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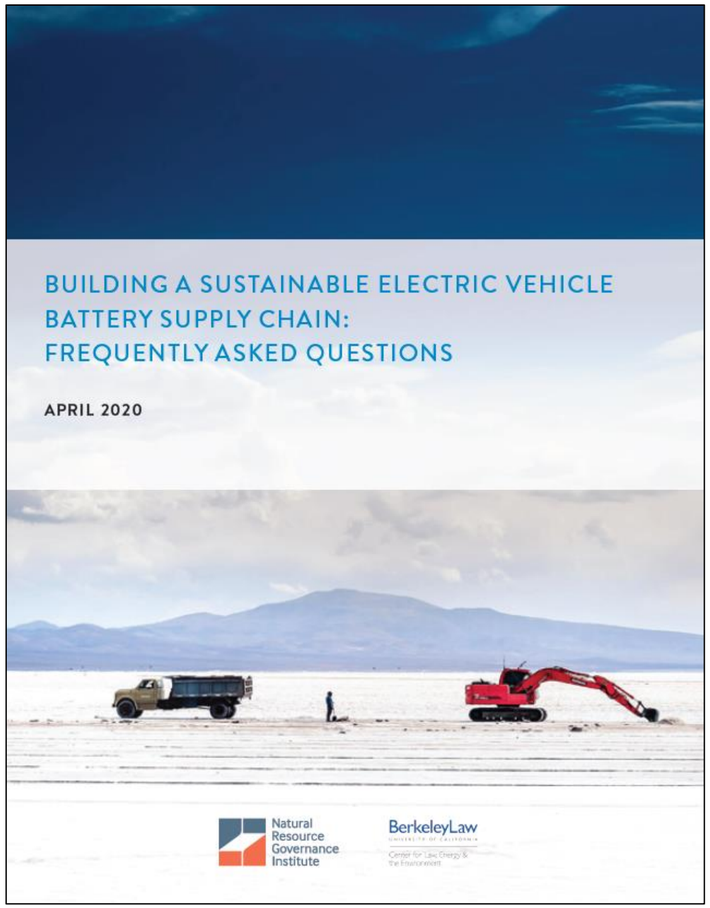
Natural Resource Governance Institute

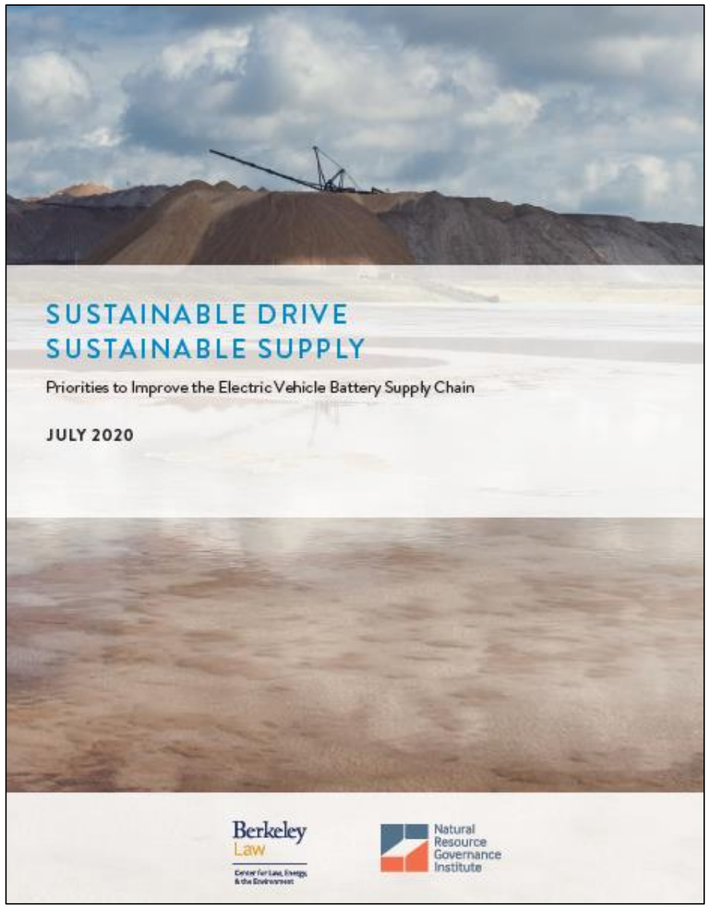
The global electric vehicle supply chain: Governance implications

Patrick Heller

Training course on strategic minerals, value chains and governance challenges in the Andes
November 25, 2020



Source: [CLEE and NRGI]



Source: [CLEE and NRGI]

Outline

1. The evolution of electric vehicle markets and mineral inputs
2. Supply chain structure and impacts on producers
3. International “clean battery” initiatives

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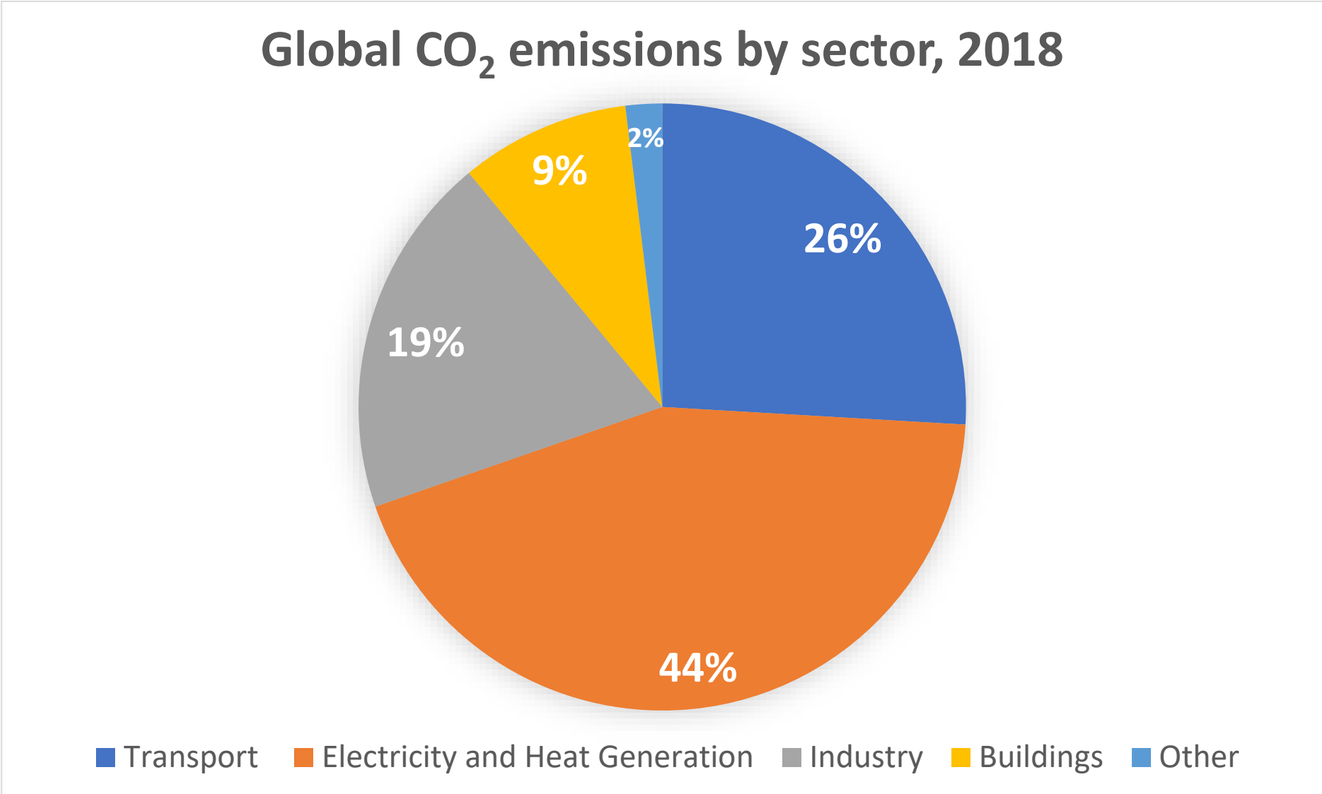
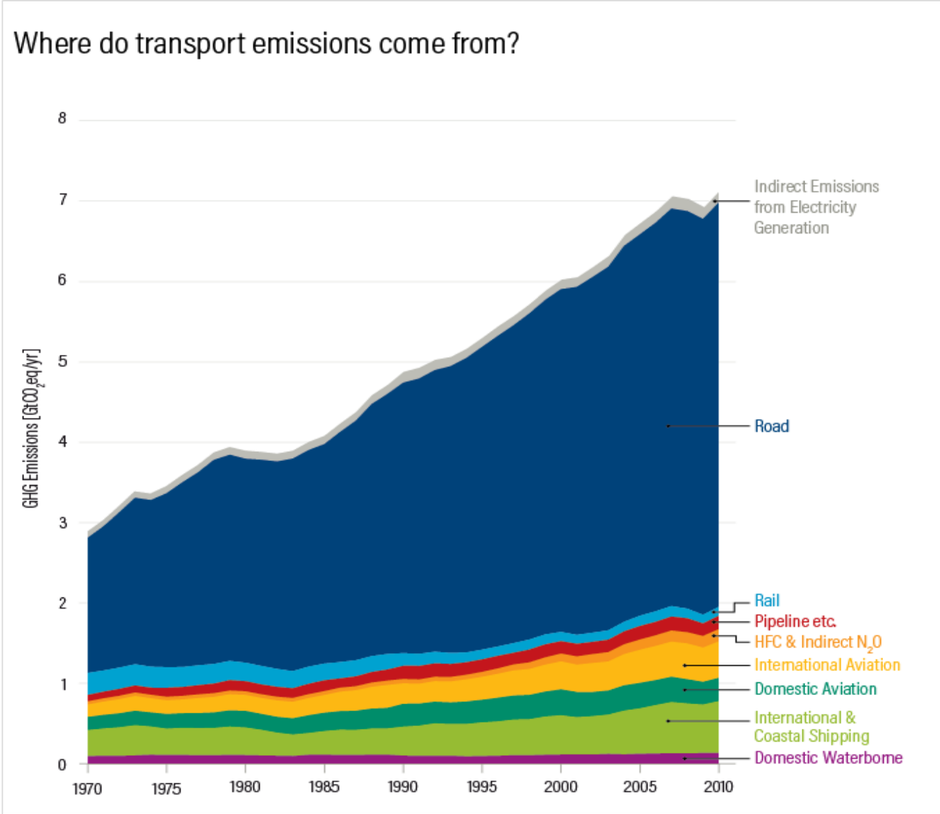
Internal combustion vehicles and global emissions

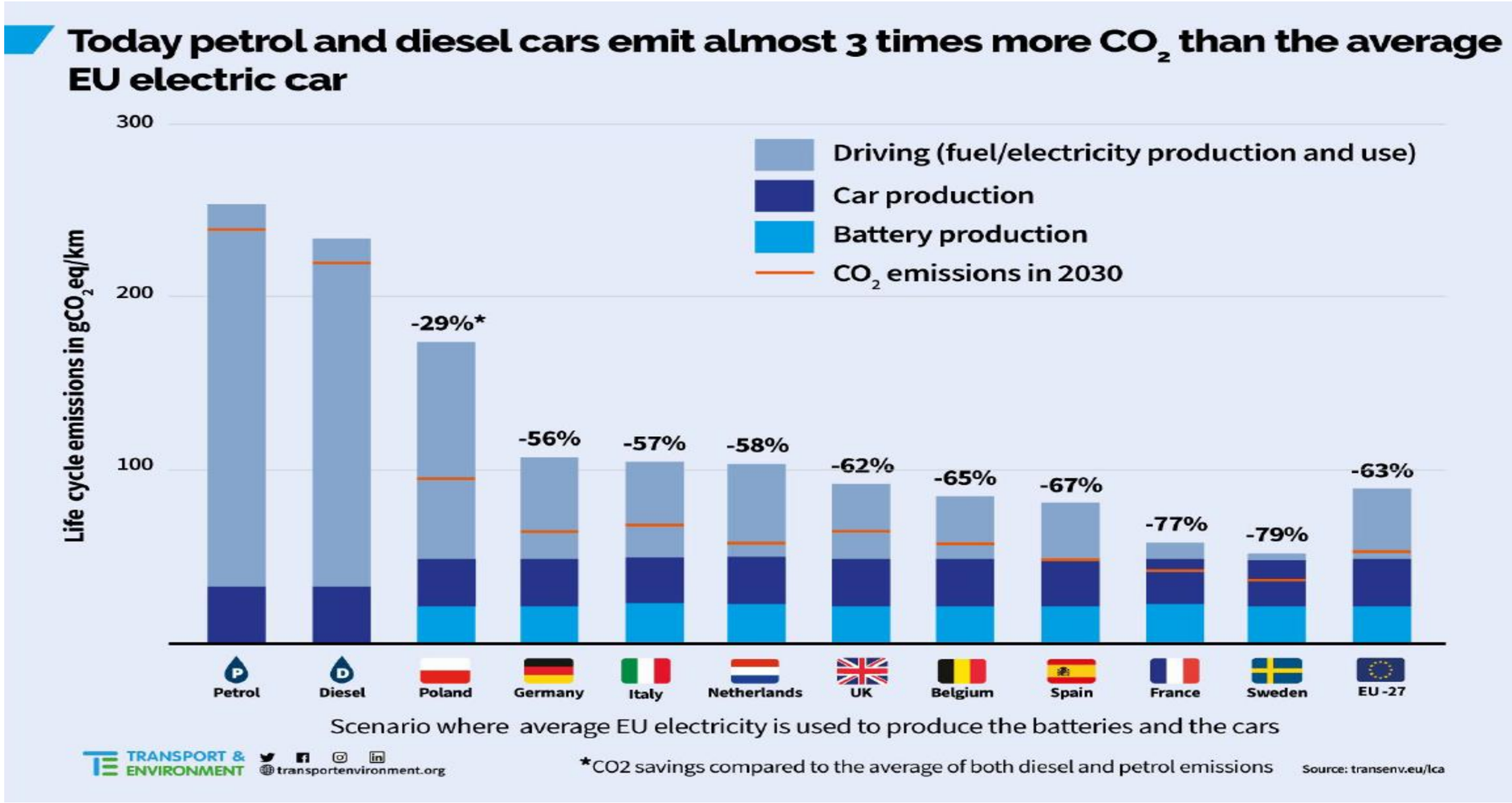




Source: International Energy Agency

Source: World Resources Institute

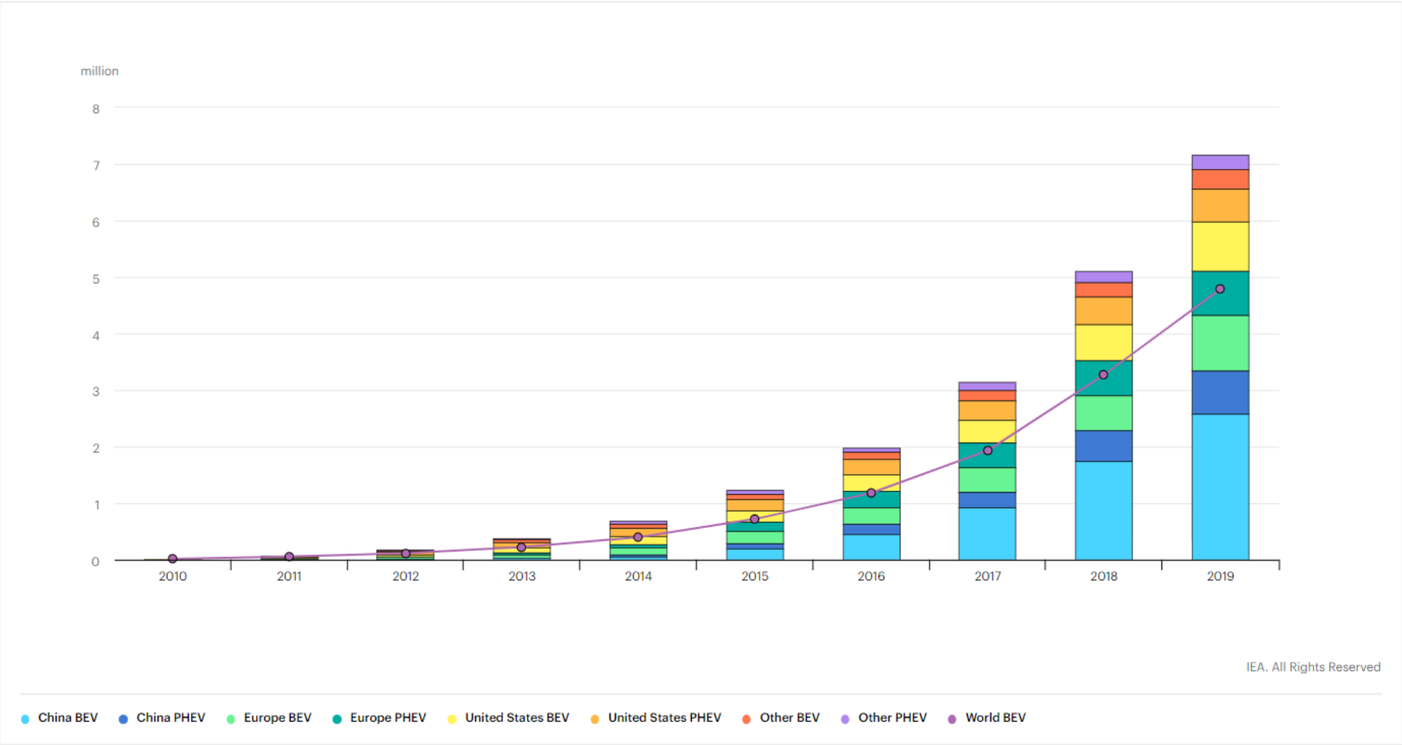
Electric Vehicles produce dramatically lower greenhouse gas emissions than internal combustion vehicles



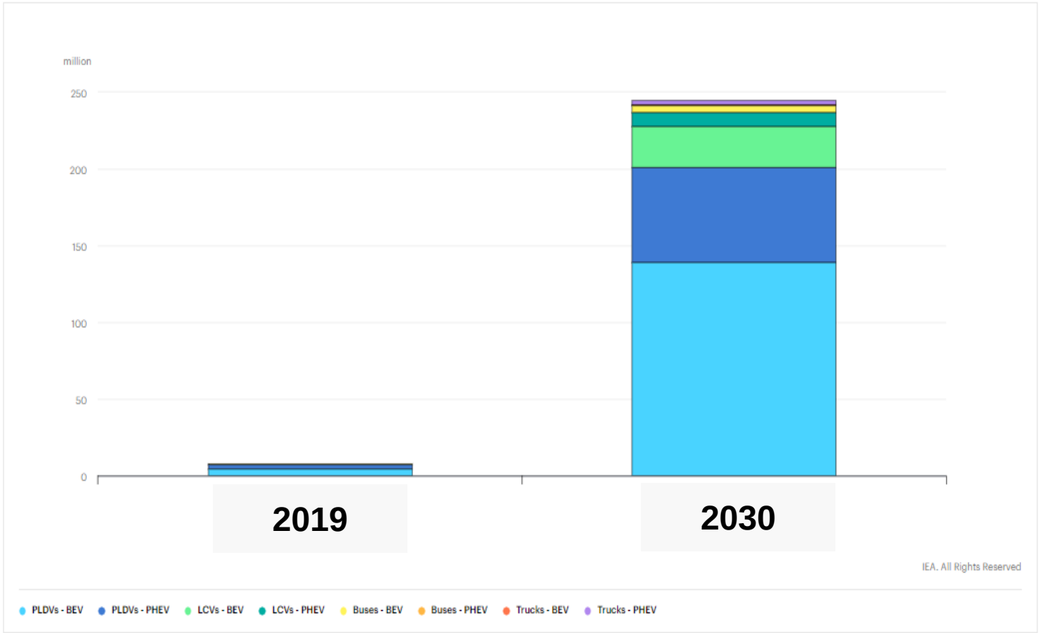
Source: [Transport & Environment]

Electric Vehicle uptake is growing……. but needs to grow much more

Global electric car stock, 2010 - 2019

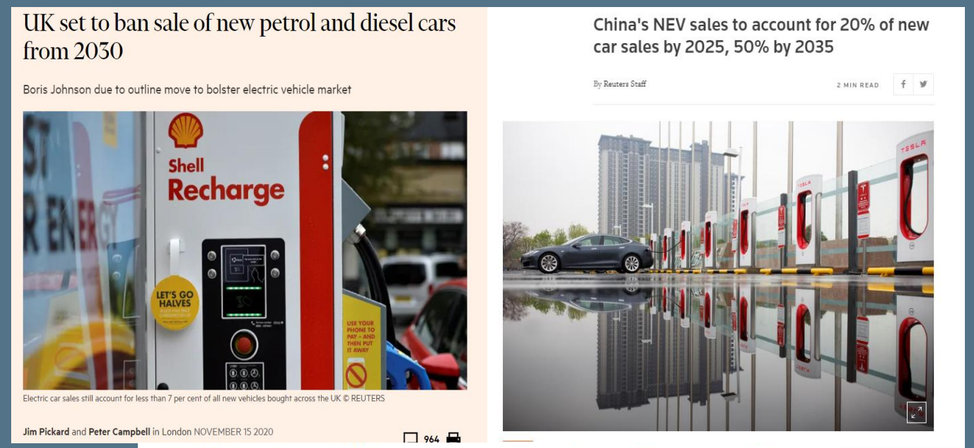


Global EV stock in the sustainable development scenario, 2019 and 2030



Source: [International Energy Agency]

Growing commitments to shift away from internal combustion vehicles



UK set to ban sale of new petrol and diesel cars from 2030

Boris Johnson due to outline move to bolster electric vehicle market

Electric car sales still account for less than 7 per cent of all new vehicles bought across the UK © REUTERS

Jim Pickard and Peter Campbell in London NOVEMBER 15 2020

964

China's NEV sales to account for 20% of new car sales by 2025, 50% by 2035

By Reuters Staff

2 MIN READ

California will ban new combustion-engine vehicles starting in 2035

Part of an ambitious package of rules meant to curb carbon emissions

By Andrew J. Hawkins | @andyjayhawk | Sep 23, 2020, 2:00pm EDT

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Photo by Ray Chavez/MediaNews Group/The Mercury News via Getty Images

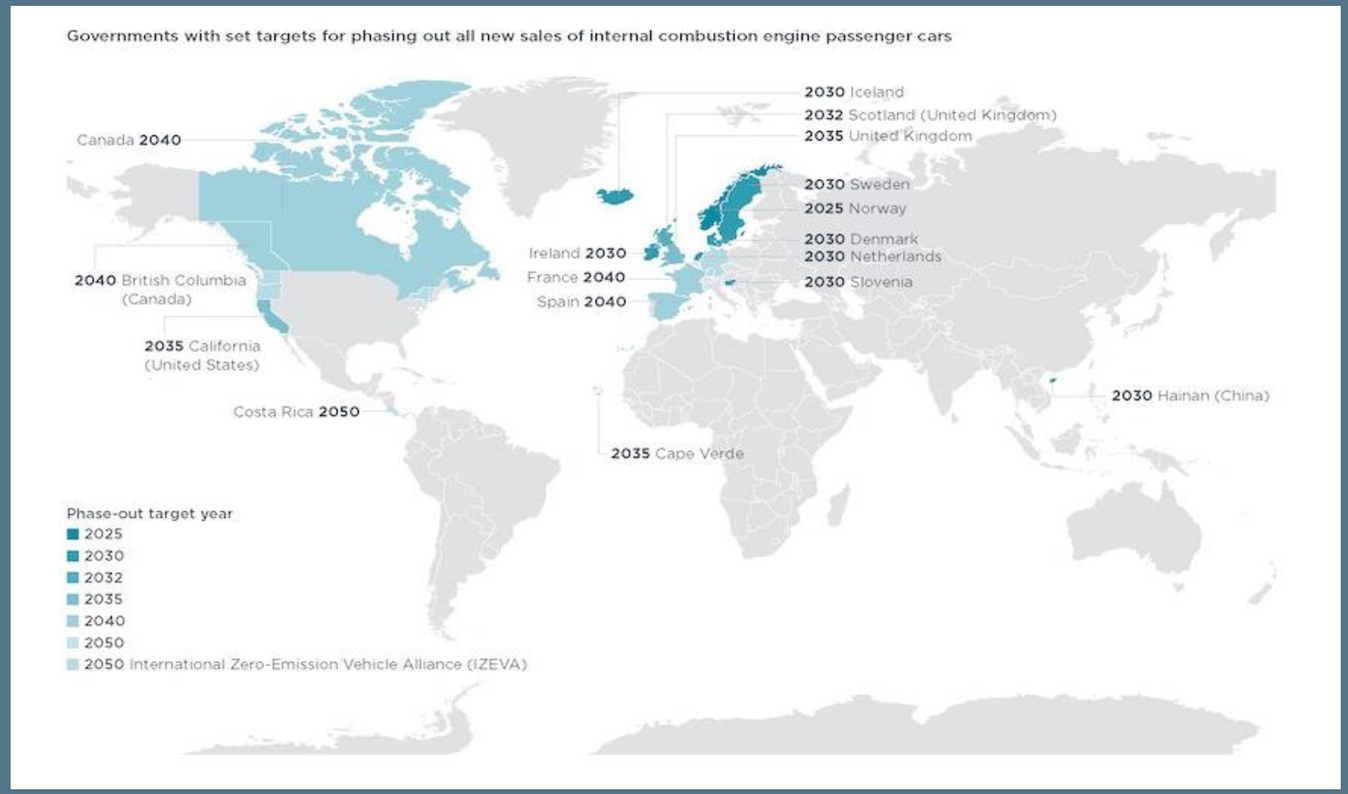


Image sources: FT, Reuters, The Verge

Source: The Driven

Expanding the EV market means expanding mineral production

Some EV battery material types and their mineral components

Nickel Cobalt Manganese

Nickel, cobalt, manganese, lithium (hydroxide)

Lithium Manganese Oxide

Lithium (carbonate), manganese,

Nickel Cobalt Aluminum

Lithium (carbonate), cobalt, nickel, aluminum

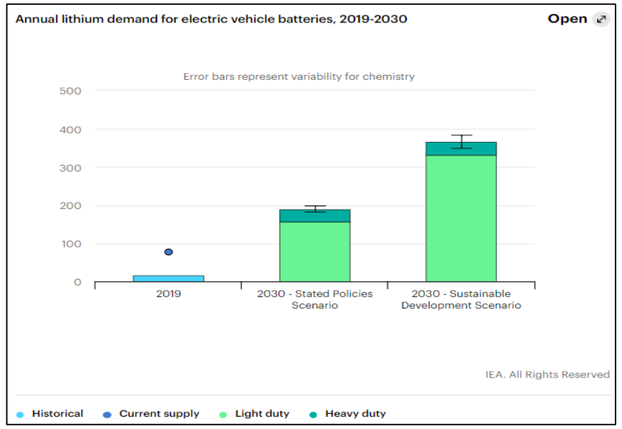
Lithium Iron Phosphate

Lithium (carbonate and hydroxide), iron, phosphate

Major increases are necessary under most scenarios

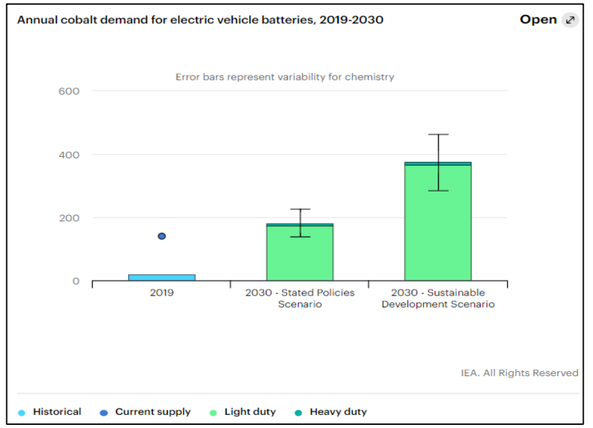
Lithium

International Energy Agency: lithium demand from EVs

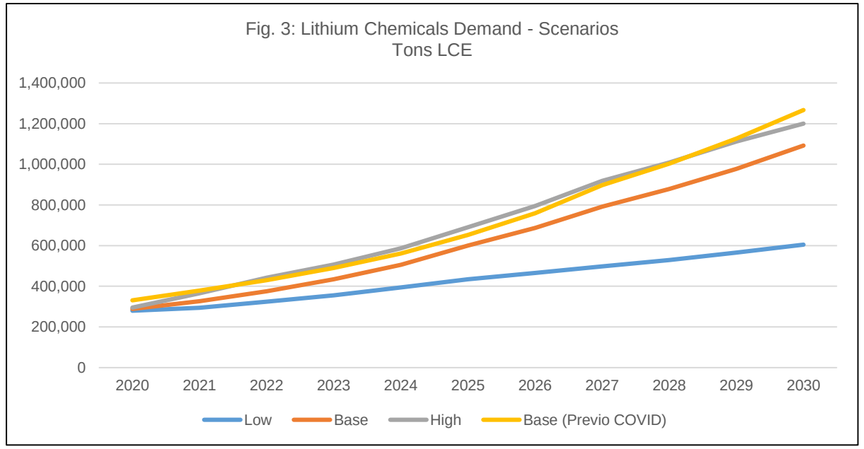


Cobalt

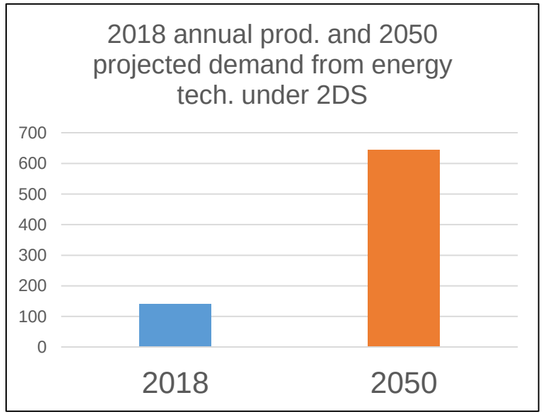
International Energy Agency: cobalt demand from EVs



SignumBOX: lithium demand under various scenarios

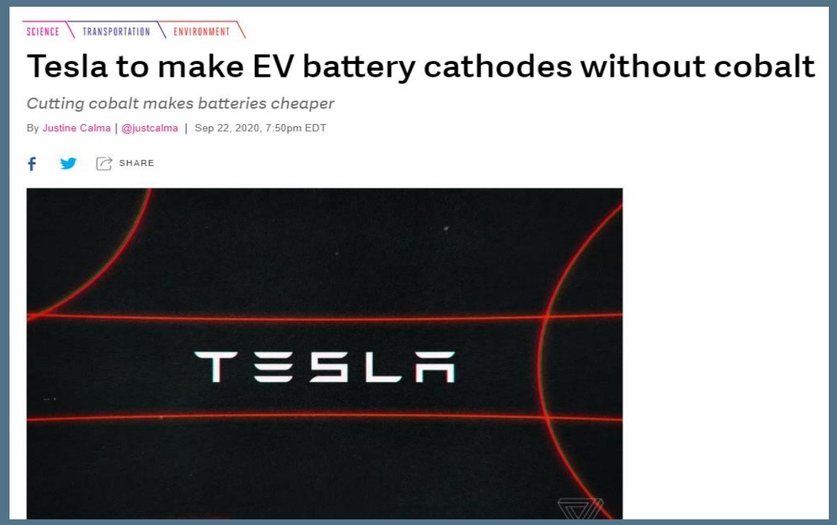


World Bank: cobalt demand from energy tech by 2050 under 2DS



Several factors make the precise growth in mineral demand difficult to predict

- EV growth linked to overall health of global economy
- Unstable policy commitments on Evs in some major economies (U.S., e.g.)
- Rapid technological change in battery composition and technologies
- In particular, supply chain challenges with cobalt are prompting research to reduce cobalt content
- Uncertainty around pace of uptake of battery recycling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Tesla to make EV battery cathodes without cobalt

Cutting cobalt makes batteries cheaper

By Justine Calma | @justcalma | Sep 22, 2020, 7:50pm EDT

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Image sources: Clean Technica; The Verge

Outline

1. The evolution of electric vehicle markets and mineral inputs
2. Supply chain structure and impacts on producers
3. International “clean battery” initiatives

A word on major vs. minor metals





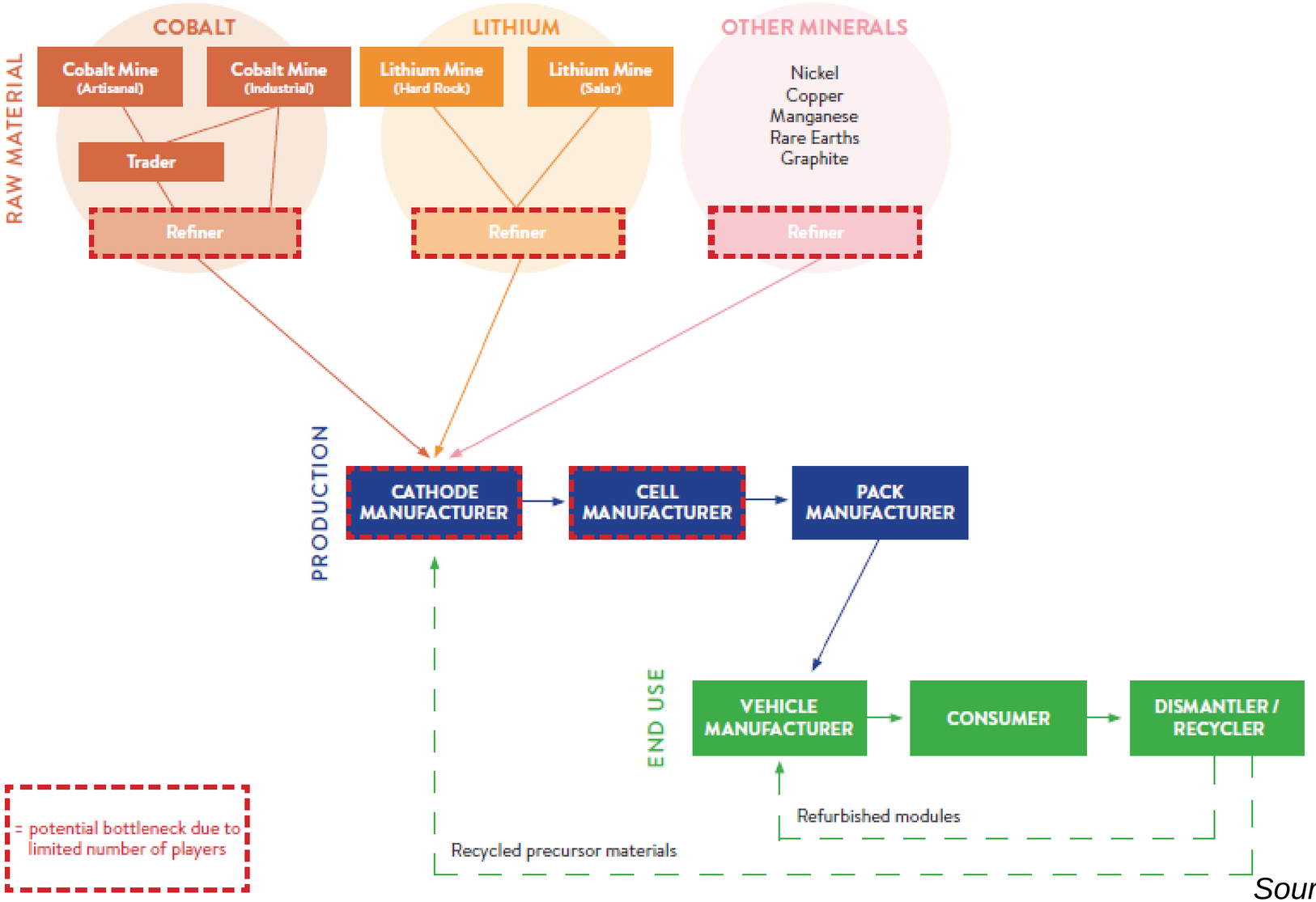
Major Metals

- Wide range of uses
- Mature markets with transparent pricing
- Abundant supply, usually with wide range of sources
- Can typically be transported and stored easily

Minor/Specialized Metals

- Use is limited to certain dominant outputs, particular chemical composition tailored to use
- Smaller number of players in marketplace
- Sometimes exist as biproducts of a major metal
- Transport and storage can be challenging

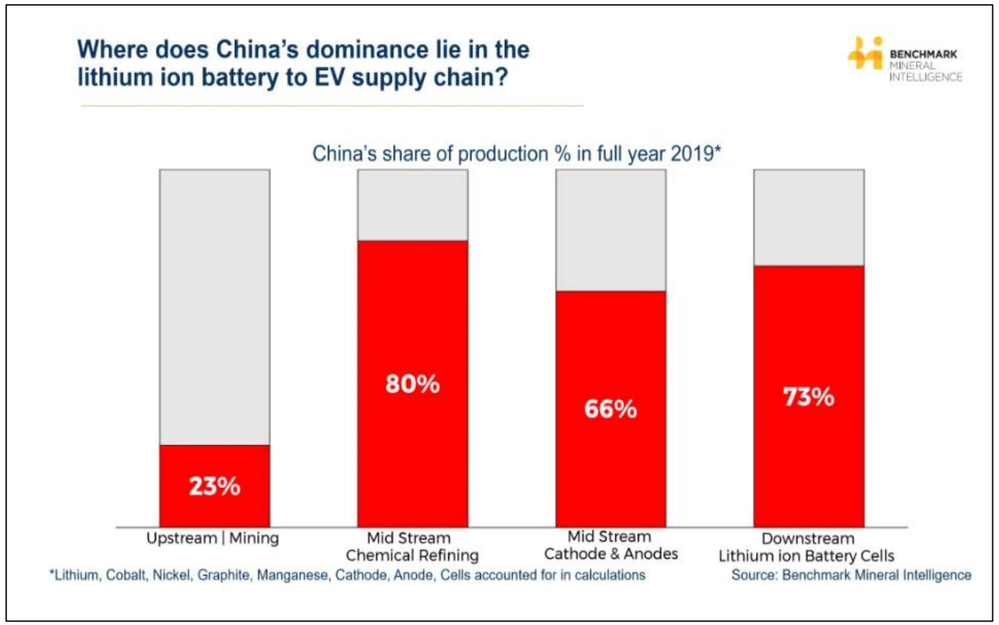
Supply Chain Structure



Source: [CLEE and NRGI]

Market structure – some factors impacting governance

1. Bottlenecks in the supply chain. Concentrated number of players
2. Mineral outputs highly linked to specific uses
3. International price mechanisms are not well-developed
4. Value lost in transportation/storage



Source: [Benchmark Mineral Intelligence]

Some implications:

- Monitoring/regulating value can be a challenge
- Planning can be unpredictable
- Contractual relationships up the supply chain carry long-term weight
- Geopolitics intensifies lobbying
- Value addition can be challenging

Market structure – some factors impacting governance

5. Industry in significant flux, with unpredictable changes in demand, technology, and investment/supply.

Prospect of major assets changing hands, in cobalt especially.

Transparency remains limited.

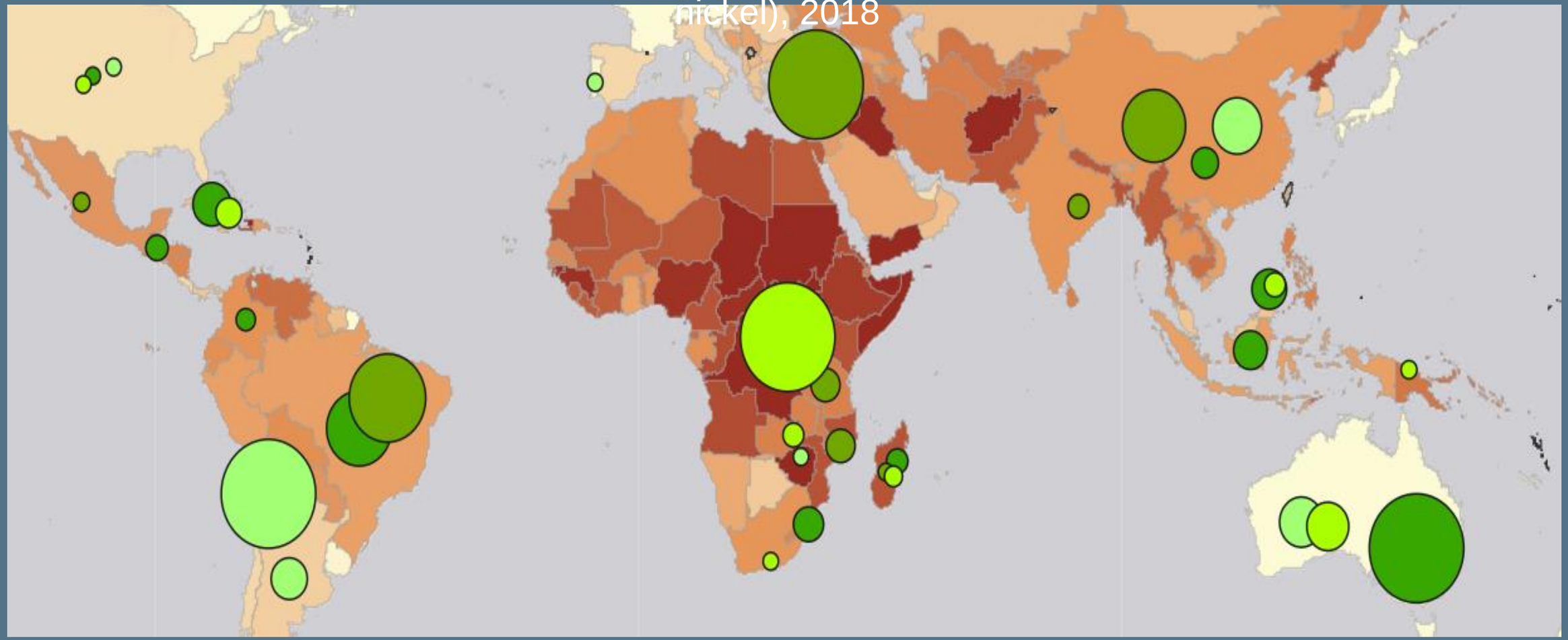
Image Source: Mining.com

Some implications:

- Risks of significant swings, especially if you look out 10+ years; governments must engage in risk-management
- Transparency and guarding against conflict of interest are key, especially in licensing and transfer of stakes

6. Large reserves found in fragile developing countries

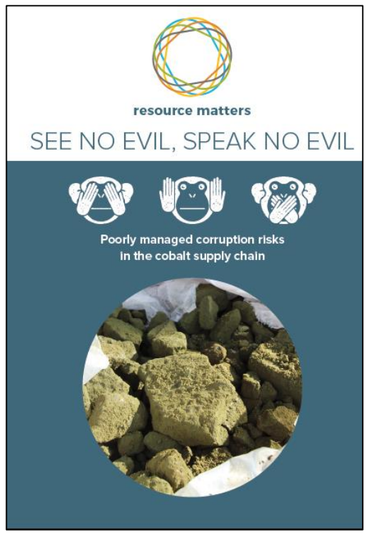
IISD's "Green Conflict Minerals" map for selected battery minerals (cobalt, graphite, lithium, nickel), 2018



Source: International Institute for Sustainable Development

Cobalt and the DRC play an outsized role in the discourse

- 60% of global production
- Significant share (10 – 30%) comes from artisanal production, with severe risks of environmental impact, harm to workers, child labor
- Major corruption scandals in the industrial mining sector
- History of other minerals fueling long-standing conflict
- Cobalt has been mined as a biproduct of copper, and economic model in need of adaptation



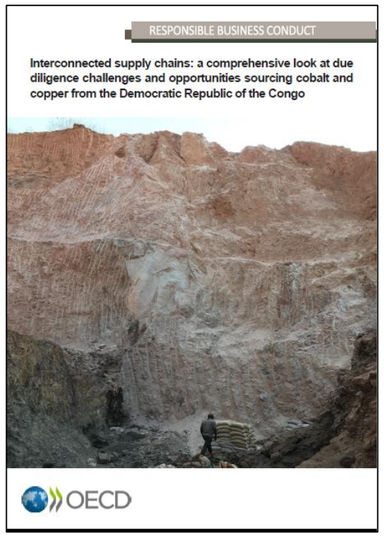


Image Sources: Resource Matters, Al Jazeera, OECD

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Connecting to the clean energy narrative

1. Leveraging consumer interest
2. Pushing for meaningful reform and long-term sustainability
3. Blunting propaganda from fossil-fuel interests

A proliferation of international initiatives

中国五矿化工进出口商会
China Chamber of Commerce of Metals,
Minerals & Chemicals Importers & Exporters

Taxonomy of initiatives: overlap/difference across various dimensions

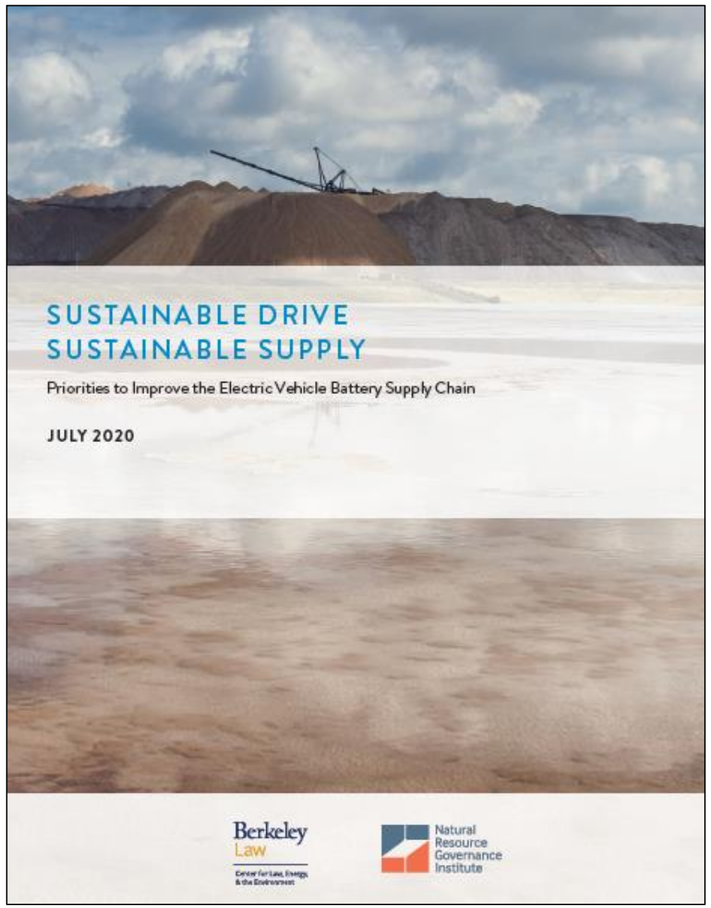
Company A Sustainability Standard Adherence Matrix

	Content				Participants					Implementation									Application				Scope	Enforcement				Sponsor			Links
					GOV-ERN-MENT	INDUSTRY		CIVIL SOCIETY	INVES-TORS	GOVERNMENT			INDUSTRY / INVESTORS & FINANCE			CIVIL SOCIETY															
STANDARD X	Human Rights	Violent Conflicct	Labor Rights		Federal / National	Mining	Mid-Stream	National	Equity	Dilg. Policy.	Corp. Mgmt.	Train./ P'ship.	Dilg. Policy.	Corp. Mgmt.	Train./ P'ship.	Dilig. Policy.	Corp. Mgmt.	Train./ P'ship.	Mining	Trad-ing	Refin-ing	Cath. Mfr.	Universal	Leg. Sanc.	De-Cert.	Down-grade		State Gov.	Intl. Org.	Trade Assn.	
	Local Economy	Local	Cilmate Change	Reuse & Recycling	Local / State	Refining / Process-ing	Down-Stream	Interna-tionl	Debt	Intl. Reptg.	3P Reptg.	Pub. Reptg.	Intl. Reptg.	3P Reptg.	Pub. Reptg.	Intl. Reptg.	3P Reptg.	Pub. Reptg.	Cell Mfr.	Batt. Asm.	Veh. Mfr.	Batt. Recy.	Limited	Cnsmr. Rep.	Invstr. Rep.	Market Rep.	Gov. Rep.	Civ. Soc.	ppp		
								Local Commu-nity		Active Diseng	Sanct-ions	Over-sight	Active Diseng	Compl/ Griev.		Active Diseng															
STANDARD X					GOV-ERN-MENT	INDUSTRY		CIVIL SOCIETY	INVES-TORS	GOVERNMENT			INDUSTRY / INVESTORS & FINANCE			CIVIL SOCIETY															
	Human Rights	Violent Conflicct	Labor Rights		Federal / National	Mining	Mid-Stream	National	Equity	Dilg. Policy.	Corp. Mgmt.	Train./ P'ship.	Dilg. Policy.	Corp. Mgmt.	Train./ P'ship.	Dilig. Policy.	Corp. Mgmt.	Train./ P'ship.	Mining	Trad-ing	Refin-ing	Cath. Mfr.	Universal	Leg. Sanc.	De-Cert.	Down-grade		State Gov.	Intl. Org.	Trade Assn.	
	Local Economy	Local	Cilmate Change	Reuse & Recycling	Local / State	Refining / Process-ing	Down-Stream	Interna-tionl	Debt	Intl. Reptg.	3P Reptg.	Pub. Reptg.	Intl. Reptg.	3P Reptg.	Pub. Reptg.	Intl. Reptg.	3P Reptg.	Pub. Reptg.	Cell Mfr.	Batt. Asm.	Veh. Mfr.	Batt. Recy.	Limited	Cnsmr. Rep.	Invstr. Rep.	Market Rep.	Gov. Rep.	Civ. Soc.	ppp		
								Local Commu-nity		Active Diseng	Sanct-ions	Over-sight	Active Diseng	Compl/ Griev.		Active Diseng															

- Content (human rights, conflict, labor, local econ. impact, local env., climate, re-use/recycling
- Participants (govt, CSOs, industry, investors)
- Mechanisms for implementation
- Application (where in the supply chain)
- Scope (all minerals or prescribed ones)
- Enforcement (legal penalty, certification, reputation)
- Sponsor (government, international org., CSO, PPP)

International initiatives – observations for Latin American CSOs

1. Poor coordination among initiatives
2. Challenging to determine where to concentrate resources
3. Enforcement and sanction mechanisms are generally weak
4. Connections to on-the-ground stakeholders tend to be distant
5. Need for better connections between human rights, environmental and governance agendas
6. Major drivers and content focus on issues related to cobalt and DRC – opportunities for a richer approach to the challenges of mineral governance in Latin America



Legislation in upstream and consumer/downstream countries can have an impact

1. European Commission expected to release draft law on sustainable batteries
2. Anti-corruption laws in UK, US, France, other jurisdictions
3. National legislation, including on transparency and governance in mineral-producer countries

Key takeaways

1. The market structures for critical minerals create several specific challenges to effective governance in the producer countries. Detailed assessment of the market for each mineral is essential.
2. The growing consumer interest in “making clean batteries clean” can help generate leverage for reform to increase sustainability.
3. Civil society groups from the region can help fill gaps in the inclusiveness and the content of leading battery sustainability initiatives.

Thank you

www.resourcegovernance.org
www.law.berkeley.edu/research/clee/

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