



United States Department of the Interior
U.S. Geological Survey
Office of the Director
Reston, Virginia 20192

April 13, 2023

The Honorable Kyrsten Sinema
United States Senate
Washington, DC 20510

Dear Senator Sinema:

Thank you for your letter to Secretary Haaland dated February 2, 2023, requesting that copper be reconsidered for inclusion on the list of critical minerals. I am pleased to respond on behalf of the U.S. Geological Survey (USGS). In this response, we briefly review the approach the USGS follows in leading the interagency development of the list of critical minerals, address the concerns raised in your letter, and highlight the latest data and some specific considerations regarding USGS studies related to copper.

Methodology

The list of critical minerals is based on a methodology developed over several years under the leadership of the USGS and with interagency input coordinated by the White House Office of Science and Technology Policy's National Science and Technology Council (NSTC) Critical Minerals Subcommittee. Minerals were included on the 2022 list of critical minerals¹ based on three evaluations: (1) a quantitative evaluation wherever sufficient data were available, (2) a semi-quantitative evaluation of whether the supply chain had a single point of failure, and (3) a qualitative evaluation when other evaluations were not possible². The quantitative methodology is based on an approach that defines supply risk as the confluence of the following three factors: (1) the likelihood of a foreign supply disruption, (2) the dependency of the U.S. manufacturing sector on foreign supplies (i.e., net import reliance), and (3) the vulnerability of the U.S. manufacturing sector to a supply disruption. The consideration of these factors to assess criticality is consistent with the definition of a "critical mineral" from the Energy Act of 2020.

For both accuracy and completeness, the list is based on the most recent data for actual consumption and production of mineral commodities. Your letter notes that data from 2018 were the most recent used in developing the 2022 list of critical minerals. Development and publication of the new methodology and the associated quantitative analysis was completed in 2020-2021, using data from 2018, the most recent year for which complete datasets (both USGS and external) were available for inclusion in the analysis. Subsequently, the methodology and draft list were subject to a rigorous review process including peer review required of all USGS

¹ <https://www.federalregister.gov/documents/2022/02/24/2022-04027/2022-final-list-of-critical-minerals>

² Nassar, N.T., and Fortier, S.M., 2021, Methodology and technical input for the 2021 review and revision of the U.S. Critical Minerals List: U.S. Geological Survey Open-File Report 2021-1045, 31 p., <https://doi.org/10.3133/ofr20211045>.

publications, an interagency review through the NSTC Critical Minerals Subcommittee, and a review of public comments received in response to the Federal Register Notice of the draft list of critical minerals.

Copper

The USGS recognizes that copper is an essential mineral commodity to U.S. economic and national security interests. As noted in the Federal Register Notice for the draft list of critical minerals, copper is also a host mineral for several byproduct critical minerals. While copper did not meet the criteria for inclusion on the 2022 list of critical minerals, we recognize that the geopolitical situation and the effects of the COVID-19 pandemic on supply chains are prompting reasonable questions over whether key commodities' supply chain risks should be reevaluated before the three-year update cycle established by the Energy Act of 2020.

Your letter also highlights the many forecasts of increasing copper demand, driven by both traditional uses of copper and the additional requirements for new low-carbon energy infrastructure.

We have reviewed the most recent data on copper supply and short-term projections of future supply. Data on reserves and identified resources available in the newest annual Mineral Commodities Summary³ inform analyses of near-term potential for domestic and global copper production, and a recent assessment of undiscovered global copper resources⁴ provides a framework for estimating long-term production potential. In addition, in response to the Energy Act of 2020, the USGS is developing a series of mineral commodity outlooks that include five-year production projections for an annual rotating set of nine mineral commodities. The first nine commodities are copper, bauxite (aluminum), cobalt, iron ore, lithium, nickel, palladium, platinum, and tin.

The most recent data for copper supply chains indicate a significant disruption at the start of the pandemic and a subsequent rebound. Copper imports to the United States are predominantly refined copper. Imports of refined copper increased in 2021 but then decreased significantly from 2021 to 2022. The relatively high level of imports in 2021 appear to represent a rebound from much lower imports in 2019 and 2020 during the height of the COVID-19 pandemic. The pandemic had large, broad impacts on many mineral commodity supply chains which are only now returning to pre-pandemic levels.

In the analysis for the 2022 list of critical minerals, the USGS assessed copper as having a relatively high economic vulnerability score, indicating that the U.S. manufacturing sector is

³ U.S. Geological Survey, 2023, Mineral commodity summaries 2023: U.S. Geological Survey, 210 p., <https://doi.org/10.3133/mcs2023>.

⁴ Hammarstrom, J.M., Zientek, M.L., Parks, H.L., Dicken, C.L., and the U.S. Geological Survey Global Copper Mineral Resource Assessment Team, 2019, Assessment of undiscovered copper resources of the world, 2015 (ver.1.1, May 24, 2019): U.S. Geological Survey Scientific Investigations Report 2018–5160, 619 p., <https://doi.org/10.3133/sir20185160>.

vulnerable to a supply disruption, but this vulnerability was mitigated by a relatively low U.S. net import reliance on foreign supplies and a diversity of foreign supply sources. Although net import reliance increased from 2018 to 2021, the latest data from the 2023 Mineral Commodity Summaries, published on January 31, 2023, indicate that import reliance decreased over the past year, from 44% in 2021 to 41% in 2022. Imports of refined copper decreased in 2022 even as domestic copper consumption increased.

The consultant report sponsored by the Copper Development Association⁵ (CDA) states that, based on more recent data, the recency-weighted supply risk for copper now exceeds the 0.40 threshold used for inclusion on the 2022 list of critical minerals. An important difference between the USGS and CDA analyses is that the USGS incorporates the most recent data for all mineral commodities into the model simultaneously, instead of analyzing potential changes for a single commodity. This requirement ensures that the model incorporates structural changes in commodities markets or supply chains that may have occurred since the last update, even those that have not (yet) affected the copper supply chain.

The U.S. has significant domestic copper production and a diversity of foreign supply sources. The USGS estimates that the United States mined 1.3 million tons of recoverable copper in 2022. Copper was mined in seven different states (led by Arizona) and the United States has multiple domestic options for downstream smelting and refining to copper metal. The United States has 25 operating copper mines, 2 smelters, 2 electrolytic refineries, and 14 electrowinning facilities. In addition, the observation that more than half of the global supply of refined copper is produced in China, Russia, North Korea, and Iran, while factually correct, is not directly relevant to the copper supply of the United States. Imports of refined copper to the United States are not dependent on any of the countries cited. American imports of refined copper come predominantly from Chile, Canada, and Mexico, reliable trade partners with whom the U.S. has free trade agreements.

Finally, the United States supplied about a third of its domestic copper consumption requirements from recycling in 2022, a good example of the potential for secondary production to mitigate supply chain risks.

Ongoing USGS Copper Studies

In recognition of the importance of copper mining to the United States' economic and national security, both for copper itself and for many byproduct critical minerals, the USGS continues to emphasize copper in its research, resource assessments, and supply chain studies. Recent USGS studies of copper include the publication in 2019 of a first-ever global assessment of undiscovered copper resources for the two most significant sources of global copper supply: porphyry copper deposits and sediment-hosted stratabound copper deposits. The geology-based

⁵ Copper Development Association, https://copper.org/copperiscritical.org/report/CDA_Copper_Critical_Mineral_full_report.pdf

study identified 236 areas for undiscovered copper in 11 regions of the world⁶. Additionally, the USGS Earth Mapping Resources Initiative (Earth MRI) has included areas permissive for copper deposits with the potential to host critical minerals as potential targets for geophysical, geochemical, and geologic mapping, with southeastern Arizona and western Utah among the focus areas for new mapping in 2023.

Summary

Mineral criticality is not static but changes over time. In accordance with the Energy Act of 2020, the USGS will continue to review and update the criticality methodology and the list of critical minerals at least every three years. This cycle will include a reanalysis of the entire suite of mineral commodities, based on the most recent and complete data available.

While copper is clearly an essential mineral commodity, its supply chain vulnerabilities are mitigated by domestic capacity, trade with reliable partners, and significant secondary capacity. As a result, the USGS does not believe that the available information on copper supply and demand justifies an out-of-cycle addition to the list at this time. The USGS will continue to carefully monitor copper supply and consumption data for the next list of critical minerals review and revision cycle. We take the input we are receiving from Congress seriously and anticipate opportunities for public comment on copper and other minerals as part of this review cycle.

Thank you again for your letter. We greatly appreciate your interest in the supply chains of minerals essential to the economic and national security of the United States. If you or your staff would like more information on copper, the 2022 list of critical minerals, or any other related topics, please contact the USGS Congressional Liaison Office at cong_liaison@usgs.gov, 703-648-4455.

Sincerely,



David Applegate
Director

⁶ Hammarstrom, J.M., Zientek, M.L., Parks, H.L., Dicken, C.L., and the U.S. Geological Survey Global Copper Mineral Resource Assessment Team, 2019, Assessment of undiscovered copper resources of the world, 2015 (ver. 1.2, December 2021): U.S. Geological Survey Scientific Investigations Report 2018–5160, 619 p., <https://doi.org/10.3133/sir20185160>.

Identical Letter Sent To:

The Honorable Mark Kelly
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The Honorable Joe Manchin, III
United States Senate
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The Honorable Mike Braun
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The Honorable Raphael Warnock
United States Senate
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The Honorable Mitt Romney
United States Senate
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