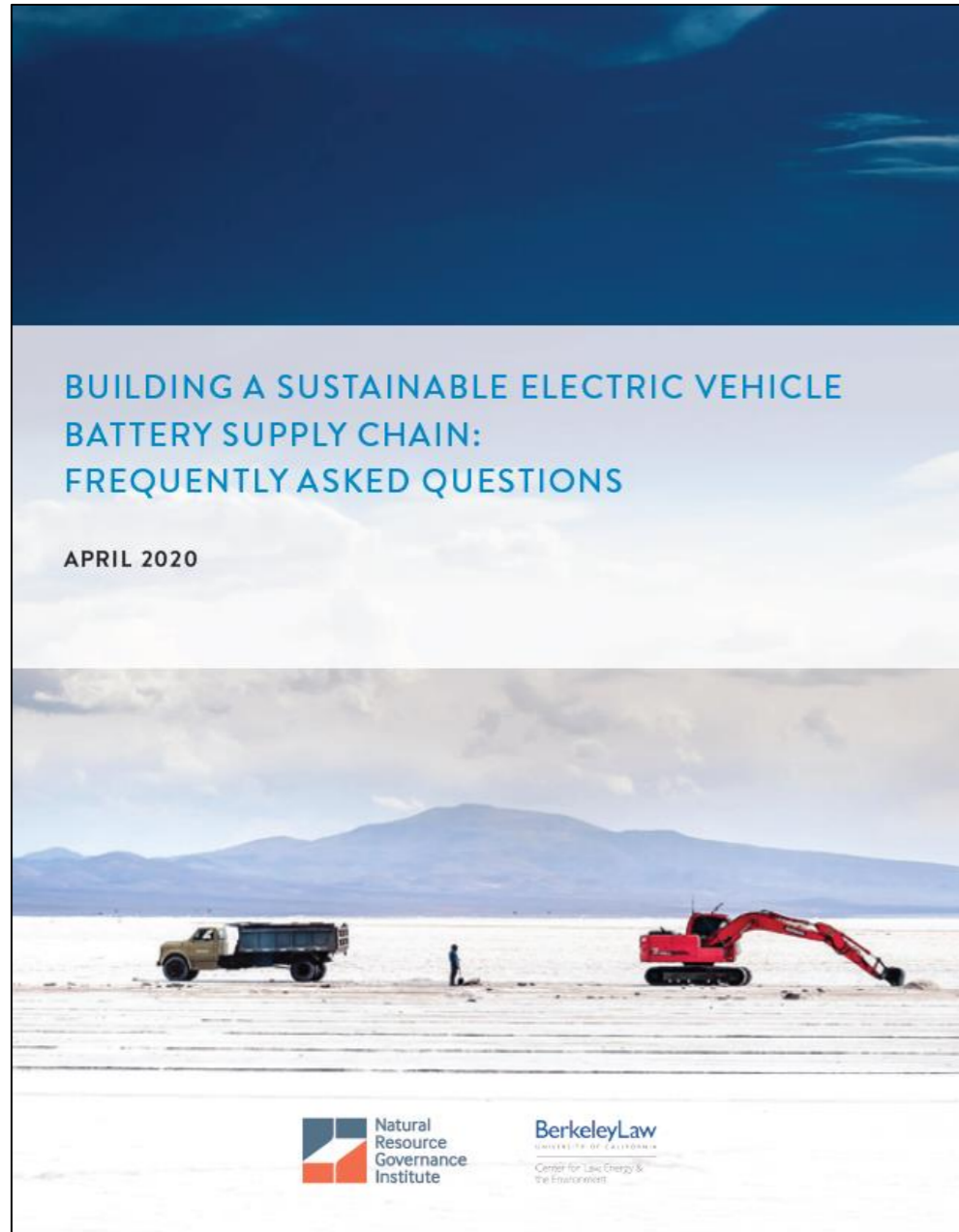


# The global electric vehicle supply chain: Governance implications

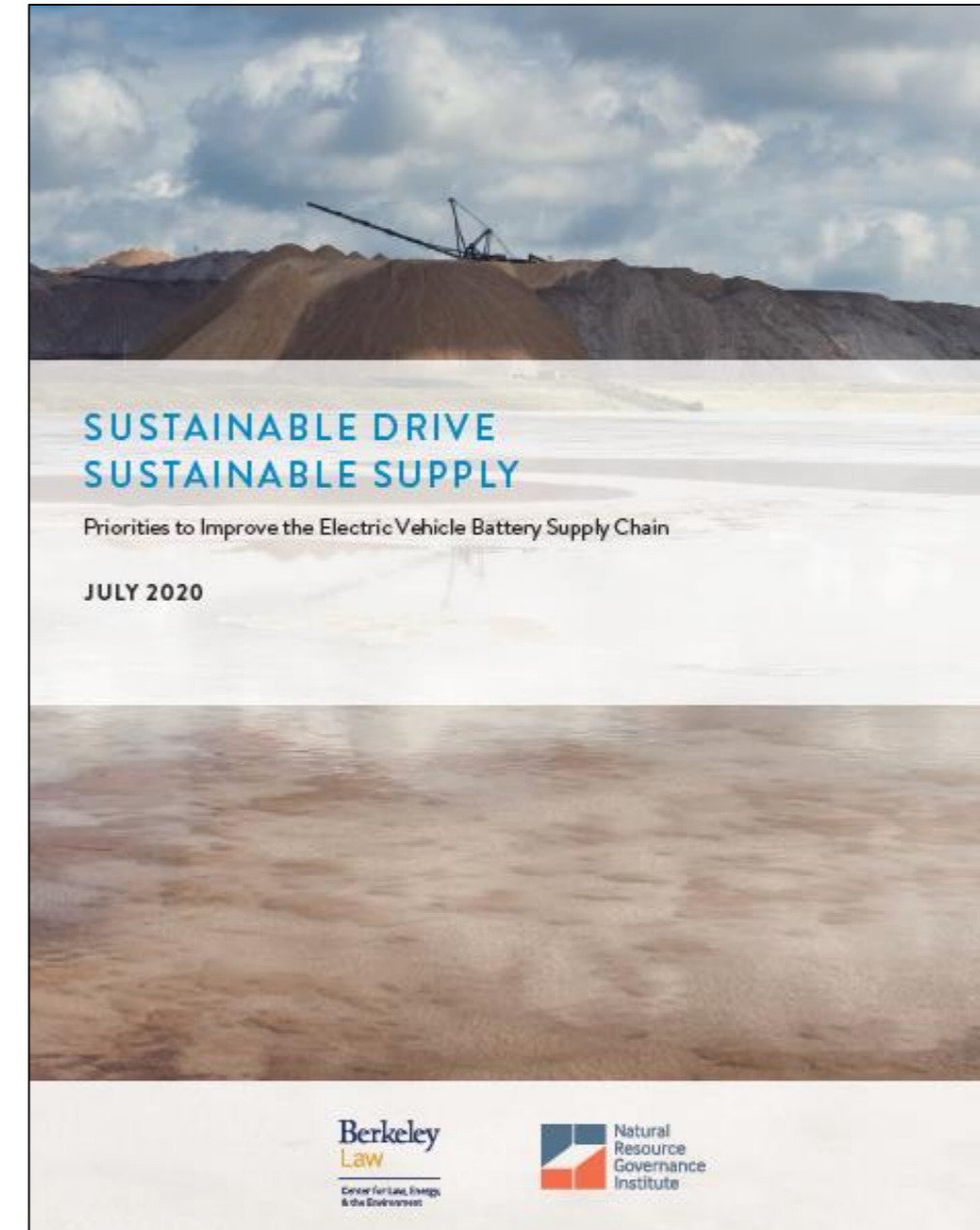
Patrick Heller

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

November 25, 2020



Source: [CLEE and NRG](#)



Source: [CLEE and NRG](#)

## Outline

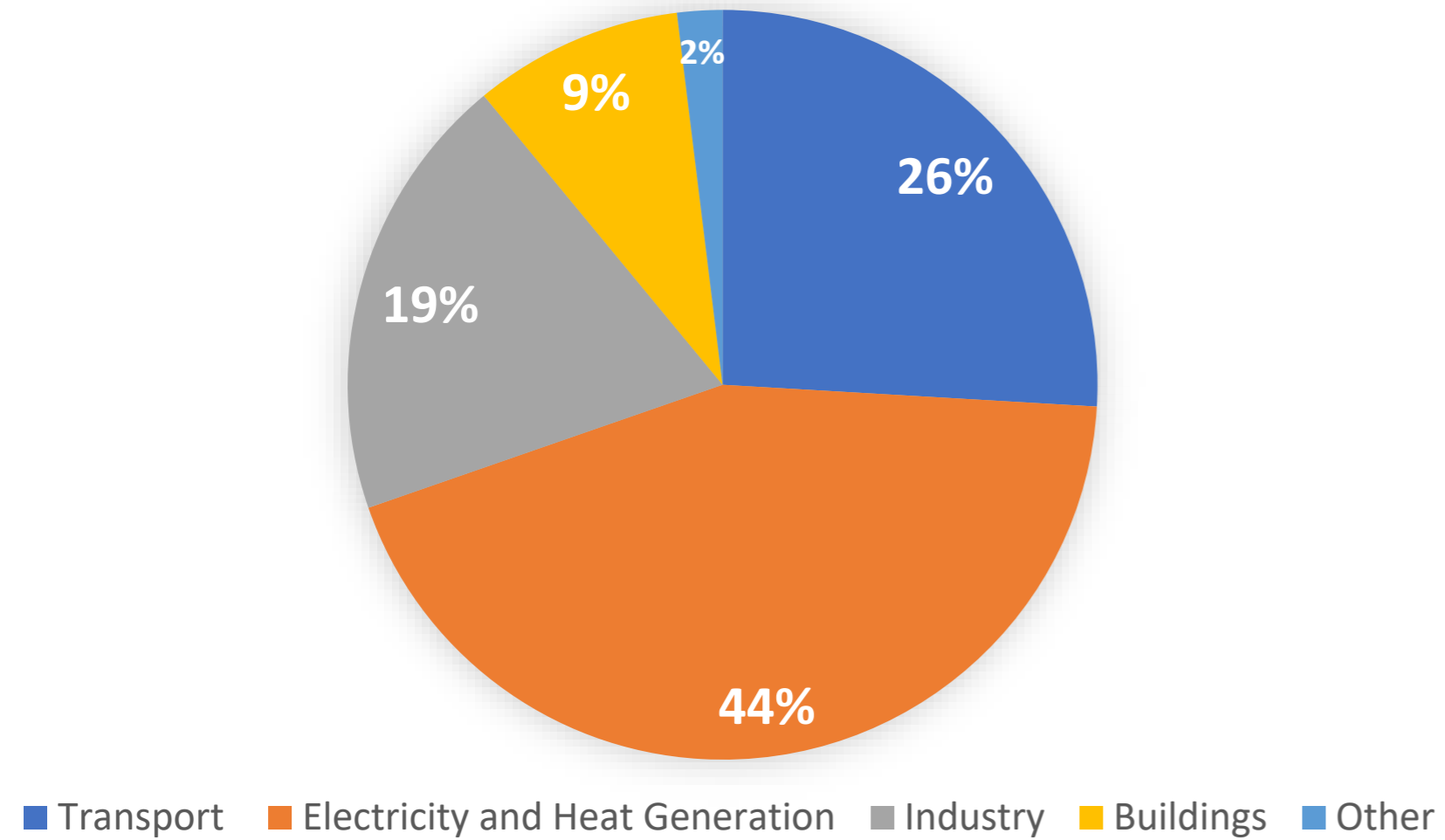
1. The evolution of electric vehicle markets and mineral inputs
2. Supply chain structure and impacts on producers
3. International “clean battery” initiatives

## Outline

1. The evolution of electric vehicle markets and mineral inputs
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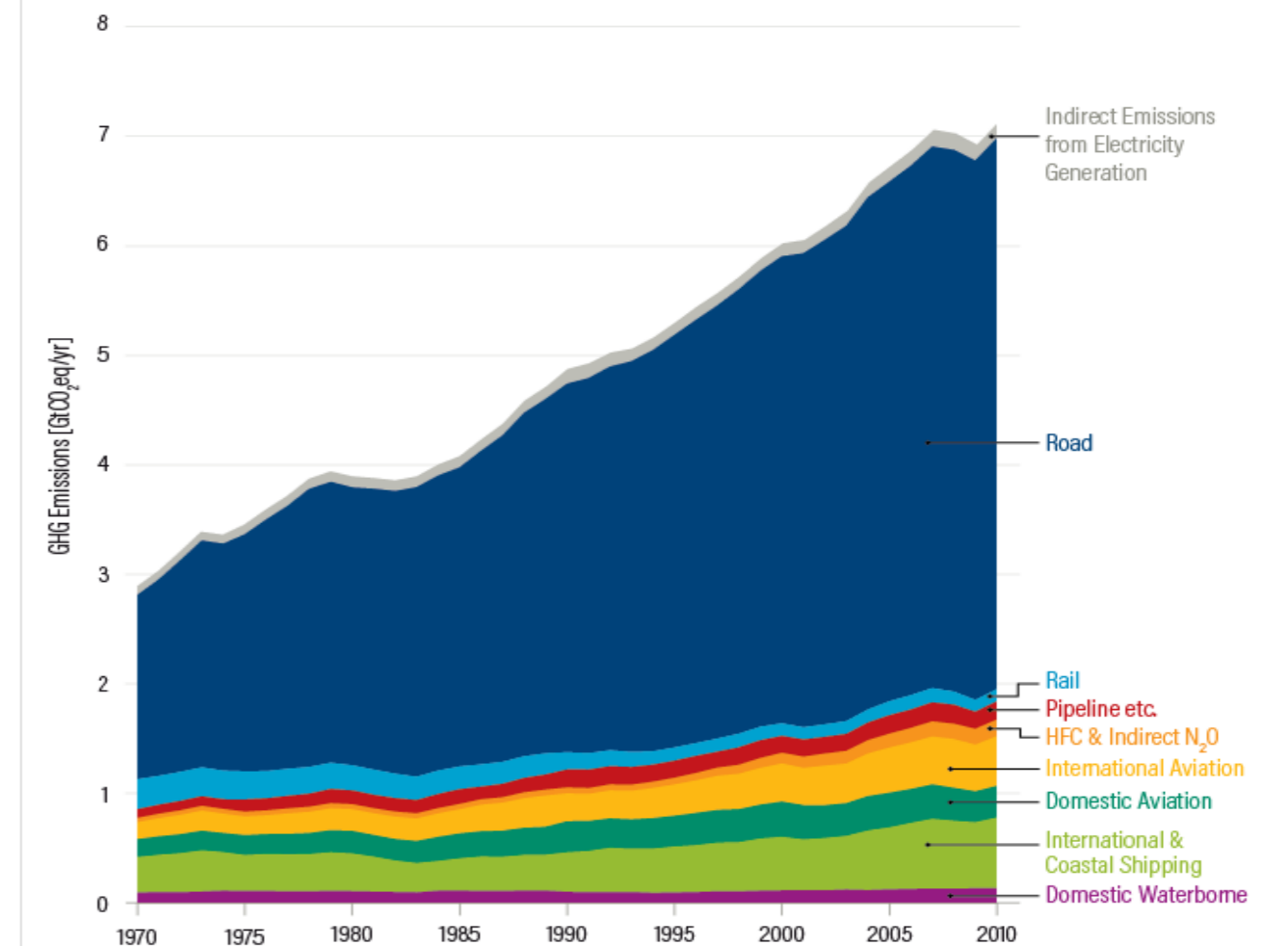
# Internal combustion vehicles and global emissions

Global CO<sub>2</sub> emissions by sector, 2018



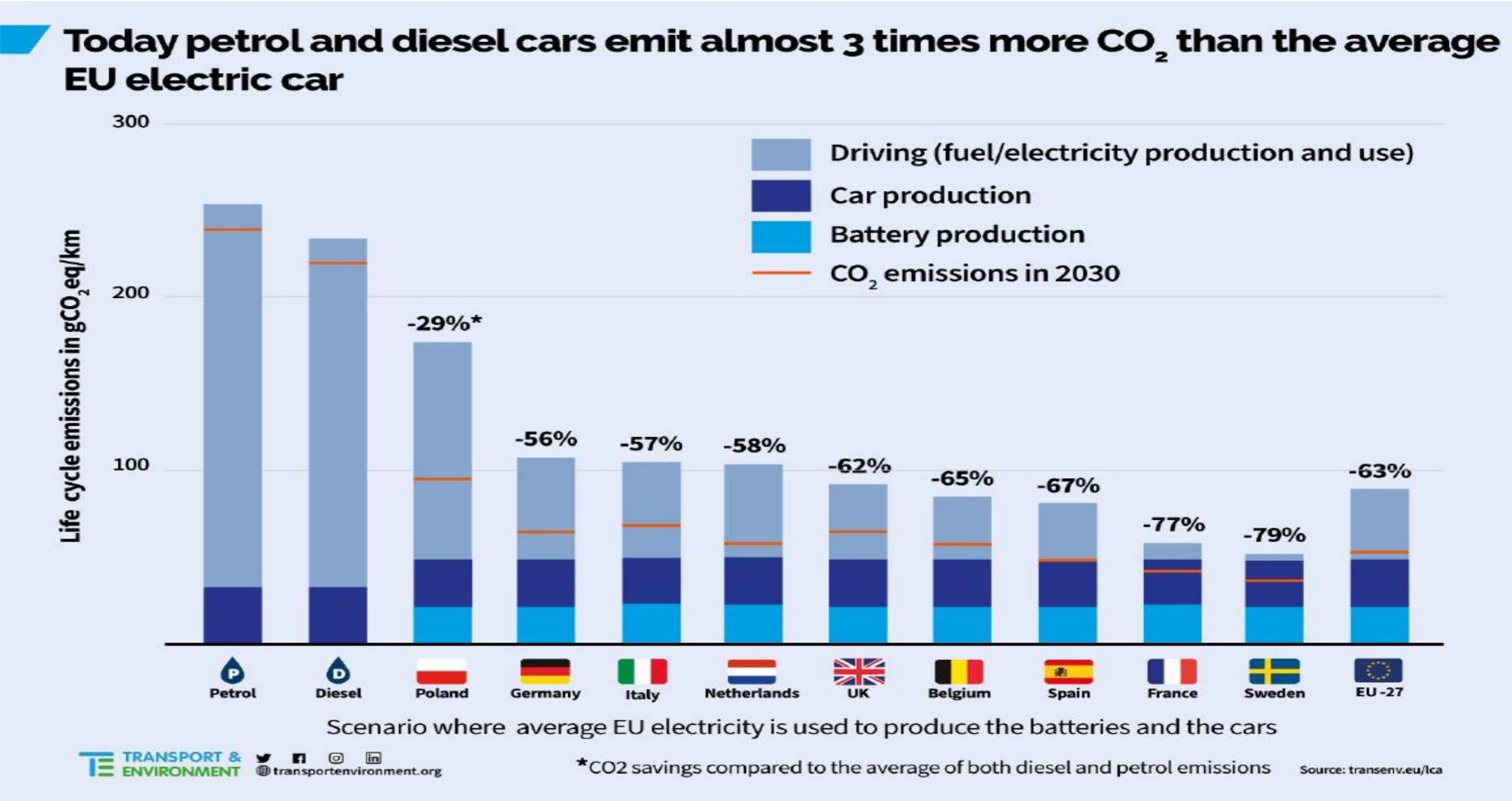
Source: [International Energy Agency](#)

Where do transport emissions come from?



Source: [World Resources Institute](#)

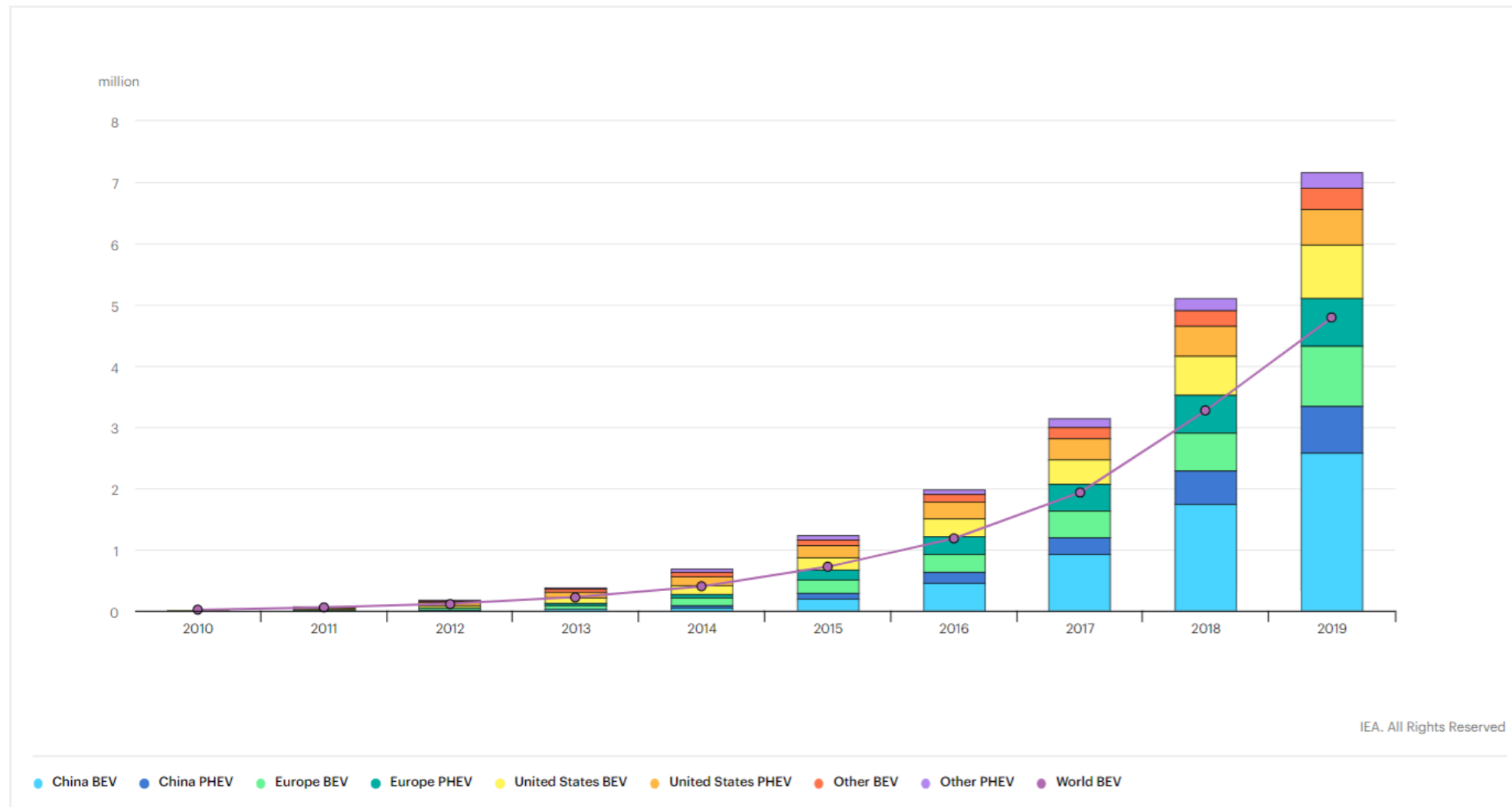
# Electric Vehicles produce dramatically lower greenhouse gas emissions than internal combustion vehicles



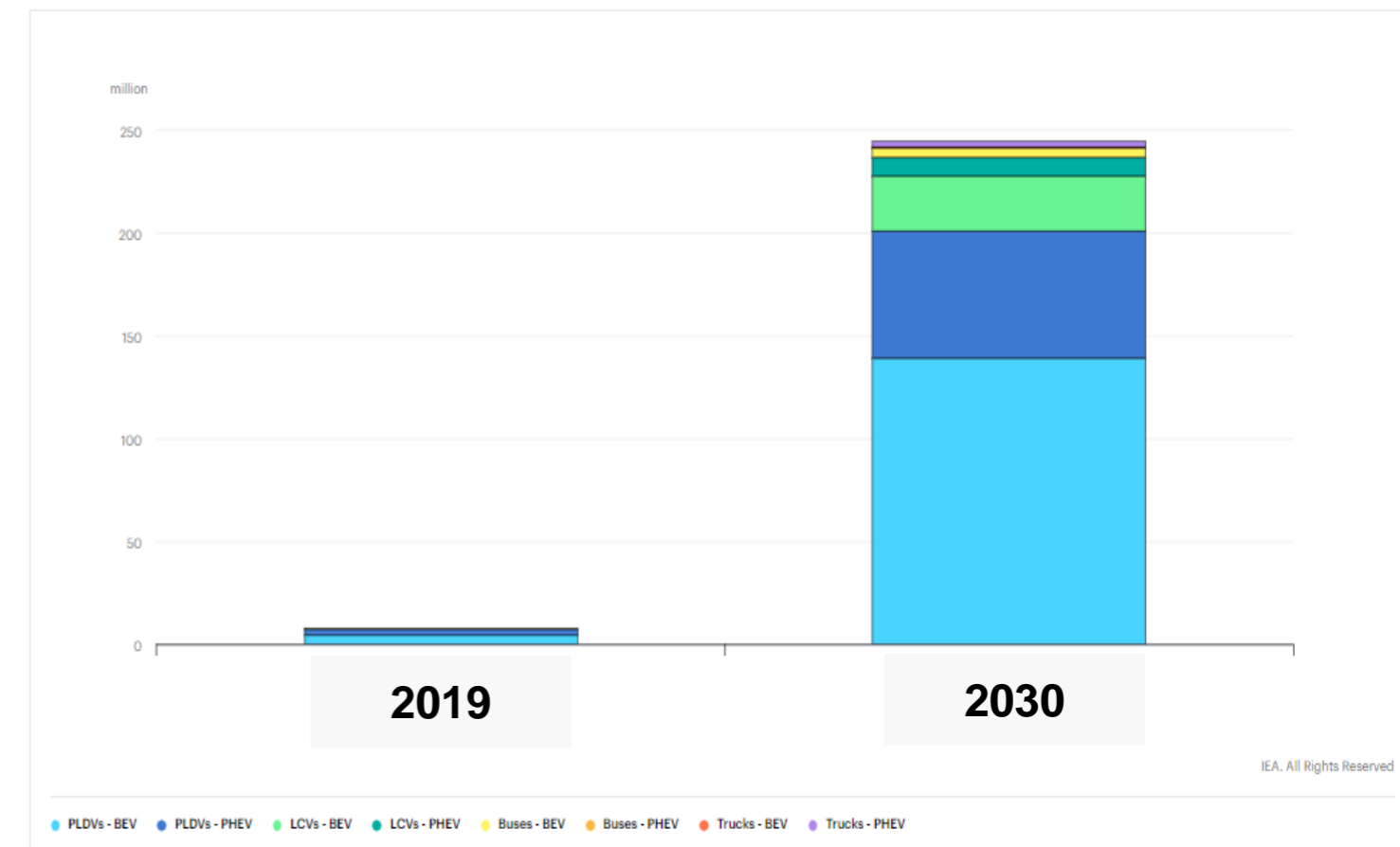
Source: [Transport & Environment](https://transenv.eu)

# 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



# Growing commitments to shift away from internal combustion vehicles

## UK set to ban sale of new petrol and diesel cars from 2050

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

## 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 | @andyjrhawk | Sep 23, 2020, 2:00pm EDT

SHARE

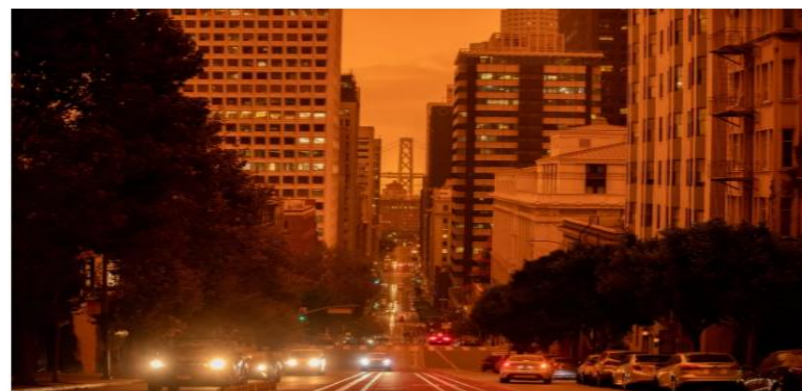
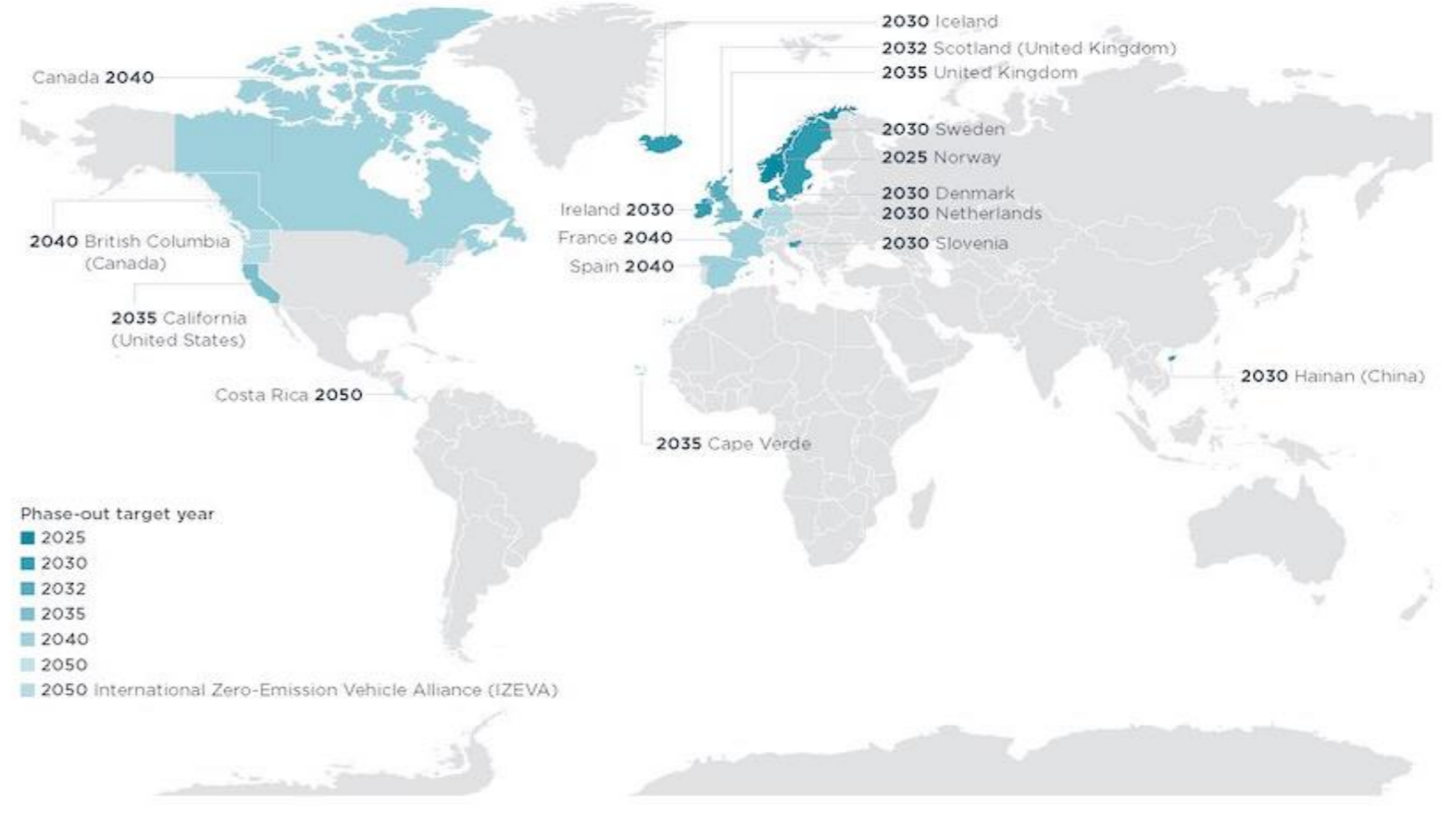


Photo by Ray Chavez/MediaNews Group/The Mercury News via Getty Images

## Governments with set targets for phasing out all new sales of internal combustion engine passenger cars





# 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)

## Nickel Cobalt Aluminum

Lithium (carbonate),  
cobalt, nickel, aluminum

## Lithium Manganese Oxide

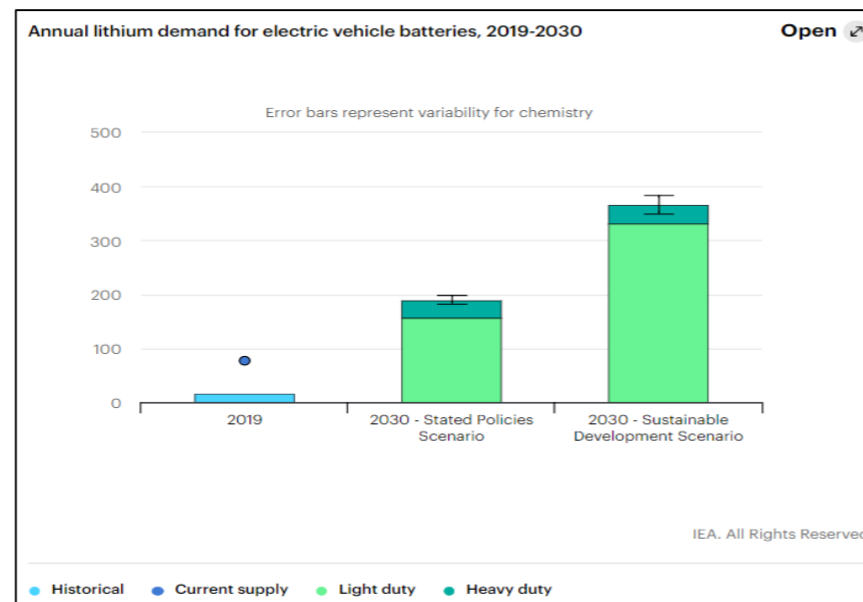
Lithium (carbonate),  
manganese,

## Lithium Iron Phosphate

Lithium (carbonate and  
hydroxide), iron,  
phosphate

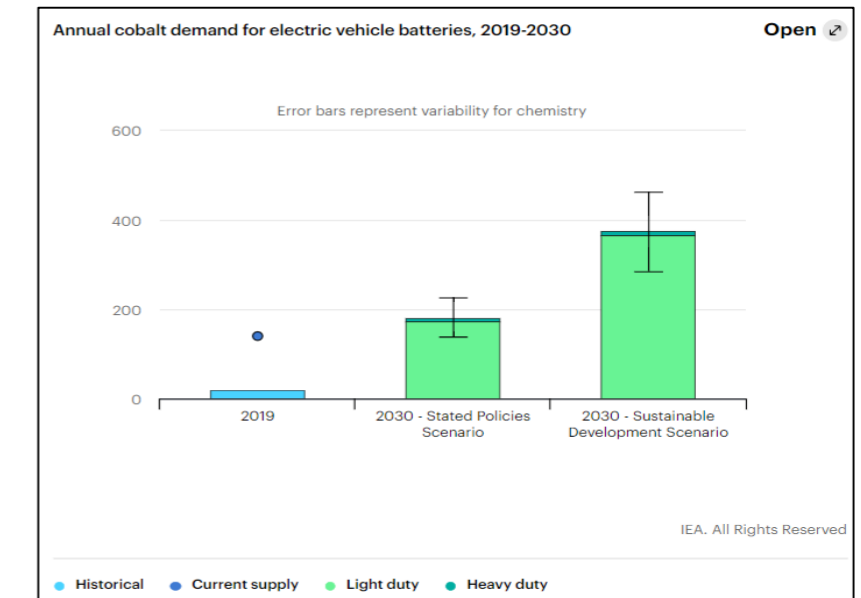
# Major increases are necessary under most scenarios

## Lithium

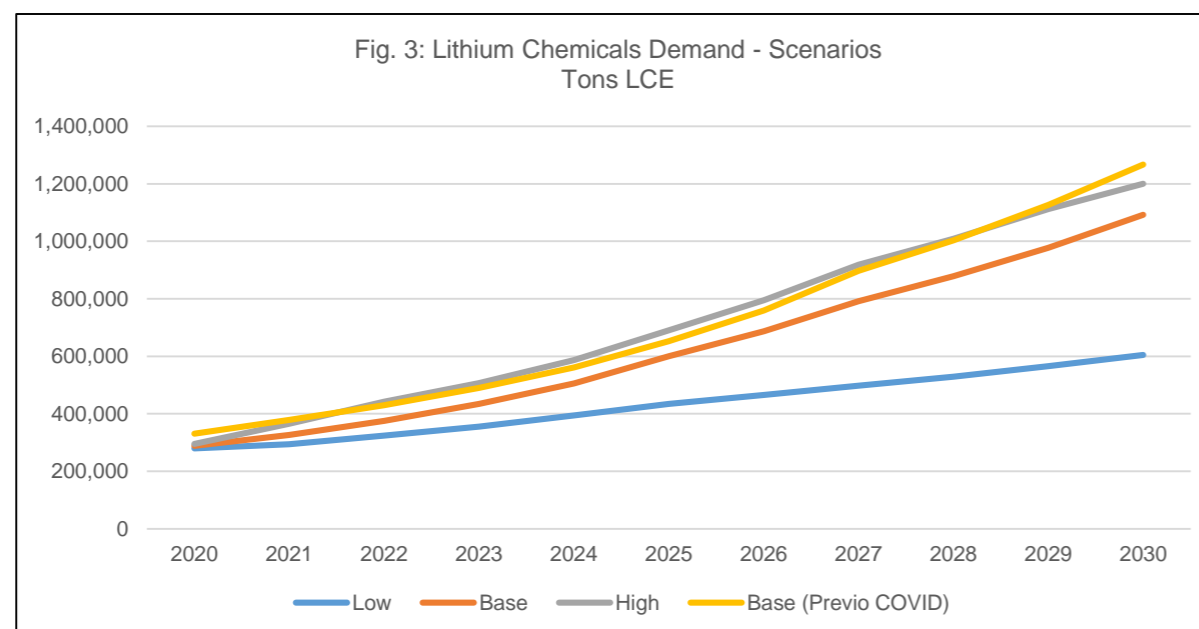


International Energy Agency:  
lithium demand from EVs

## Cobalt

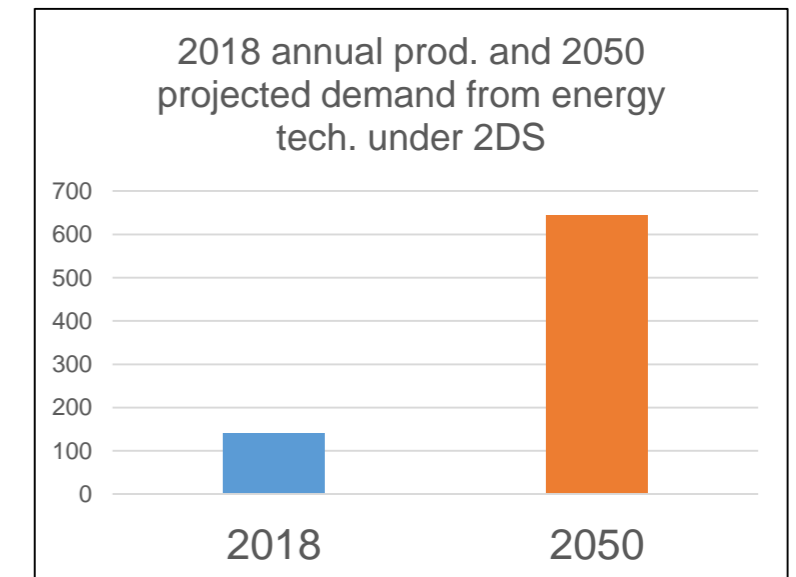


International Energy Agency:  
cobalt demand from EVs



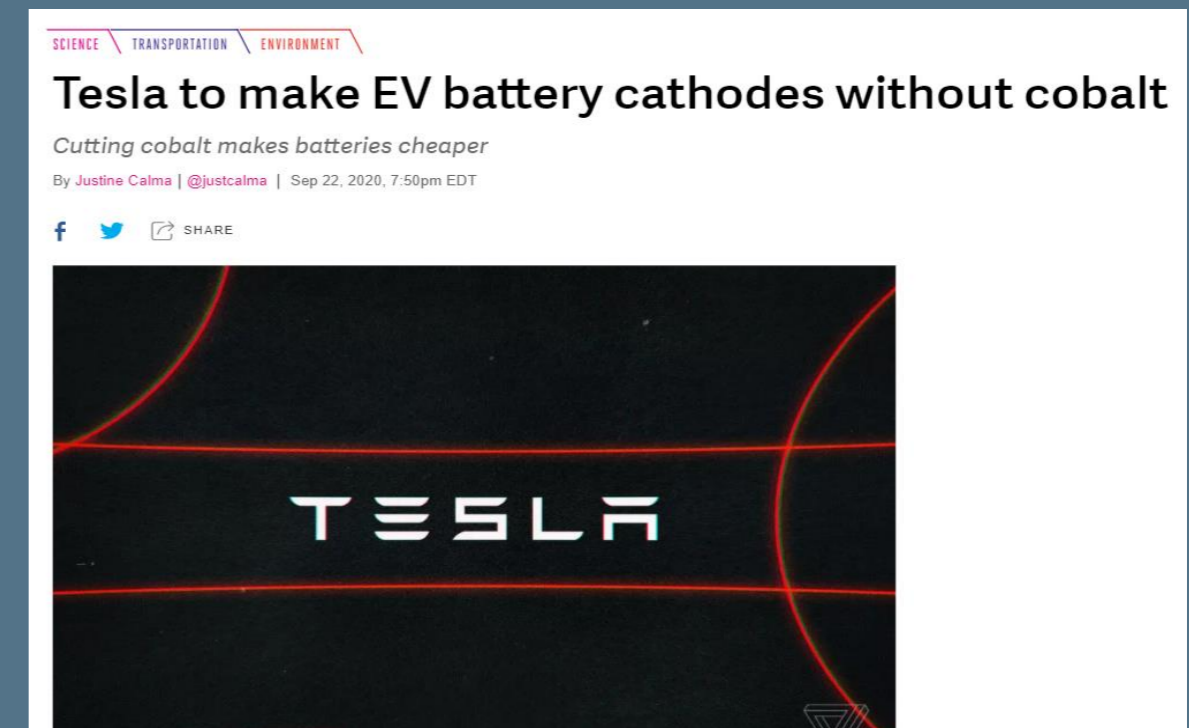
SignumBOX:  
lithium demand under various scenarios

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



## Outline

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# A word on major vs. minor metals



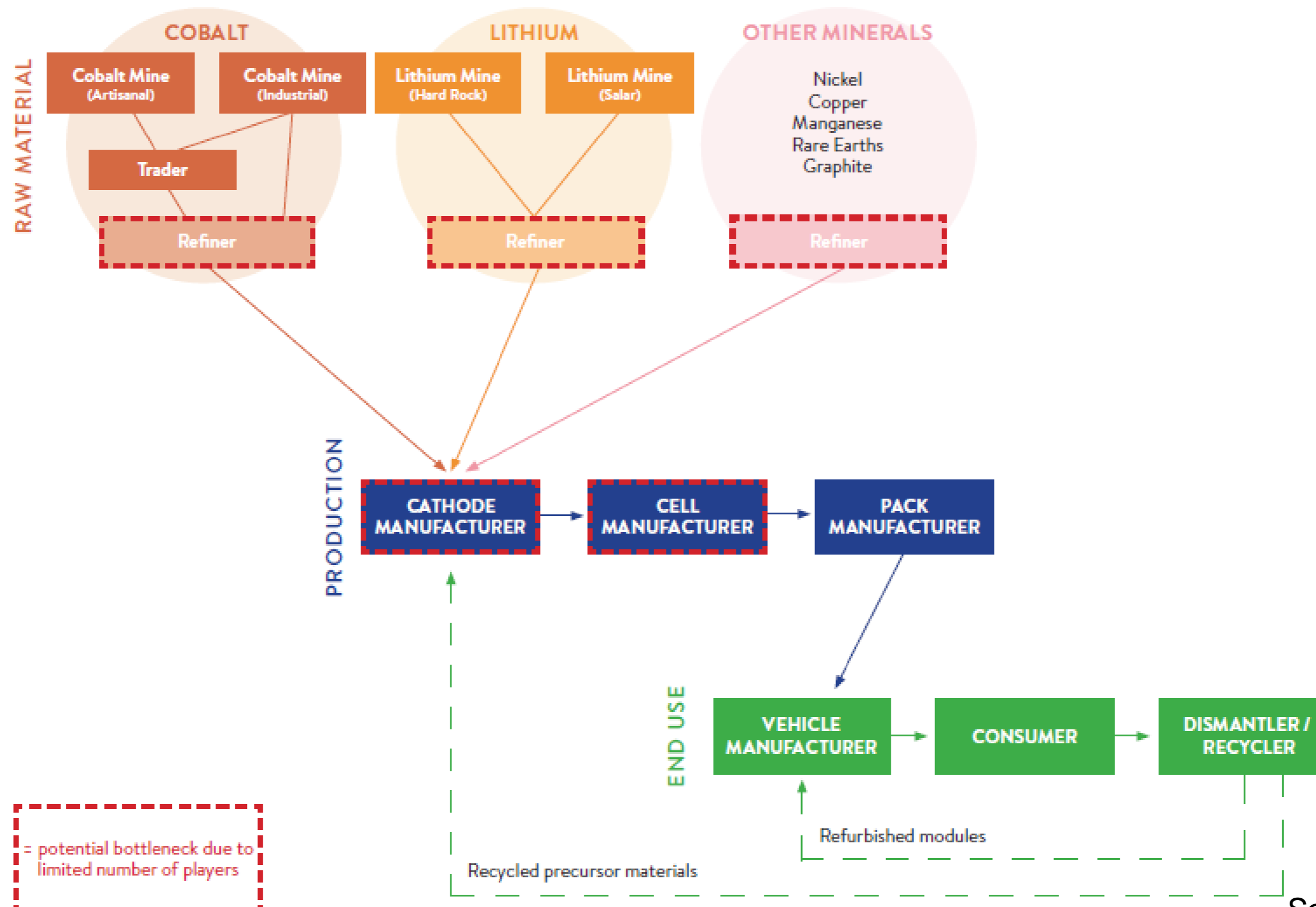
## Major Metals

- 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

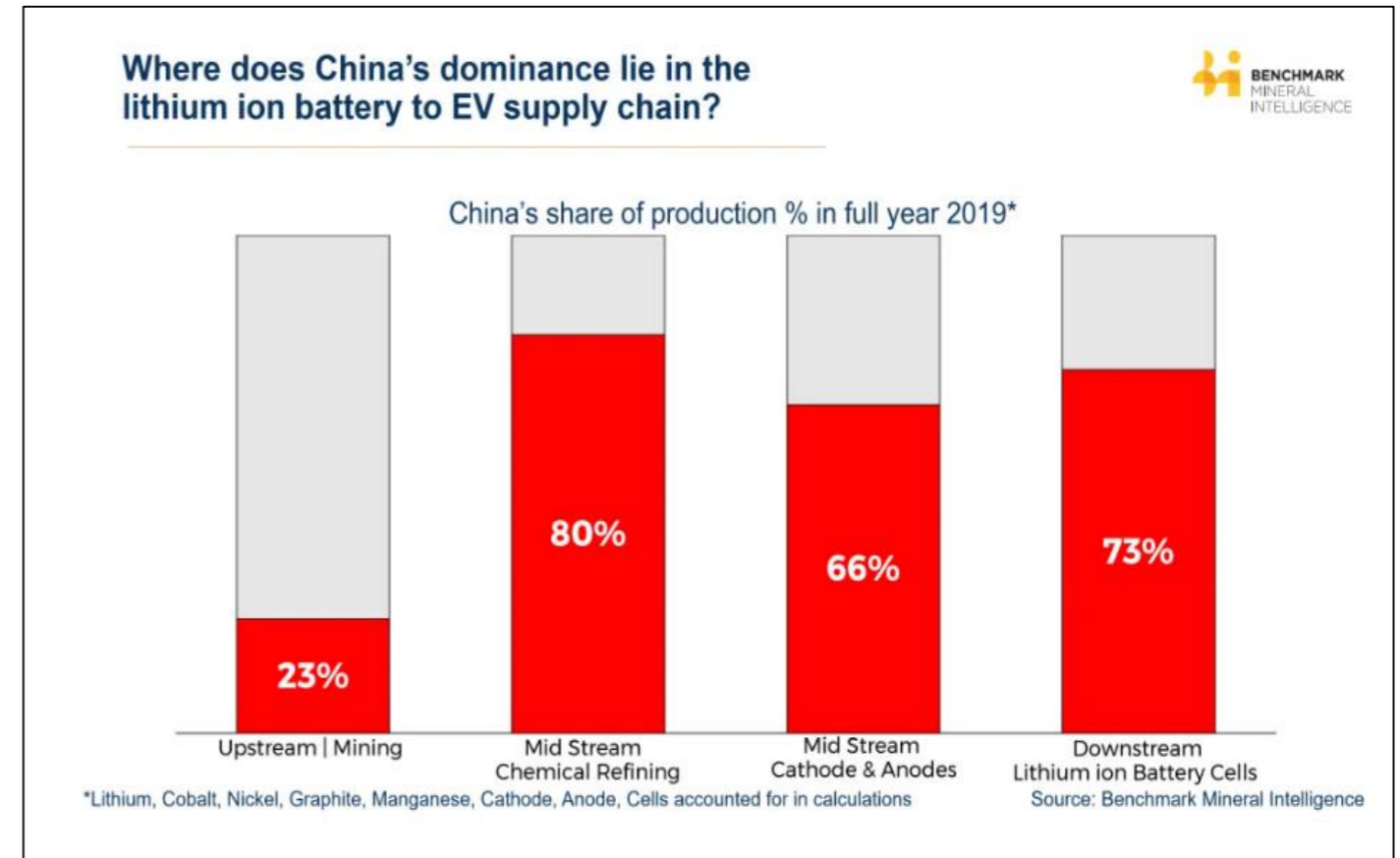
- Use is limited to certain dominant outputs, particular chemical composition tailored to use
- Smaller number of players in marketplace
- Sometimes exist as byproducts of a major metal
- Transport and storage can be challenging

# Supply Chain Structure



# 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](https://www.mining.com)

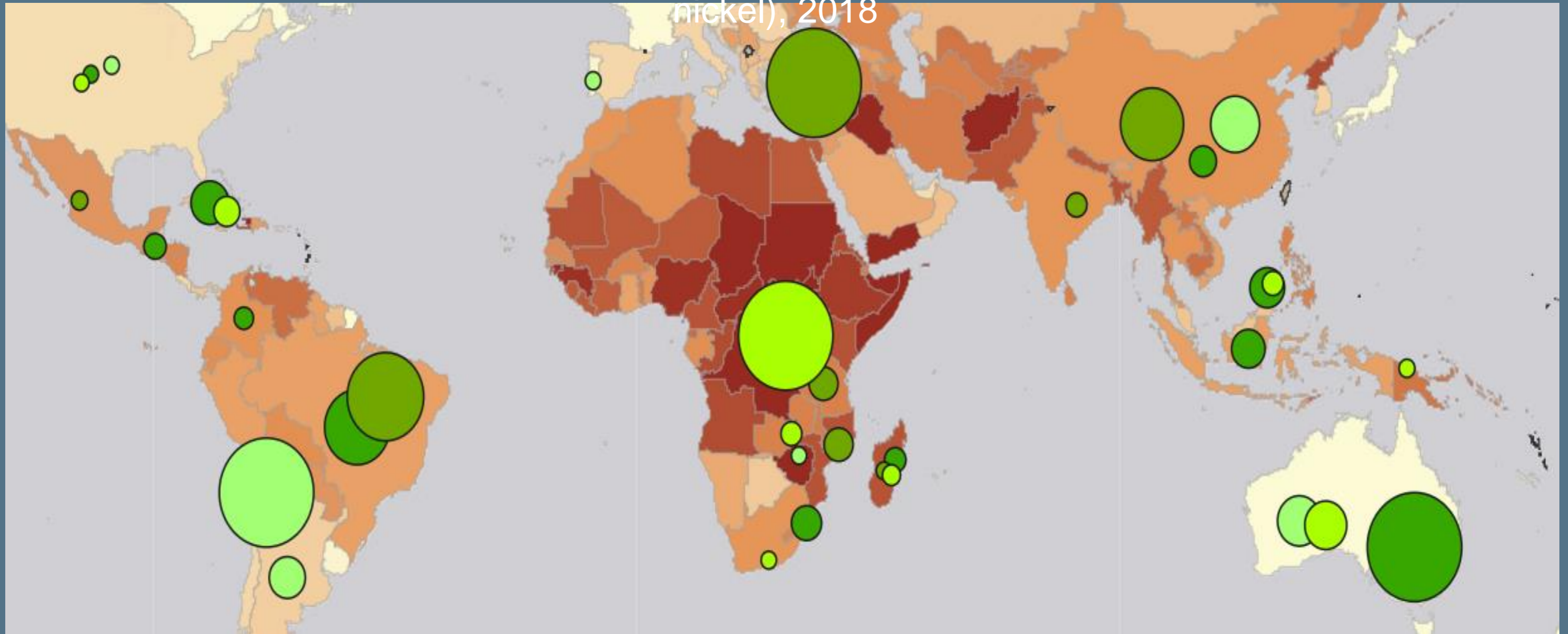
## Some implications:

- 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



# 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 byproduct of copper, and economic model in need of adaptation



## DR Congo mine collapse death toll rises to 43

Two galleries collapsed in an open-pit mine owned by Swiss mining giant Glencore, killing artisanal miners.



Artisanal miners usually work on their own with rudimentary mining tools on the outskirts of commercial mines [File: Kenny Katombe/Reuters]

28 Jun 2019



Image Sources: [Resource Matters](#), [Al Jazeera](#), [OECD](#)

## Outline

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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

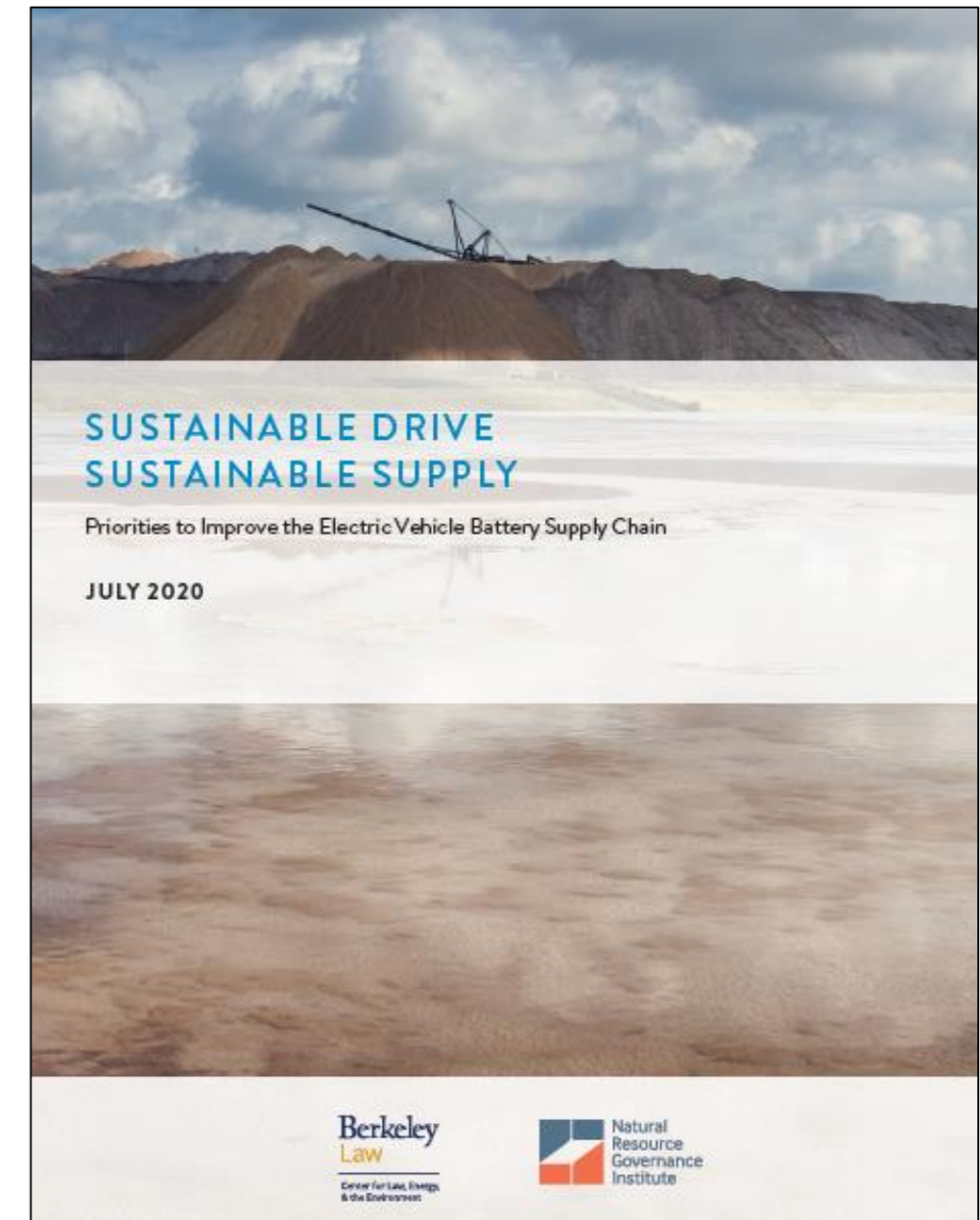
Company A Sustainability Standard Adherence Matrix

|            | Content       |                  |                |                   | Participants       |                       |             |                 | Implementation |                |             |                 |                                |               |                 |                |             | Application     |           |            |           | Scope       | Enforcement |             |              |             | Sponsor   |            |            | Links       |  |
|------------|---------------|------------------|----------------|-------------------|--------------------|-----------------------|-------------|-----------------|----------------|----------------|-------------|-----------------|--------------------------------|---------------|-----------------|----------------|-------------|-----------------|-----------|------------|-----------|-------------|-------------|-------------|--------------|-------------|-----------|------------|------------|-------------|--|
|            |               |                  |                |                   | GOVERNMENT         | INDUSTRY              |             | CIVIL SOCIETY   | INVESTORS      | GOVERNMENT     |             |                 | INDUSTRY / INVESTORS & FINANCE |               |                 | CIVIL SOCIETY  |             |                 |           |            |           |             |             |             |              |             |           |            |            |             |  |
| STANDARD X | Human Rights  | Violent Conflict | Labor Rights   |                   | Federal / National | Mining                | Mid-Stream  | National        | Equity         | Dilig. Policy. | Corp. Mgmt. | Train./ P'ship. | Dilig. Policy.                 | Corp. Mgmt.   | Train./ P'ship. | Dilig. Policy. | Corp. Mgmt. | Train./ P'ship. | Mining    | Trading    | Refining  | Cath. Mfr.  | Universal   | Leg. Sanc.  | De-Cert.     | Down-grade  |           | State Gov. | Intl. Org. | Trade Assn. |  |
|            | Local Economy | Local            | Climate Change | Reuse & Recycling | Local / State      | Refining / Processing | Down-Stream | International   | 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 Community |                | Active Diseng  | Sanctions   | Over-sight      | Active Diseng                  | Compl/ Griev. |                 | Active Diseng  |             |                 |           |            |           |             |             |             |              |             |           |            |            |             |  |
| STANDARD X | Human Rights  | Violent Conflict | Labor Rights   |                   | Federal / National | Mining                | Mid-Stream  | National        | Equity         | Dilig. Policy. | Corp. Mgmt. | Train./ P'ship. | Dilig. Policy.                 | Corp. Mgmt.   | Train./ P'ship. | Dilig. Policy. | Corp. Mgmt. | Train./ P'ship. | Mining    | Trading    | Refining  | Cath. Mfr.  | Universal   | Leg. Sanc.  | De-Cert.     | Down-grade  |           | State Gov. | Intl. Org. | Trade Assn. |  |
|            | Local Economy | Local            | Climate Change | Reuse & Recycling | Local / State      | Refining / Processing | Down-Stream | International   | 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 Community |                | Active Diseng  | Sanctions   | 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](http://www.resourcegovernance.org)

[www.law.berkeley.edu/research/clee/](http://www.law.berkeley.edu/research/clee/)

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