024'. <https://www.mckinsey.com/industries/energy-and-materials/our-insights/global-materials-perspective>
- Mercedes-Benz (2025). *Raw Material Report 2024*. <https://group.mercedes-benz.com/dokumente/nachhaltigkeit/produktion/mercedes-benz-raw-material-report.pdf>
- Ollivier de Leth, D. (2025). 'Save your tiers for another day: Omnibus restriction excludes most supermarket suppliers in risk countries'. SOMO, 22 April. <https://www.somo.nl/save-your-tiers-for-another-day/>
- Transport and Environment (2025). 'Battery due diligence rules: Are carmakers ready?'. https://www.transportenvironment.org/uploads/files/2025_05_Briefing_Battery_due_diligence_rules_are_carmakers_ready.pdf
- Volkswagen (2025). *Responsible Raw Material Report 2024*. <https://www.volkswagen-group.com/en/publications/more/responsible-raw-materials-report-2024-2986>
- Volvo (2019). 'Volvo Cars to implement blockchain traceability of cobalt used in electric car batteries'. <https://www.media.volvocars.com/global/en-gb/media/pressreleases/260242/volvo-cars-to-implement-blockchain-traceability-of-cobalt-used-in-electric-car-batteries>

