U.S. Senate Budget Committee Hearing
Warrior Met and Wall Street Greed: What Corporate Raiders are Doing to Workers and Consumers

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Hart Senate Office Building

Meeting U.S. Climate Goals through Critical Minerals

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Chairman Saunders, Ranking Member Graham, Distinguished Committee members,

I am grateful for the invitation to speak before you today and I look forward to engaging with you on these issues of vital importance for the future of the United States climate change mitigation and geopolitical goals. My testimony today focuses on the challenges facing the critical minerals supply chain and the need for concerted action by government and the private sector to address a significant and growing deficit in the availability of these resources as the global energy transition brings a dramatic increase in demand.

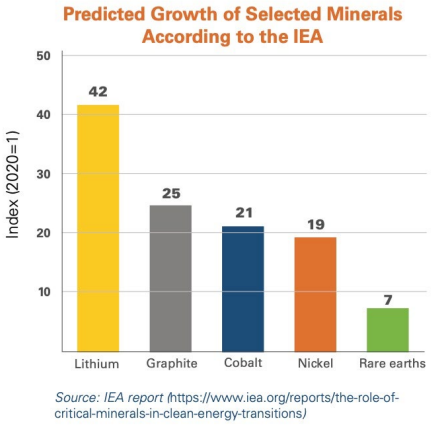
In the summer of 2021, the Wilson Center convened a Critical Minerals Working Group, made up of stakeholders from industry, academia and civil society, to examine the vulnerabilities that exist in the critical minerals supply chain, and to discuss how the private sector and government can address them. Drawing on the impressive experience and insights of the participants, the working group identified three main vulnerabilities in the supply chain:

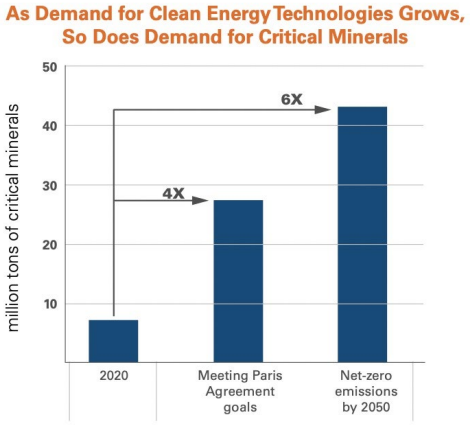
- First, to meet its climate goals, the United States must face rapidly and dramatically rising demand for critical minerals while constrained by chronic underinvestment in mining, processing, infrastructure, and human capital.

- Second, the United States must compete on a global basis against China and the European Union for access to critical minerals and must address the geographic concentration of both extractive and processing activities. To reference the most obvious example, China's dominant position in the supply chain stems not only from its ownership and control of critical minerals mines, but also processing facilities.
- Third, there is a governance challenge that impacts the first two vulnerabilities in which mining firms from the United States and other western countries must adhere to justifiably stringent compliance measures in the areas of environment, society and transparency/anti-corruption regulations, regardless of whether they are operating domestically or internationally. Permitting and legislative restrictions on U.S. mining firms place them at a competitive disadvantage compared to Chinese competitors and provide a strong disincentive for developing resources within the United States.

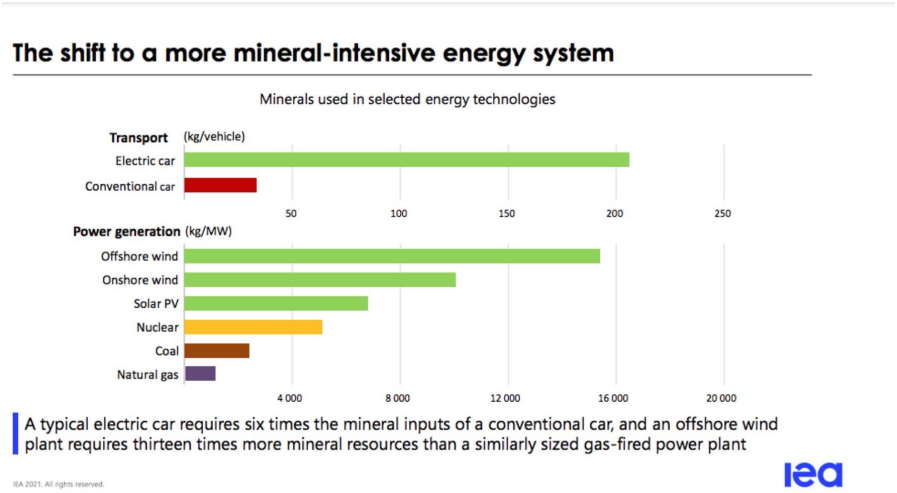
The first challenge is the scale and pace of rising demand. As mentioned, demand for critical minerals outpaces that of supply, and will continue to rise, particularly considering the key role that critical minerals will play in the clean energy transition. An International Energy Agency (IEA) assessment found that to reach the Paris Agreement goals of a less than 2° Celsius rise in global temperature, clean energy technologies would demand four times the current mineral input by the year 2040. The IEA foresees mineral demand specifically for electric vehicles and grid storage for EV batteries to increase at least 30 times by 2040 and estimates a tripling of mineral demand by 2040 for low-carbon power generation.

Rising demand for Critical Minerals





While these predictions take place over the course of decades, exponential increases in demand for lithium are already happening. In a 2021 quarterly earnings report SQM, the second largest lithium producing company in the world, predicted global lithium demand to increase by nearly 50% in 2021. Already unable to keep pace, considering lag time, permitting challenges and underinvestment in infrastructure, technological innovation, and human capital, this issue will continue to compound.



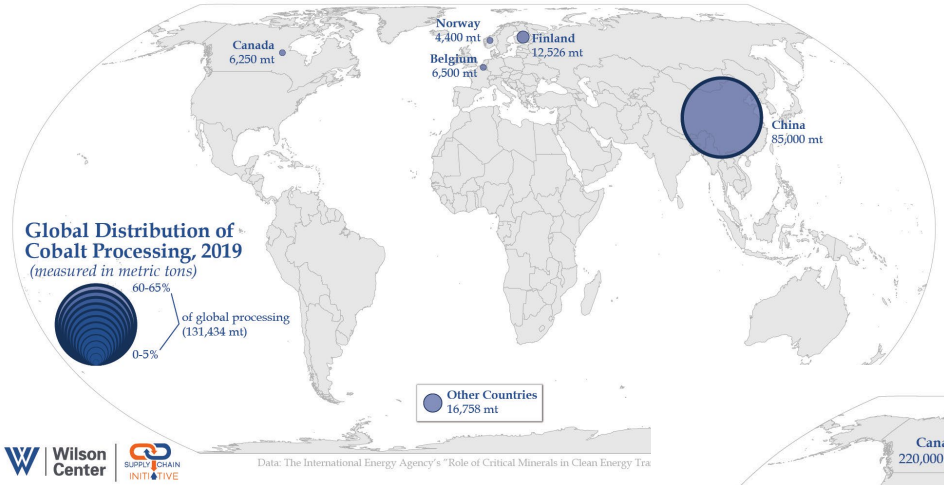
The critical minerals and rare earths industries are facing up to this challenge of limited supply and rising demand, which is complicated by underinvestment, mining's long-term orientation and associated high risk profile, and questions of human capital and R&D. However, despite best efforts to synchronize supply and demand, discrepancies remain. One reason for the mismatch relates to investors' preference for shorter-term horizons than what is possible in the long-term oriented mining industry. From the exploration and discovery phases, to permitting, and then to extraction and processing, mining is profoundly complex and nuanced which makes investment difficult and at times, risky.

Finding and developing national resources is easier said than done. The U.S. has only mapped approximately 12% of its land in terms of metal reserves: the USGS estimates it would take 10+ years to find and map all U.S. resources, with another 7-10 years to get those resources to market, completely missing the window within which the U.S. requires critical minerals. While new discovery projects are important for the long term, the U.S. will need to address known resources for its short and mid-term strategy.

Once the minerals have been extracted from the ground, another major challenge presents itself. A lack of processing and refining capacity here in the US, and the

excessive concentration of that capacity in countries like China, make the United States especially vulnerable to interruptions in supply. The Biden administration's 100-Day review concluded: "For the second supply chain step of refining and processing, the U.S. has an even more significant deficit than in raw production capacity as critical minerals mined in the U.S. are often exported for processing. Increasing U.S. processing capacity alone would bolster the supply chain … Currently, the U.S. has limited raw material production capacity and virtually no processing capacity."

The case of Rare Earth Elements is indicative. The United States is on the brink of a huge opportunity within the REE production space - mining and producing more rare earths in 2020 than ever, and still, estimates show that the U.S. and Canada combined have a surplus of 17.7 million tons of rare earth resources. Despite this, the U.S. remains heavily reliant on China for rare earth compounds and metals, with China providing to the U.S. an estimated 80% of imported rare earth elements between 2016 and 2019. This U.S. reliance on Chinese REEs is partially attributable to insufficient domestic processing abilities. Investment in production and processing facilities can align U.S. supply with demand and remain globally competitive where REEs are readily available.


Global Distribution of Cobalt Processing, 2019
(measured in metric tons)
60-65%
of global processing (131,434 mt)
0-5%
Canada 6,250 mt
Norway 4,400 mt
Belgium 6,500 mt
Finland 12,526 mt
China 85,000 mt
Other Countries 16,758 mt
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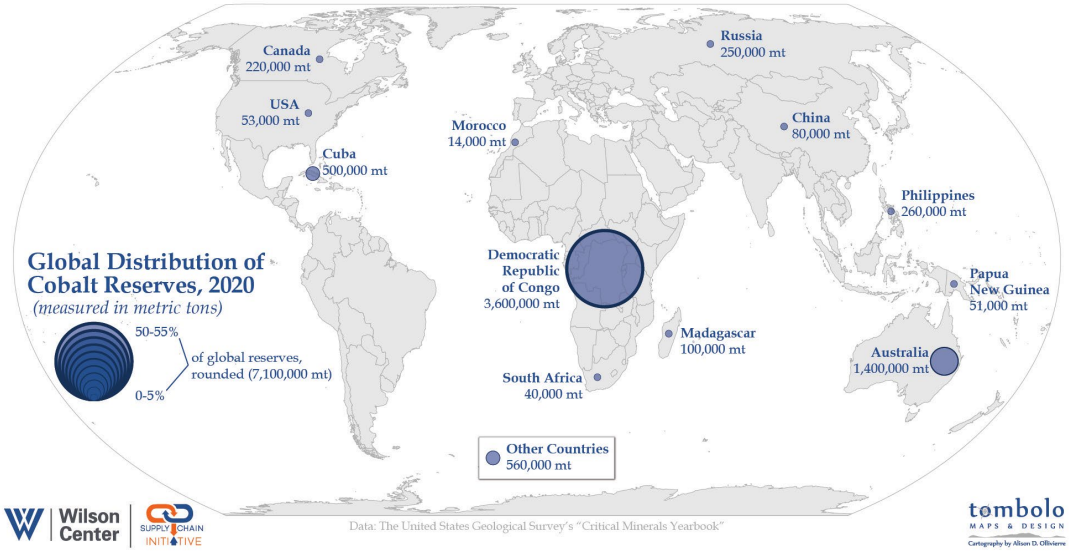
SUPPLY CHAIN INITIATIVE
Data: The International Energy Agency's "Role of Critical Minerals in Clean Energy Tra


Global Distribution of Cobalt Reserves, 2020
(measured in metric tons)
50-55%
of global reserves, rounded (7,100,000 mt)
0-5%
Canada 220,000 mt
USA 53,000 mt
Cuba 500,000 mt
Morocco 14,000 mt
Russia 250,000 mt
China 80,000 mt
Philippines 260,000 mt
Democratic Republic of Congo 3,600,000 mt
Papua New Guinea 51,000 mt
Madagascar 100,000 mt
Australia 1,400,000 mt
South Africa 40,000 mt
Other Countries 560,000 mt
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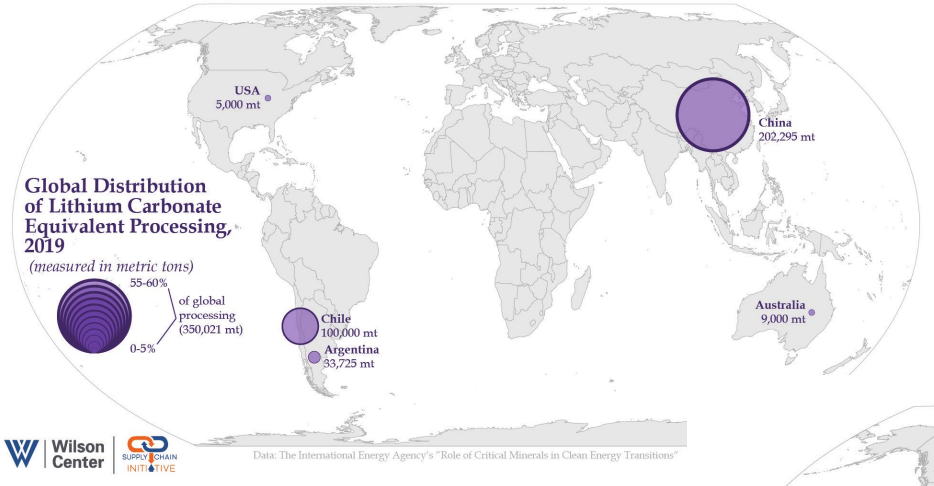
SUPPLY CHAIN INITIATIVE
Data: The United States Geological Survey's "Critical Minerals Yearbook"
tombolo MAPS & DESIGN
Cartography by Alison D. Ollivierre


Global Distribution of Lithium Carbonate Equivalent Processing, 2019
(measured in metric tons)
55-60%
0-5%
of global processing (350,021 mt)
USA
5,000 mt
China
202,295 mt
Chile
100,000 mt
Argentina
33,725 mt
Australia
9,000 mt
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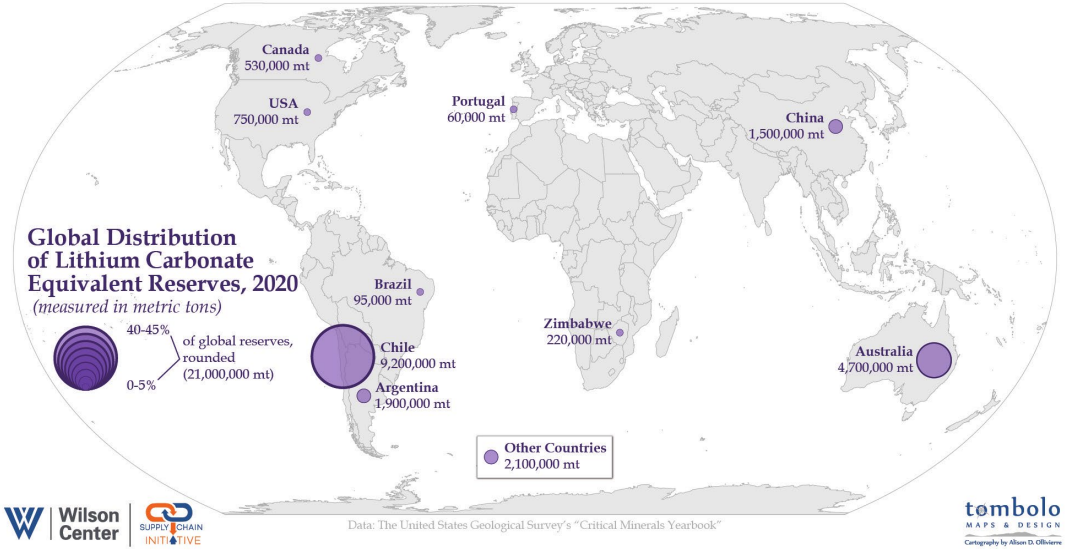
SUPPLY CHAIN INITIATIVE
Data: The International Energy Agency's "Role of Critical Minerals in Clean Energy Transitions"


Global Distribution of Lithium Carbonate Equivalent Reserves, 2020
(measured in metric tons)
40-45%
0-5%
of global reserves, rounded (21,000,000 mt)
Canada
530,000 mt
USA
750,000 mt
Portugal
60,000 mt
China
1,500,000 mt
Brazil
95,000 mt
Zimbabwe
220,000 mt
Chile
9,200,000 mt
Argentina
1,900,000 mt
Australia
4,700,000 mt
Other Countries
2,100,000 mt
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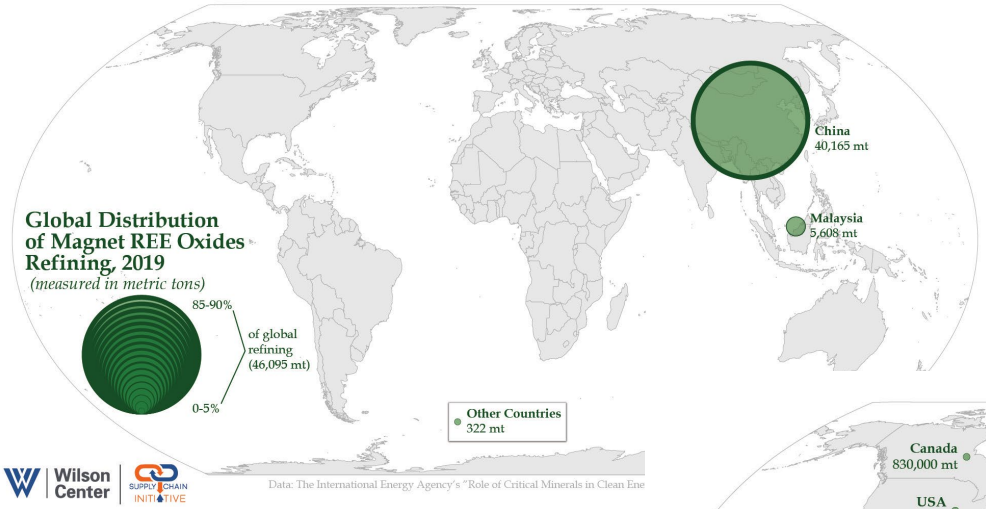
Global Distribution of Magnet REE Oxides Refining, 2019
(measured in metric tons)
85-90%
0-5%
of global refining (46,095 mt)
China 40,165 mt
Malaysia 5,608 mt
Other Countries 322 mt
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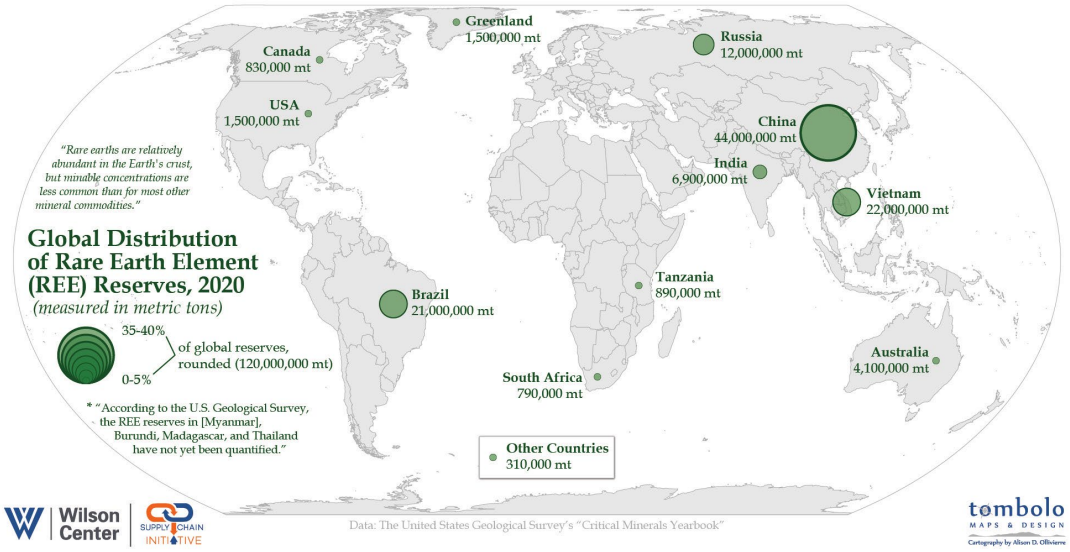
SUPPLY CHAIN INITIATIVE
Data: The International Energy Agency's "Role of Critical Minerals in Clean Ene


"Rare earths are relatively abundant in the Earth's crust, but minable concentrations are less common than for most other mineral commodities."
Global Distribution of Rare Earth Element (REE) Reserves, 2020
(measured in metric tons)
35-40%
0-5%
of global reserves, rounded (120,000,000 mt)
* "According to the U.S. Geological Survey, the REE reserves in [Myanmar], Burundi, Madagascar, and Thailand have not yet been quantified."
Greenland 1,500,000 mt
Canada 830,000 mt
USA 1,500,000 mt
Russia 12,000,000 mt
China 44,000,000 mt
India 6,900,000 mt
Vietnam 22,000,000 mt
Tanzania 890,000 mt
Brazil 21,000,000 mt
South Africa 790,000 mt
Australia 4,100,000 mt
Other Countries 310,000 mt
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SUPPLY CHAIN INITIATIVE
Data: The United States Geological Survey's "Critical Minerals Yearbook"
tombolo MAPS & DESIGN
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Thinking beyond the extraction and processing of critical minerals, governance has a key role in the critical minerals supply chain to create a more equitable playing field that rewards virtue and punishes transgression. Critical minerals and REEs are viewed as commodities, with price as the determining factor for firms in choosing a supplier. For meaningful change to come about, they must be de-commoditized, and values must be integrated into the commodities themselves. To allow U.S. firms to compete, we must cultivate a mining and processing environment that is stable and that encourages investment supportive of Environmental and Social Governance (ESG). Of course, there are myriad issues around ESG, including political will, processing, and above-ground conditions. The current opacity of the critical minerals supply chain has created a significant need for new international agreements on transparency, and disclosure, especially given the dominance of countries where transparency is far from a priority.

Permitting policies play a significant role in the global competition for critical minerals, oftentimes in the context of time frame challenges. There is clear crossover between permitting and social license challenges; the extensive nature of permitting regimes in the U.S. makes them comprehensive and thorough, but also difficult, timely, and costly, thus putting U.S. firms at a distinct disadvantage as compared to competitors with less extensive permitting policies. From start to finish, including development to construction, start-up, operations, and reclamation, U.S.- based projects are required to obtain various permits, such as environmental permits, developmental and operational permits, reclamation bonding and related activities, and permits from authorizing agencies. A major mining project on federal lands may be subject to 30 or more local, state, and federal regulations and programs.

The multi-stage processes of U.S. permitting regimes, the involvement of various agencies at all levels of government, and the lack of basic, cross-agency coordination has resulted in a 7- to 10-year permit timeframe for U.S. based mining projects. This marks a stark contrast to that of Canada and Australia where the average permitting period is two years and environmental standards are equally thorough. Given the many stakeholders and the multilevel permitting process in the U.S., permitting delays pose a significant threat to mining projects in the U.S., even in states that have more generous mining policies, such as Nevada, West Virginia, and Arizona. In fact, a 2012 report published by Behre Dolbear found that the U.S. was tied with Papua New Guinea for most significant delays in mining permitting.

SNL Mining estimates that excessive permitting regimes decrease the expected value of a mine by half as a direct result of increased costs and risks directly associated with prolonged permitting requirements. Additionally, SNL Mining found that delays associated with permitting result in the loss of one third or more of the mining project. The impact of U.S. bureaucratic hurdles in the permitting process is best illustrated by the fact that the U.S. comprises only 11% of global spending on global mining exploration, meaning that the majority of U.S. investment goes toward existing mines and mining projects, thus making it exceedingly difficult for the U.S. to compete on the global scale against formidable competitors such as China. Attempts to reform permitting in the U.S. have been met with significant challenges, particularly as permitting becomes increasingly politicized and subject to multiple levels of legal challenges.

To help reduce the exceedingly long lead times for mining projects mentioned earlier in this paper, the U.S. government should look again at international best practice for regulation and permitting. Compliance costs billions of dollars and impedes the competitiveness of U.S.-based mining projects; delays in bringing resources to market are even more costly. As Canada's Fraser Institute argues, "The permitting process is costly for firms, as they must invest time and resources to comply with the permit's requirements. These costs can rise when the process lacks transparency or is uncertain, adding additional risk to firms and reducing a jurisdiction's competitiveness."

It is vital to recognize that we are not suggesting a lowering of standards. Strong environmental protections remain a priority for mining companies, in part due to the demands of investors, in part due to the demands of end users to "green" the value chain, and in part due to increased public oversight. Rather than lowering standards, it is the regulatory and permitting process that requires review. Regulatory innovation that takes firm competitiveness and national, geopolitical, and climate objectives into consideration is desperately needed to provide more transparent timelines for permitting, clearly define the roles of different agencies to avoid regulatory duplication, and to allow for shared responsibility between regulators and the firms they regulate. Again, looking to Canada, the province of Alberta has adopted what amounts to an honor system for hydrocarbons regulation, with heavy penalties for those that break the rules. Combining this approach with robust oversight would allow for speedier permitting, while providing strong incentives to respect ESG rules.

At the same time as the U.S. government addresses its own permitting challenges, it must work with industry and with its allies overseas to develop binding

international standards to level the playing field in environmental, social governance. These standards should be applied to both extractive industries and to the processing plants that transform the raw materials. Of particular importance is the issue of transparency and disclosure. This means both improving minimum standards for disclosure and developing a life-cycle approach to climate disclosure for products. As such, there must be a concerted global, cross-industry effort from the highest-level producers and suppliers all the way to consumers.

Compliance with ESG standards is costly, but rather than pursuing a race to the bottom in terms of cost, the U.S. must take the lead in encouraging other nations to raise their standards while also bearing some of the additional costs. The Energy Resource Governance Initiative (ERGI) has been a centerpiece of the successive U.S. administrations' approach to "sound mining governance and resilient energy mineral supply chains." ERGI has expanded since its launch in 2019 and is facilitating safer investment climates for western countries to invest in countries that wouldn't otherwise see investment. The initiative has made it incumbent upon government officials to seek out reformers in the mining industry and give them the tools and opportunities to succeed and effect reforms. Now, the U.S. government must work to harmonize its achievements with those of the EITI (Extractive Industries Transparency Initiative) and at the same time seek meaningful ways of ensuring compliance.

Concluding thoughts

As America moves towards a clean energy future, with massive investment in renewable energy and electrification of the vehicle fleet, we must address a deeply concerning reality. The lack of investment here in the United States in critical minerals extraction and processing leaves the country vulnerable to supply shortages and interruptions in the production of batteries, vehicles, and advanced technologies. Whereas countries such as China have invested heavily in developing national and foreign sources of these minerals, the United States has for too long neglected its own natural endowments and failed to engage with foreign allies and partners to guarantee supply.

In order to rectify this situation, the U.S. government and the extractive industries must work together to bring new resources online. Part of the solution involves new investment in mining; part in new processing facilities. To make new mining projects attractive to investors, the United States must look to international best practice for permitting, in order to streamline the regulatory process as much as possible without lowering standards of environmental protection. At the same time, the United States government must work with its partners internationally to

develop a more harmonized approach to questions of environmental and social governance (ESG) to ensure a level playing field for American firms. Furthermore, U.S. critical mineral development must be accompanied by collaborative efforts around the world to supply minerals not readily found here in the United States.

The clean energy transition cannot happen without critical minerals. To secure the critical minerals supply chain, the U.S. government must work with the extractive industries at home and abroad to facilitate responsible and environmentally conscious extraction in as efficient a manner as possible.