Dependence on Foreign Adversaries: America's Critical Minerals Crisis

House Committee on Natural Resources

Subcommittee on Oversight and Investigations

United States House of Representatives

February 9, 2023

Nick Loris

Vice President of Public Policy

Conservative Coalition for Climate Solutions (C3 Solutions)

My name is Nick Loris, and I am the Vice President of Public Policy at the Conservative Coalition for Climate Solutions (C3 Solutions). Thank you for this opportunity to appear before the subcommittee to discuss America's dependence on foreign adversaries with respect to critical minerals.

My written testimony consists of the following sections:

- **The importance of critical minerals for the quality of life, economic well-being and, national security**
- **The need for critical minerals to meet clean energy demands and climate ambitions**
- **The adverse environmental and social impacts from mining and processing in certain places abroad**
- **Opportunities to capitalize on domestic mineral abundance, diversify supply chains, promote ethical mineral sourcing, and develop market alternatives**

Section I. The importance of critical minerals to the economy and to climate objectives.

Critical minerals are just that: *critical*. Non-fuel mineral commodities are essential for quality of life, technological progress, national security, and environmental ambitions. Nearly all the modern technologies Americans rely on such as cell phones, laptops, appliances, and vehicles require critical minerals. They are the foundation that empowers companies to build, manufacture and innovate. These minerals are necessary inputs to produce affordable energy, stable food supplies, defense technologies, and advancements in modern medicine. In short, critical minerals are the foundation for the products to keep Americans and people around the world safe, healthy, and happy.

More broadly, mineral development is an important source of jobs and economic activity in the United States. According to the U.S. Geological Survey's (USGS) 2021 Mineral Commodity Summaries report, the estimated value of nonfuel mineral production was $82.3 billion in 2020.[1] While that figure represents all nonfuel mineral production (crushed stone account for 22 percent of that value), the value is nonetheless impressive. The USGS highlights just how essential minerals are to the overall economy, noting that: "These mineral materials as well as imports of processed mineral materials, which increased by 83% in 2020, were, in turn, consumed by downstream industries creating an estimated value of $3.03 trillion in 2020, 3% decrease from that in 2019."[2] The United States supplied an additional 10,000 metric tons of rare earth concentrates, a 36 percent increase from 2019.[3] The U.S. continues to be the second largest producer of rare earth concentrates, though well behind China.

As characterized by The Energy Act of 2020, the other factor which makes minerals "critical" is their susceptibility to supply chain disruptions. Russia's invasion of Ukraine exemplified the economic uncertainties, supply chain vulnerabilities and fundamental pitfalls of reliance on mineral producers that are hostile to the interests of the United States. As a major supplier of nickel, copper, and palladium (important inputs for batteries and semiconductors), Russia's invasion and subsequent sanctions drove up prices for these elements.[4] Though not a critical mineral, the nuclear industry's reliance on Russian for high-assay low-enriched uranium (HALEU) brought conversations about more domestic enrichment to the forefront.[5] Disruptions around the world can threaten supplies of minerals necessary for modern technologies, including renewable, nuclear, and alternative energy technologies.

According to a recent report from the Citizens for Responsible Energy Solutions (CRES), the U.S. is completely import-dependent for 14 critical minerals and greater than 50 percent-dependent for 17 other mineral commodities.[6]

Section II. The need for critical minerals for clean energy and climate ambitions

As it stands today and for the foreseeable future, renewable and clean energy technologies are quite mineral dependent. A March 2022 report from the International Energy Agency (IEA) details the critical minerals necessary for low- and zero-carbon dioxide power generation and

---

[1] U.S. Geological Survey, "Mineral Commodities Summary," January 29, 2021, https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf

[2] Ibid.

[3] U.S. Geological Survey, "Mineral Commodity Summary February 2021," February 2, 2021, https://www.usgs.gov/media/images/mineral-commodity-summary-february-2021

[4] Dr. Robert Johnson, "Supply of Critical Minerals amid the Russia-Ukraine War and Possible Sanctions," Columbia Center on Global Energy Policy, April 2022, https://www.energypolicy.columbia.edu/publications/supply-critical-minerals-amid-russia-ukraine-war-and-possible-sanctions and Emily Pickrell, "Russia-Ukraine War Helps Drive Nickel Prices, EV Headaches," Forbes, March 31, 2022, https://www.forbes.com/sites/uhenergy/2022/03/31/russia-ukraine-war-helps-drive-nickel-prices-ev-headaches/?sh=39a102357cd9

[5] Paul Day, "US urges haste on domestic HALEU plan as Russia faces isolation," *Reuters*, March 22, 2022, https://www.reutersevents.com/nuclear/us-urges-haste-domestic-haleu-plan-russia-faces-isolation

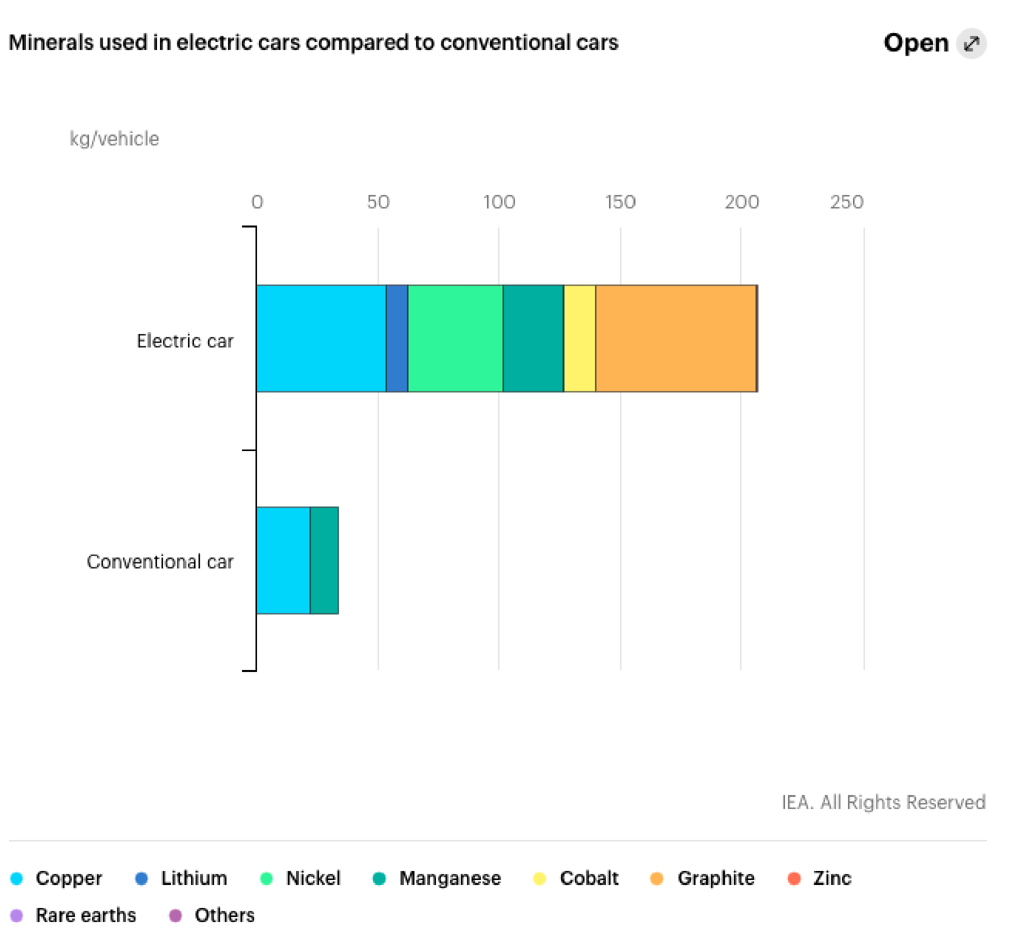
[6] Phil Rossetti and George David Banks, "Foreign Mineral Supply Chain Dependence Threatens U.S. National Security," CRES Forum, March 2022, https://cresforum.org/wp-content/uploads/2022/03/CRES_WhitePager_CriticalMinerals_03212022_v1.pdf

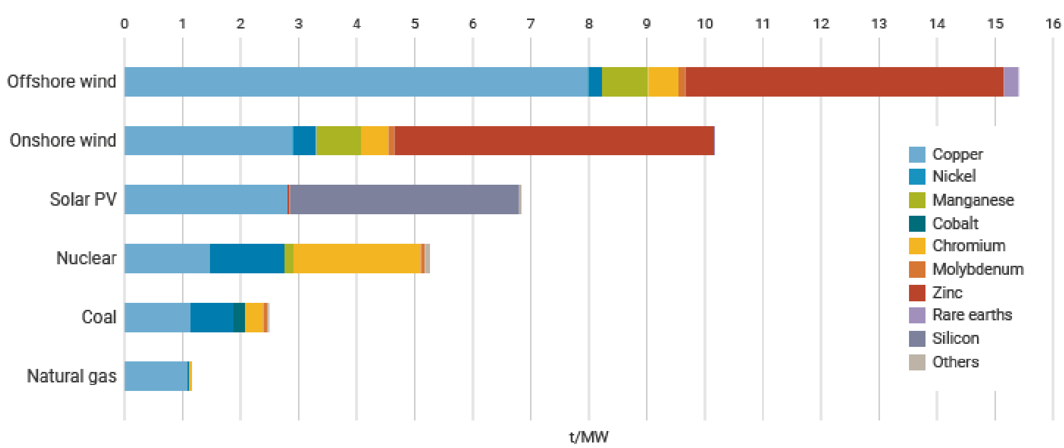
transportation.[7] Whether it is wind, solar, hydro, nuclear, electric vehicles, battery storage, hydrogen, geothermal, or bioenergy, every one of these clean energy technologies requires a moderate or high amount of at least two critical minerals.[8] Several technologies, most notably wind, batteries, and hydrogen, have moderate to high needs for four or more critical minerals.[9]

As indicted by the IEA charts below, clean energy technologies are much more mineral intensive than their conventional counterparts. When comparing electricity generating sources to a natural gas plant, offshore wind is 13 times more intensive, onshore wind is nearly 9 times more intensive, solar photovoltaics are nearly 6 times more intensive, and nuclear power is 4.5 times more intensive.[10] Similarly, electric vehicles are 6 times more mineral intensive than vehicles powered by an internal combustion engine.[11]

Included in list of critical minerals for various clean energy technologies is rare earth elements (REEs). The value of REEs lies in their unusual physical and chemical properties that give them unique magnetic and optical capabilities. Rare earth elements are essential for solar cells, batteries, wind turbine magnets and hydrogen electrolysers.[12] They are critical to scaling up clean energy deployment and global decarbonization.

[7] International Energy Agency, "The Role of Critical Minerals in Clean Energy Transitions: World Energy Outlook Special Report," March 2022, https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf
[8] Ibid. See chart on page 45.
[9] Ibid.
[10] International Energy Agency, "The Role of Critical Minerals in Clean Energy Transitions: Executive Summary," March 2022, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/executive-summary
[11] Ibid.
[12] International Energy Agency, "The Role of Critical Minerals in Clean Energy Transitions: World Energy Outlook Special Report," March 2022, https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf

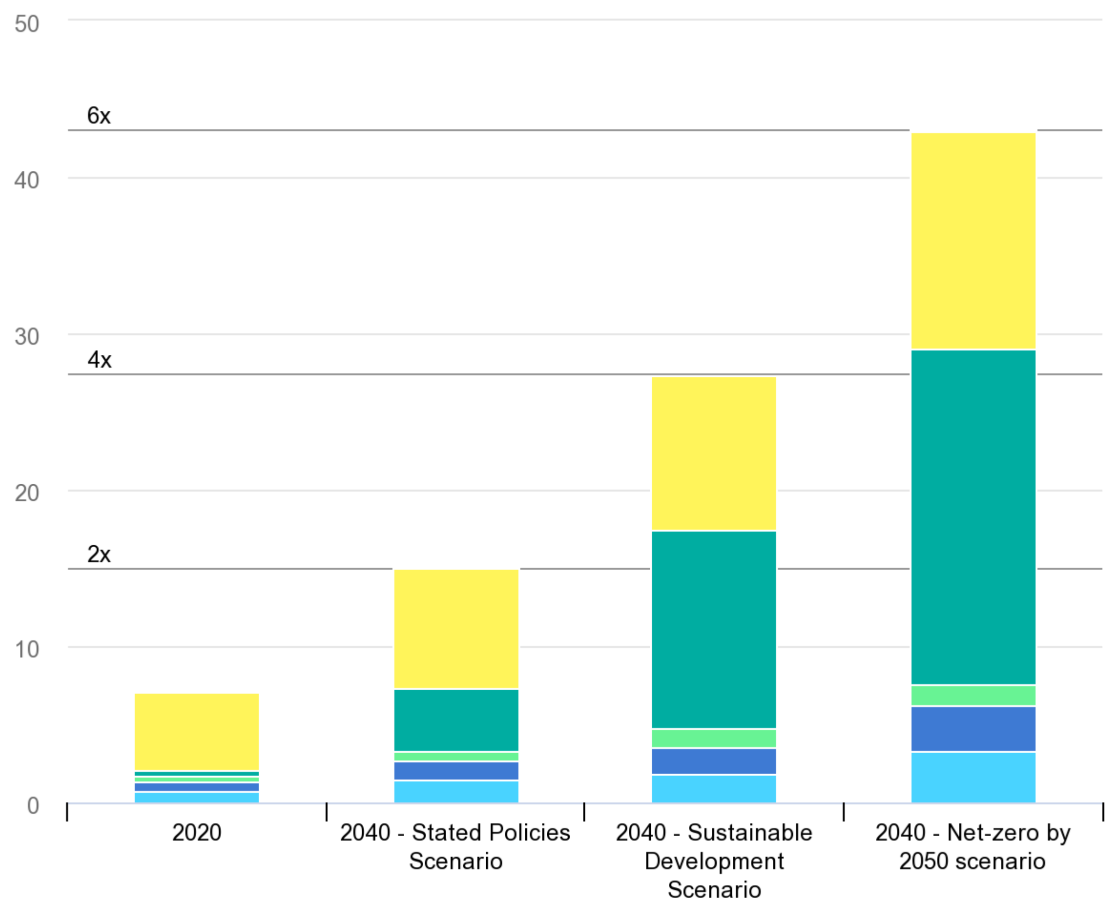




Source: International Energy Agency

Addressing climate change will require significant increases in the critical mineral supply. Setting aside the attainability and potential costs of net-zero targets (both necessary considerations), a substantial number of critical minerals will be needed to meet any emissions target. To meet the IEA's global net zero targets by 2050, the agency estimates the world will need 43 million metric tons of critical minerals, a sixfold increase from 2020 levels.[13]

In IEA's less ambitious Sustainable Development Scenario (SDS), which is the trajectory of clean energy needed to meet the Paris Climate Agreement targets, critical mineral growth would need to quadruple. IEA estimates that, "Lithium sees the fastest growth, with demand growing by over 40 times in the SDS by 2040, followed by graphite, cobalt and nickel (around 20-25 times). The expansion of electricity networks means that copper demand for grid lines more than doubles over the same period."[14] Notably, these projections exclude the demand requirements for steel and aluminum.



Source: International Energy Agency

[13] International Energy Agency, "The Role of Critical Minerals in Clean Energy Transitions: Executive Summary," March 2022, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/executive-summary
[14] Ibid.

Regarding future critical mineral demand, IEA's sustainable development scenario and net-zero scenarios are very ambitious. Making these projections a reality would require "an unprecedented push in clean energy."[15] That push includes electric vehicle sales increasing from 5 percent in 2020 to 60 percent in 2030 and for 90 percent of power generation to come from renewable sources, 70 percent being wind and solar.[16]

Nevertheless, even if the most ambitious net zero target is not met, it is very likely that critical mineral demand will be substantial. Energy analysts Philip Rossetti and George David Banks analyzed several studies that attempt to estimate the demand for critical minerals. Rossetti and Banks write, "there is a significant range in the estimates required across all three analyses, which can largely be attributed to varying assumptions as to the rates of improvement in the efficiency of materials utilization and in recycling, as well as the substitutability of minerals. *However, all three analyses estimate a non-trivial portion of the Earth's total critical minerals would be required to meet global clean energy demand* [emphasis added]."[17]

Certainly, projecting resource requirements across multiple decades is not a prediction but is instead an assessment of the potential demand for critical minerals. Expert projections of peak oil, food shortages, and resource exhaustion have come and gone, often with little accuracy. These projections often assume that past trends and the status quo will continue.[18] However, markets change as innovators drive efficiency and technological progress. It is worth projecting future critical minerals needs with some humility and optimism that markets will find ways to responsibly meet consumers' needs, which may or may not include the use of these minerals.

Moreover, massive critical mineral requirements are not by itself a reason a reason to be pessimistic about the future of clean energy. Instead, policymakers must recognize the importance of these minerals, the economic and technological realities of future demand, and the challenges and opportunities that lie ahead.

Section III. The adverse environmental and social impacts from mining and processing in certain places abroad

When considering the environmental effects among all the energy sources and technologies available, policymakers must consider the broad range of environmental and social tradeoffs. Environmental impacts for one product may include impacts on: air quality, water quality, greenhouse gas emissions, land use, water use, and fish and wildlife habitat. There are direct, indirect, and cumulative effects to consider. Some risks are more well-known and others less known. Some environmental risks are immediate while others span decades or reach centuries into the future.

---

[15] International Energy Agency, "Net Zero by 2050 A Roadmap for the Global Energy Sector," May 2021, https://iea.blob.core.windows.net/assets/7ebafc81-74ed-412b-9c60-5cc32c8396e4/NetZeroby2050-ARoadmapfortheGlobalEnergySector-SummaryforPolicyMakers_CORR.pdf

[16] Ibid.

[17] Phil Rossetti and George David Banks, "Foreign Mineral Supply Chain Dependence Threatens U.S. National Security," CRES Forum, March 2022, https://cresforum.org/wp-content/uploads/2022/03/CRES_WhitePager_CriticalMinerals_03212022_v1.pdf

[18] "Malthus, the false prophet," *The Economist*, May 15, 2008, https://www.economist.com/finance-and-economics/2008/05/15/malthus-the-false-prophet

Making matters even more difficult is that people weigh environmental tradeoffs differently and often neglect opportunity costs and unintended consequences. Does an unobstructed river hold more environmental value than the air quality and climate benefits from hydroelectric power? Does blocking a pipeline lead to more environmental risk because companies shift the liquid fuels transport to rail, truck, or ship? The reality is that decision-making that properly weighs costs, benefits, and tradeoffs – using sound, transparent science as a guiding tool – is not an easy task.

The ethics and environmental concerns regarding the sourcing of critical minerals have generated more public awareness and bipartisan concern. Addressing the human rights abuses and environmental harms of critical mineral development will be essential for ensuring socially just growth in clean energy and for reliance on many modern technologies.

Rechargeable lithium-ion batteries for smartphones, laptops, and electric vehicles require cobalt, which primarily comes from the Democratic Republic of the Congo (DRC). The DRC supplies nearly 75 percent of the world's cobalt, and the ethical and social problems from cobalt mining in the DRC are appalling, to say the least. Harvard fellow Siddharth Kara has extensively documented the horrors and abuses of artisanal mining, or digging by hand, in the DRC. Having visited and researched the practices, Kara reports that more than 35,000 child laborers are digging the cobalt out by hand while breathing in toxic fumes and dust. They risk being buried alive by a collapsing tunnel, yet earn only a dollar or two per day.[19] In a recent interview with *NPR*, Kara said:

> You have to imagine walking around some of these mining areas and dialing back our clock centuries. "People are working in subhuman, grinding, degrading conditions. They use pickaxes, shovels, stretches of rebar to hack and scrounge at the earth in trenches and pits and tunnels to gather cobalt and feed it up the formal supply chain. Cobalt is toxic to touch and breathe — and there are hundreds of thousands of poor Congolese people touching and breathing it day in and day out. Young mothers with babies strapped to their backs, all breathing in this toxic cobalt dust.[20]

Despite attempts to rely on ethical practices for cobalt, cross-contamination of cobalt from artisanal mines mixed with cobalt from industrial mining all but guarantees that unethically sourced cobalt is moving up through the supply chain.[21] The rampant corruption in the DRC and the fact that the Chinese own most of the mines in the DRC exacerbate the problem.

---

[19] Siddarth Kara, "Is your phone tainted by the misery of the 35,000 children in Congo's mines?" *The Guardian*, October 12, 2018, https://www.theguardian.com/global-development/2018/oct/12/phone-misery-children-congo-cobalt-mines-drc and Siddarth Kara, "I saw the unbearable grief inflicted on families by cobalt mining. I pray for change," *The Guardian*, December 16, 2019, https://www.theguardian.com/global-development/commentisfree/2019/dec/16/i-saw-the-unbearable-grief-inflicted-on-families-by-cobalt-mining-i-pray-for-change

[20] Terry Gross, "How 'modern-day slavery' in the Congo powers the rechargeable battery economy," *NPR*, February 1, 2023, https://www.npr.org/sections/goatsandsoda/2023/02/01/1152893248/red-cobalt-congo-drc-mining-siddharth-kara

[21] Ibid.

Another extremely concerning region for sourcing of critical minerals and clean energy is China. The human rights exploitations of Uyghur Muslim minorities and other Muslim minorities in the Xinjiang region of China has also been well documented. The Department of Labor (DOL) has tracked and reported on forced labor connected to many products such as food, clothing, textiles, footwear, coal, thread/yarn, electronics, cotton, and coal.[22]

DOL and many outside organizations have also reported on the Xingjian region's connection to polysilicon, a key input for the production of solar panels.[23] A recent Breakthrough Institute report estimates that 42 percent of the global solar-grade polysilicon production capacity was in that region for 2021.[24] This percentage aligns closely with a May 2021 study from the Helena Kennedy Centre for International Justice at Sheffield Hallam University that found the Xinjiang region accounted for 45 percent of the polysilicon production capacity in 2020.[25] The same research team recently exposed a connection between supply chains (mining, processing, and manufacturing) in the auto sector and forced Uyghur labor.[26]

Encouragingly, the federal government is ramping up its efforts to block imports of products made with forced labor. In December 2021, President Biden signed the Uyghur Forced Labor Prevention Act into law. Last November, the U.S. Customs and Border Protection seized 1,053 shipments of solar equipment from China over slave labor concerns.[27]

In addition to the egregious human rights tragedies, there is also economic and environmental concerns of overreliance on China for minerals and processing. Currently, most rare earth minerals are mined and processed in China.[28] According to the U.S. Geological Service, China accounted for 80 percent of the rare earth minerals imported into the U.S. in 2020.[29] Poor environmental standards have resulted in contaminated water, air, and soil.[30] Weak enforcement

---

[22] U.S. Department of Labor Bureau of International Affairs, "Against Their Will: The Situation in Xinjiang," https://www.dol.gov/agencies/ilab/against-their-will-the-situation-in-xinjiang

[23] Ibid

[24] Seaver Wang and Juzel Lloyd, "Sins of a Solar Empire: An Industry Imperative to Address Unethical Solar Photovoltaic Manufacturing in Xinjiang," Breakthrough Institute, November 15, 2022, https://thebreakthrough.imgix.net/Sins-of-Solar_Report_v5.pdf

[25] Murphy, L. and Elimä, N., "In Broad Daylight: Uyghur Forced Labour and Global Solar Supply Chains." Sheffield, UK: Sheffield Hallam University Helena Kennedy Centre for International Justice. https://acrobat.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Ad360ffab-40cc-4d83-8b8b-a8bd503286a3&viewer%21megaVerb=group-discover

[26] Murphy, L., Salcito, K, Uluyol, Y, Rabkin, M, et al, "Driving Force: Automotive Supply Chains and Forced Labor in the Uyghur Region." Sheffield, UK: Sheffield Hallam University Helena Kennedy Centre for International Justice, December 2022, https://acrobat.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3A69ce4867-d7e7-4a6a-a98b-6c8350ceb714&viewer%21megaVerb=group-discover

[27] Nichola Groom, "Exclusive: U.S. blocks more than 1,000 solar shipments over Chinese slave labor concerns," *Reuters*, November 11, 2022, https://www.reuters.com/world/china/exclusive-us-blocks-more-than-1000-solar-shipments-over-chinese-slave-labor-2022-11-11/

[28] International Energy Agency, "The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions," March 2022, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/executive-summary

[29] U.S. Geological Survey, "Mineral commodity summaries 2021: U.S. Geological Survey," U.S. Department of Interior, 2021, https://doi.org/10.3133/mcs2021

[30] Jaya Nayar, "Not So "Green" Technology: The Complicated Legacy of Rare Earth Mining," *Harvard International Review*, August 12, 2021, https://hir.harvard.edu/not-so-green-technology-the-complicated-legacy-of-rare-earth-mining/

regarding the storage of mining waste and wastewater has contaminated groundwater, grasslands, and livestock. A history of illegal mining operations has created legacy sites that pose human health and environmental risks with no clear financial liability. While there has been some progress in enforcing more stringent labor and environmental standards, concerns remain and efforts in China have not gone nearly far enough.[31] Rossetti and Banks also comment that "it is estimated that mining and extraction of both energy and non-energy related products in China is 2.2 times as carbon intensive as the United States, and mining support services are 5.2 times as carbon-intensive."[32]

While policymakers should take steps to diversify the market and prohibit the import of products using slave labor, fully decoupling from China is also likely unrealistic. One reason is that U.S. companies are not solely importing the rare earth elements or oxides but products that contain them. The processed rare earths are sent to another country for assembly and exported to the U.S. so China would have to restrict rare earths trade to all those countries. In many cases, the company making the final product also resides in China. Eugene Gholz, professor of political science at Notre Dame, writes:

> In some cases, like the rare-earth content of Apple's iPhones, the final assembly of the consumer product takes place in China; to stop those rare earths from getting to U.S. consumers, China would have to ban consumer product exports. Perhaps the Chinese government would contemplate banning iPhone sales in a huge trade conflagration, but at that point, access to rare earths would be the least of America's concerns.[33]

An encouraging data point worth mentioning is that China tried to cut off rare earths to Japan a decade ago, and the rare earths markets diversified. Prices increased, and mines opened in other countries including Australia, Brazil, Malaysia, and Vietnam. The rare earths mining and processing market continues to diversify. Canada's rare earth mining project began shipping concentrated ore in May of last year and is functioning without any tailings ponds, making it much more environmentally friendly.[34] Japan, through state backing, is investing to extract an abundance of rare earths off its coast.

Mountain Pass mine in California re-opened, and it has a processing facility. MP Materials, which owns Mountain Pass, "is one of 3 percent of mining operations — the only one in the global rare earth industry — that recycles the water used for the process and produces dry tailings."[35] Several other mining projects and processing facilities opened in the U.S., and many

---

[31] Rodrigo Castillo and Caitlin Purdy, "China's Role in Supplying Critical Minerals for the Global Energy Transition," The Brookings Institute, July 2022, https://www.brookings.edu/wp-content/uploads/2022/08/LTRC_ChinaSupplyChain.pdf
[32] Phil Rossetti and George David Banks, "Foreign Mineral Supply Chain Dependence Threatens U.S. National Security," CRES Forum, March 2022, https://cresforum.org/wp-content/uploads/2022/03/CRES_WhitePager_CriticalMinerals_03212022_v1.pdf
[33] Eugene Gholz, "Here's the dirty truth about China's rare-earths threat," *The Washington Post*, May 31, 2019, https://www. washingtonpost.com/opinions/2019/05/31/heres-dirty-truth-about-chinas-rare-earths-threat/
[34] The Canadian Press, "First Canadian rare earth mine starts shipping concentrate from N.W.T.," CBC, May 23, 2022, https://www.cbc.ca/news/canada/north/nechalacho-starts-shipping-from-nwt-1.6462745
[35] Laura Seligman, "China Dominates the Rare Earths Market. This U.S. Mine Is Trying to Change That," *Politico*, December 14, 2022, https://www.politico.com/news/magazine/2022/12/14/rare-earth-mines-00071102

non-Chinese rare earth processing facilities opened around the world. Market diversification is helping to reduce dependence on China and demonstrate more environmentally friendly ways to mine and process REEs.

IV. Opportunities to capitalize on domestic mineral abundance, diversify supply chains, promote ethical mineral sourcing, and develop market alternatives

Many factors affect the current and future price of various clean energy technologies such as input costs, technological innovation, the availability of lower cost substitutes, and market efficiencies through economies of scale – just to name a few. Cost will be a predominant factor for the pace and scope of clean energy adoption in the United States and around the world. For instance, electric vehicles are more popular, and demand is up, but more than half the respondents of a recent poll said lack of affordability was, unsurprisingly, the biggest concern.[36]

Liberating the abundance of resources domestically and improving efficiencies for private investment and research, development, and demonstration programs will help combat rising prices for mineral commodities, establish more secure supply chains, and diversify away from unethically sourced minerals. American leadership in critical mineral development and on climate change should empower innovators to provide cleaner choices at lower prices.

Thus far, the Biden administration has taken a frustratingly contradictory approach to procuring the minerals necessary for an energy transition. A lithium mine project in Nevada and nickel mine project in Minnesota, for example have faced permitting hurdles. Julie Padilla, the chief regulatory officer for Twin Metals Minnesota testified, "We can mine here better than anywhere else in the world. But the United States will not be able to do that under the current regulatory process that is unpredictable, subject to political manipulation with changing rules in each administration, and in conflict with the priorities of our nation."[37] The more the U.S. and other developed countries extract their own resources, the fewer minerals they will need to import from countries that have lax environmental standards and use morally unconscionable labor practices. At a minimum, domestic mining proposals should be granted a rigorous environmental review process rather than be placed off limits before any review is conducted.

In addition to adding layers of red tape and blocking projects, President Biden's use of the Defense Production Act (DPA) is also misguided. Using the DPA not only sidesteps the necessary system reforms but sets a dangerous precedent to have the government usurp the role of competitive markets.[38] Eugene Gholz also warns that, "US government investments using the Defense Production Act to create still more rare earth production capacity would add to this glut.

[36] "More U.S. consumers want EVs but prices are a concern - Deloitte survey," *Reuters*, January 4, 2023, https://www.reuters.com/technology/more-us-consumers-want-evs-prices-are-concern-deloitte-survey-2023-01-04/
[37] Press release, "Twin Metals Testifies at U.S. Senate Committee on Energy and Natural Resources Hearing on Urgency of expanding Domestic Mining," Twin Metals Minnesota, March 31, 2022, https://www.twin-metals.com/press-release/ twin-metals-testifies-at-u-s-senate-committee-on-energy-and-natural-resources-hearing-on-urgency-of-expanding-domestic-mining/
[38] Eli Lehrer, "President Biden's Defense Production Act power grab," *The Hill*, April 9, 2022, https://thehill.com/opinion/national-security/3262612-president-bidens-defense-production-act-power-grab/

The government investment could even drive the privately funded, already-operating US mine out of business again."[39]

Upstream mining and refining have been identified as a challenge to meet the objectives targeted in the infrastructure bill and the Biden administration's climate targets.[40] Several private sector-led initiatives are at various stages of development to increase resource development, processing, and recycling.[41] Companies and investors are also exploring substitutes and alternatives to critical minerals. Easing supply chain constraints and securing processed minerals will best be achieved by opening domestic and international markets to extraction, processing, and trade. Modernizing permitting processes should put America on par with countries like Canada and Australia that unleash energy abundance while maintaining rigorous environmental safeguards and input from communities.[42]

Policymakers should:

- Strengthen partnerships with the private sector and with allied countries to ensure that critical minerals are ethically and responsibly sourced. While challenging, more stringent verification of ethically sourced minerals is imperative and should help reduce human rights abuses, reduce dependence on corrupt, unethical actors, and develop a more responsibly sourced critical mineral supply chain.

- Expedite permitting for natural resource extraction and energy projects and infrastructure. Modernizing the National Environmental Policy Act would significantly improve the permitting process for energy security, capitalizing on America's abundance of natural resources and diversifying America's energy sources. Importantly, sensible resource development in the U.S. and in allied countries would have a smaller environmental and climate footprint. Congress should also Prohibit both pre-emptive and retroactive vetoes under Section 404 of the Clean Water Act.

- Open opportunities for state-led environmental reviews and permits. Empowering states to conduct the environmental review and permits could create more efficient and localized reviews that better address the needs of local communities. State regulators could acquire technical expertise from the Federal Energy Regulatory Commission, the Bureau of Land Management, and the Environmental Protection Agency as necessary.

---

[39] Eugene Gholz, "The rare earths industry can weather any Chinese trade battle," *CNN*, July 23, 2019, https://www.cnn.com/2019/07/23/perspectives/rare-earths-china-argentina-trade-war/index.html

[40] Camille Erickson, "Infrastructure bill challenged by dearth of US upstream mining, refining," *S&P Global Market Intelligence*, November 10, 2021, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/infrastructurebill-challenged-by-dearth-of-us-upstream-mining-refining-67508084

[41] Alex Fitzsimmons, "Time to Build a Domestic Critical Minerals Supply Chain," ClearPath, October 21, 2021, https://clearpath.org/our-take/time-to-build-a-domestic-critical-minerals-supply-chain/?gclid=CjwKCAiAuOieBhAIEiwAgjCvcqsyySUdaKtCmZeOMjwNGyJSeYSgN2M9kDgoSFYX_cy_CK5H70_krRoCOLIQAvD_BwE

[42] Minerals Make Life, "Delays in the U.S. Mine Permitting Process Impair and Discourage Mining at Home," National Mining Association, May 2021, https://nma.org/wp-content/uploads/2021/05/Infographic_SNL_minerals_permitting_5.7_updated.pdf

- Work with the private sector to maximize the efficiency of money allocated for research, development, and demonstration included in the Infrastructure Investment and Jobs Act (IIJA). IIJA includes National Science Foundation grants for basic research on domestic critical minerals mining and recycling, $320 million for the U.S. Geological Survey for its Earth Mapping Resources Initiative, and $140 million to build a Rare Earth Demonstration Facility.

- Continue research and development for critical minerals recycling that can turn mine waste into useful products and provide research and development support for developing substitutes for critical minerals. For instance, the Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) Mining Innovations for Negative Emissions Resource Recovery (MINER) program could help unlock breakthrough technologies that supply economically feasible alternatives to critical minerals.[43]

- Maintain openness to alternative mining sources. The ocean floor contains nodules that are rich in minerals that can be used for batteries, renewable energy and defense technologies. The nodules can effectively be scooped up from the ocean floor and the deep ocean (down to 20,000 feet). There is no actual mining, extraction, or tailings associated with deep seabed mining, and studies have shown the climate and environmental impact is far smaller than the conventional mining of minerals. While it is critical to understand the ecological and environmental risks and impacts of deep seabed mining, it is also important to evaluate the trade-offs between the various ways to extract and refine minerals. More collaboration among companies, coastal countries, and scientists should establish a transparent, science-based assessment of seabed mining.[44]

- Maintain energy source and technology neutrality. The critical minerals that the economy relies on today may look much different in 20 or 30 years. Breakthrough technologies could make certain critical minerals much less valuable if companies develop an economically competitive alternative. If government policy tips the scale toward specific mature technologies, it will be that much more difficult for innovators to disrupt the market. To the extent government provides any subsidies, technology neutrality will generate more efficient outcomes. Congress should also narrow government procurement and purchase of rare earth elements to Department of Defense and national security needs.

---

[43] Press release, "DOE Announces $39 Million for Technology to Grow the Domestic Critical Minerals Supply Chain and Strengthen National Security," The Department of Energy, October 27, 2022, https://www.energy.gov/articles/doe-announces-39-million-technology-grow-domestic-critical-minerals-supply-chain-and

[44] Cecilia Jamasmie, "Extracting battery metals from seafloor may beat traditional mining — study," Mining.com, April 22, 2020, https://www.mining.com/extracting-battery-metals-from-seafloor-beats-traditional-mining-study/ and Daina Paulikas, "Life cycle climate change impacts of producing battery metals from land ores versus deep-sea polymetallic nodules," *Journal of Cleaner Production*, Vol. 275, No. 123822, December 1, 2020, https://www.sciencedirect.com/science/article/pii/ S0959652620338671?via%3Dihub and Christina Jovanovic, "Precious and Few: Solving Renewable Energy's Critical Minerals Problem," *LSU Journal of Energy Law and Resources*, Vol. 9, Issue 1, Winter 2021, https://digitalcommons.law.lsu.edu/cgi/viewcontent.cgi?article=1204&context=jelr