

Testimony of Mr. Misael Cabrera, PE
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Mr. Chair and Members of the Committee, my name is Misael Cabrera, and I am the inaugural Director of the School of Mining & Mineral Resources at the University of Arizona. The School was formed to address the pressing need for a sustainable supply of critical minerals for generations to come. We do this through industry-advancing research, and by developing the interdisciplinary mining and minerals workforce of tomorrow. We also offer students from all majors a Sustainable Minerals Minor Degree so that the multiplicity of professionals that the mining industry needs can share a fundamental understanding of the issues facing this essential industry.

Prior to this appointment, I served in the position of Director of the Arizona Department of Environmental Quality longer than any other Director in the department's history. During my tenure at ADEQ, we dramatically increased environmental outcomes, delivered award-winning online systems, and were recognized 28 times by local and national organizations. Prior to serving in Arizona State Government, I held a variety of leadership roles in private sector, international engineering firms.

Today, I am not speaking on behalf of the University. In fact, my comments are based largely on nearly 30 years of experience as an environmental professional.

It is this career-long commitment to the environment that has led me to notice that our planet's population has doubled in my lifetime and is forecasted to reach 10 billion in the next 25 years. Today's global population is also more prosperous than it was 50 years ago¹ and that expanding population wants

¹ Macrotrends, *World Poverty Rate 1981 – 2023*. Accessed April 15, 2023.
<https://www.macrotrends.net/countries/WLD/world/poverty-rate>

better infrastructure, the latest consumer electronics, more advanced medical equipment, more effective defense systems, and cleaner energy to address the effects of climate change.

But low-carbon energy technologies like solar panels, wind, and geothermal are significantly more mineral-intensive than fossil fuel technologies. Under the International Energy Agency's most aggressive scenario, total demand for mineral resources will grow by as much as 3.5 billion tons by the year 2050.² And demand for cross-cutting minerals like copper, which is prescient for decarbonization, will exceed the total demand across all human history³.

Different scenarios driven by choice of technology, material substitution, and potential technological improvements over time can shift these demand estimates, but there is no lower-carbon pathway that does not significantly increase our need for minerals.

The 2020 World Bank Report, *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition*, states plainly that "...any potential shortages in mineral supply could impact the speed and scale at which [green] technologies may be deployed globally."⁴ Thus, the speed of decarbonization relies heavily on a ready supply of minerals and consequently, the productivity of responsible and sustainable mining operations.

Even if metal recycling efforts were to increase 100-fold, there simply isn't enough material in circulation to meet the growing demand. Thus, the unavoidable truth is that we cannot develop cleaner,

² 2020 World Bank Report. *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition*. © 2020 International Bank for Reconstruction and Development/ The World Bank. <https://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf>

³ Jones, Allan G. *Mining for Net Zero: The Impossible Task*. Accessed July 19, 2023. <https://library.seg.org/doi/10.1190/tle42040266.1>

⁴ IBID

greener technologies without more minerals. And we cannot secure enough minerals without a significant focus on mining.

Supplying the planet with the necessary minerals requires a balanced approach, walking the line between responsible environmental protections, and the ability to move into extractive operations in a much more streamlined fashion. Since mining practices became codified in the United States, the industry has swung from the “move fast, dig deep” approach that had unforeseen environmental consequences, to today, when inefficient, bureaucratic processes are crippling our ability to supply the minerals necessary to address climate change.

To illustrate this over-correction, it takes an average of *16 years* from the time of initial mineral discovery until the first production takes place in a new mine.⁵ Much of this lag is caused by the regulatory environment that is a direct after-effect of legacy mining practices that are no longer used in the United States. Modern mine operators take their responsibility to the planet and neighboring communities very seriously, with clear criteria for environmental performance during and after mining operations, including responsible closure and post-closure reclamation protocols.

In contrast, many foreign governments do not operate under the same strict regulatory environment that we do in the United States, creating an unfairly advantaged dominance when it comes to mineral production. China is a perfect example of this, producing eight times more rare earth element (REE) tonnage than the U.S., and accounting for 85 percent of global supply of REE in 2016.⁶ And China’s mineral dominance is not limited to REEs. In 2020, China led all other countries in copper smelting,

⁵ International Energy Agency. *The Role of critical minerals in clean energy transitions: world energy outlook special report*. Revised March 2022. | Website: www.iea.org

⁶ Harvard International Review. 2021. *Not So “Green” Technology: The Complicated Legacy of Rare Earth Mining*. Edited by Jaya Nayar. 12 August. Accessed June 30, 2022. <https://hir.harvard.edu/not-so-green-technologythe-complicated-legacy-of-rare-earth-mining/>.

producing over 7.2 million metric tons of the commodity.⁷ The closest competitors, Japan and Chile only produced 1.7 and 1.2 million metric tons, respectively.⁸

To add environmental insult to economic injury, much of that smelting capacity is powered by fossil fuels. While many nations, including the U.S., are striving to reduce their carbon footprint, China's negative environmental impact is growing. Case in point: from 2017-2020, we reduced cumulative emissions by 11 percent while China's emissions *increased* by 7 percent.⁹ Astonishingly, China's carbon pollution now surpasses all other developed countries, combined.¹⁰ It is not an overstatement to say that by allowing China to maintain its chokehold on supplies of critical minerals, we are not only abdicating our economic and technological independence, we are condemning the Earth to be mined in ways that are far less responsible and entirely unsustainable for future generations.

President Biden acknowledges the inherent risks of dependence on foreign sources of critical minerals, even to our homeland security. In his March 31, 2022, *Memorandum to the Secretary of Defense*, he wrote about these risks, calling for "...sustainable and responsible domestic mining [and] processing."

A key factor in developing a reliable domestic minerals supply chain is streamlining the Federal Government permitting process. With layers of regulatory oversight from local, state and federal levels, it is imperative to identify what improvements can be made to mine permitting without reducing opportunities for public input or limiting the comprehensiveness of environmental reviews.

⁷ Statista. 2022. *Global copper smelter production in 2020, by key producing country*. Accessed July 1, 2022. <https://www.statista.com/statistics/1241253/world-annual-copper-smelter-production-by-country/>.

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⁹ World Population Review. 2022. "*World Population Review. Carbon Footprint by Country 2022*." worldpopulationreview.com. Accessed July 10, 2023. <https://worldpopulationreview.com/country-rankings/carbonfootprint-by-country>

¹⁰ De Chant, Tim. 2021. "*China's carbon pollution now surpasses all developed countries combined*." arstechinca.com. 6 May. Accessed July 10, 2023. <https://arstechnica.com/tech-policy/2021/05/chinas-carbonpollution-now-surpasses-all-developed-countries-combined/>.

One of the means to that end is the U.S. Federal Permitting Improvement Steering Council's (FPISC) FAST-41 process. FAST-41 for Infrastructure Permitting is a "coordinated framework for improving the federal environmental review and authorization process," and on May 8, 2023, the South32 Hermosa project was the first mining initiative to gain FAST-41 coverage.¹¹ I recommend that this process be applied to new major mining projects that will produce minerals that are essential for not only defense, but also for green technology.

And given that we are in the copper state, I would like to point out that an electric vehicle contains about four times the amount of copper as a traditional internal combustion engine automobile. Copper is also the second most used metal in defense platforms by weight¹², and is the gateway to over a dozen important minerals and rare earth elements that are only produced as co-products. Until the 1980's the US was a global leader in refined copper production. Today we have lost our position and China is the globally dominant producer of refined copper.

When considering our need for minerals like copper as a free society, it is important to assess where the greatest risks lie. I believe that modern US mines present relatively low environmental risk; I believe that the risk of global pollution as a result of over-reliance on foreign mining is much higher; and I believe that the potential for decarbonation delays because of supply chain constraints is too great.

When we add national defense vulnerabilities and American jobs, the asymmetric risk of not fostering sustainable and responsible domestic mineral supplies becomes very clear.

¹¹ Permitting Dashboard, Federal Infrastructure Projects, Accessed July 10, 2023.

<https://www.permits.performance.gov/fpisc-content/permitting-council-announces-first-ever-critical-minerals-mining-project-gain-fast-41>.

¹² McGroarty, Daniel. *Got copper? New pentagon report spotlights key role of critical metals*. 04/13/15. Accessed July 19, 2023. <https://thehill.com/blogs/congress-blog/homeland-security/238483-got-copper-new-pentagon-report-spotlights-key-role-of/>

It has been my distinct privilege to share these comments with you. I am available to answer any questions that you may have.