EDITORIAL

The matter of a clean energy future

A clean energy transition will create jobs, promote energy independence, improve public health, and, ultimately, mitigate climate change. But getting to this new future will require more than just phasing out fossil fuels. The production of a wide range of energy-relevant materials—lithium, cobalt, and nickel for batteries; rare earth elements for wind turbines and electric motors; silicon for solar panels; and copper to expand the electric grid—must be scaled up substantially. Mobilizing these materials without reproducing the environmental harms and social inequities of the fossil fuel status quo poses an urgent challenge.

Studies project that producing the materials to enable a clean energy transition will be a massive undertaking. The International Energy Agency forecasts that keeping the world on a path compatible with the goals of the Paris Climate Accord will require expanding production of energy-relevant materials sixfold between 2020 and 2040, to 43 million tons per year. At first glance, that may seem to pale in comparison to the fossil fuel industries, which produced roughly 15 billion tons of coal, oil, and natural gas globally in 2020 alone and added 32 billion tons of carbon dioxide to the atmosphere when burned.

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But the transition will be even more difficult than it first appears. Nickel, cobalt, and copper and many other energy-relevant materials occur in low-grade ores, which entail far more mining, processing, and waste than fossil fuels. Securing the millions of tons of finished materials needed will require mining hundreds or thousands of times more raw ore. Although this transition will ultimately lower greenhouse gas emissions, especially as more renewable energy powers mining processes, it will require processing metal ores at a scale that rivals the material throughput of today's fossil fuel industries.

The potential harms of such a transition are considerable. Large-scale mining affects ecosystems, threatens water supplies, and is sometimes linked to poor working conditions, corruption, and human rights abuses. But scaling up mining to support a clean energy transition also offers the opportunity to reform materials production in ways that are both socially and environmentally just. Wealthier countries, which have often outsourced mineral extraction abroad, need to help shoulder these burdens and model responsible approaches to development.

To meet the global clean energy challenge, government policies supporting public and private sector investments are needed at every stage of extraction and processing. This means support for exploration, research into new mining and processing technologies, streamlined permitting processes, support for expanding processing capacity, and trade agreements that ensure supplies from international markets. Over the past decade, China has prioritized such public-private investments from mine to factory. Only recently have the United States and European Union begun to adopt similar policies aimed at developing domestic supply chains and diversifying international sources of energy-relevant materials.

These policies must be paired with initiatives to ensure that materials are sourced sustainably and transparently. Over the past decade, third-party certification programs have proliferated in the mining sector. One of the most promising approaches is a standard championed by the Initiative for Responsible Mining Assurance. It offers an independent certification system that can be used to assess mining activities relative to best practices for worker health and safety, human rights, community engagement, corruption, pollution control, and land reclamation through mandatory third-party audits and publicly available scorecards.

But if such standards are going to be effective, policymakers, corporations, investors, environmental groups, and consumers must demand that they be integrated into the policies that support new mines, govern mining operations, and regulate international trade. Such approaches will be essential to ensuring that as extractive industries scale up, information about the impacts of their activities is available and private actors who align their operations with social and sustainability priorities are rewarded.

Ultimately, innovation will reshuffle the burdens of resource extraction in ways that cannot be fully anticipated. Already there are efforts to reduce or, in some cases, eliminate the use of cobalt in lithium-ion batteries. But innovation will not eliminate the material-intensive nature of clean energy technologies. Given the urgent need to mitigate climate change and the long lead time for developing mines and building out supply chains, the time to reckon with the material demands of a clean energy transition is now.

–James Morton Turner

PHOTO: ADAM PULZETTI

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