The global electric vehicle supply chain: Governance implications

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

Global CO₂ emissions by sector, 2018

- Transport: 44%
- Electricity and Heat Generation: 26%
- Industry: 19%
- Buildings: 9%
- Other: 2%

Where do transport emissions come from?

- Road
- Pipeline etc.
- H&C & Induced N.D.
- International Aviation
- International & Coastal Shipping
- Domestic Waterborne

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

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

**International Energy Agency:**
lithium demand from EVs

**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

Image sources: Clean Technica; The Verge
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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

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

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.

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 byproduct 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
**Taxonomy of initiatives: overlap/difference across various dimensions**

Company A Sustainability Standard Adherence Matrix

<table>
<thead>
<tr>
<th>Content</th>
<th>Participants</th>
<th>Implementation</th>
<th>Application</th>
<th>Scope</th>
<th>Enforcement</th>
<th>Sponsor</th>
<th>Links</th>
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<tbody>
<tr>
<td>Human rights</td>
<td>Govt, CSOs, industry, investors</td>
<td>Government, Industry, Investors &amp; Finance, Civil Society</td>
<td>Mining, Trade, LSP, Eco, Pat, Privacy</td>
<td>Local, Govt, All</td>
<td>Legal, Certification, Reputation</td>
<td>Government, International Org., CSO, PPP</td>
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- **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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