Co-authored with Ted Lamm and Patrick Heller (advisor at the Natural Resource Governance Institute and a senior visiting fellow at CLEE)

The global transition from fossil fuel-powered vehicles to electric vehicles (EVs) will require the production of hundreds of millions of batteries. The need for such a massive deployment raises questions from the general public and critics alike about the sustainability of the battery supply chain, from mining impacts to vehicle carbon emissions.

Growing demand for the mineral inputs for battery production can provide an opportunity for mineral-rich countries to generate fiscal revenues and other economic opportunities. But where extraction takes place in countries with weak governance, the benefits expected by citizens and leaders may not materialize; in some cases extraction might even exacerbate corruption, human rights abuses and environmental risks.

Many EV proponents and suppliers are aware that supply chain governance problems pose a challenge to the evolution of the EV industry, but outstanding questions remain about how these challenges materialize. To address some of these questions as part of a broader research initiative, UC Berkeley School of Law's Center for Law, Energy & the Environment (CLEE) and the Natural Resource Governance Institute (NRGI) are today releasing the new brief "*Building a Sustainable Electric Vehicle Battery Supply Chain: Frequently Asked Questions*." It provides basic information on the EV battery supply chain and key battery minerals, such as cobalt and lithium, and addresses the following questions:

- What does the supply chain for EV batteries comprise?
- How do carbon emissions from EVs compare to traditional internal combustion engine (ICE) vehicles?
- What are the most significant challenges in managing the mineral extraction necessary for the EV supply chain, and what sustainability and human rights initiatives apply?

Based on existing research and consultation with experts throughout the EV battery ecosystem, the FAQ presents a diagram of the steps in the supply chain and data on the largest producers of key battery mineral. It offers the following key findings:

- EVs offer significant life-cycle greenhouse gas savings over internal combustion engines, with estimates up to 72-85 percent in areas with high

renewable energy penetration.

- While the EV battery supply chain involves a range of actors across the globe, the limited number of players at key intermediate manufacturing stages has the potential to create “bottlenecks” that complicate efforts to promote sustainability.
- In terms of the long-term availability of minerals needed to meet projected global EV demand, expert opinions differ. Governance decisions and the relationships between mineral-producing countries and commercial players will have a major impact on the pace of supply growth, while efforts at technological innovation in battery chemistry and recycling could decrease the need for additional mining.
- Human rights impacts from EV battery mining are particularly significant for cobalt, as a result of governance challenges in the Democratic Republic of Congo that have allowed corruption and economic inequalities to persist.
- Local environmental impacts from EV battery mining can be acute in some contexts but also reflect broader challenges and impacts from mining in general, particularly when compared to the environmental damage from baseline oil and gas production.
- The EV battery and mining industry features a lengthy and diverse set of standards and initiatives designed to improve sustainability, yet improved transparency and compliance still require enhanced coordination among stakeholders.

This FAQ is the first report in a stakeholder-led research initiative by CLEE and NRGI that aims at greater sustainability in the EV battery supply chain. A full policy report coming later in 2020 will identify high-priority actions that private and public sector players can take to ensure a sustainable EV battery supply chain. While the EV battery supply chain entails a range of sustainability-related risks—as do most mineral extraction and production supply chains—participants can take collaborative steps to manage it effectively and in the public interest. Such approaches will reduce harms while helping the world meet long-term climate goals.