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R STREET POLICY STUDY NO. 96
May 2017

EMBARRASSMENT OF RICHES: REVERSING U.S. MINERALS IMPORT DEPENDENCY

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INTRODUCTION

As recently as 1990, the United States was the world's largest producer of minerals—a a collection of nonfuel resources that are the building blocks of today's technologies. In the ensuing decades, quite a different trend has emerged. Of 88 mineral commodities tracked by the U.S. Geological Survey (USGS), the United States is more than 25 percent import-dependent for 62 of them.[1]

That trend is growing worse. In its annual Mineral Commodity Summary, USGS notes:

> Several U.S. metal mines and processing facilities were idled or closed permanently in 2016, including iron ore mines in Michigan and Minnesota; three primary aluminum smelters in Indiana, Missouri, and Washington; one secondary zinc smelter in North Carolina; a titanium sponge facility in Utah, the only such facility in the United States; and titanium mineral operations in Virginia.

Domestic trends aside, minerals are a fundamental building block to economic prosperity. The industries that rely on minerals, including construction and manufacturing, contributed $2.78 trillion to the domestic economy, nearly 15 percent of gross domestic product.[2] On this basis alone, declining minerals production and processing should be concerning. But it is the types of manufactured goods that rely on minerals that make import-dependency of significant consequence.

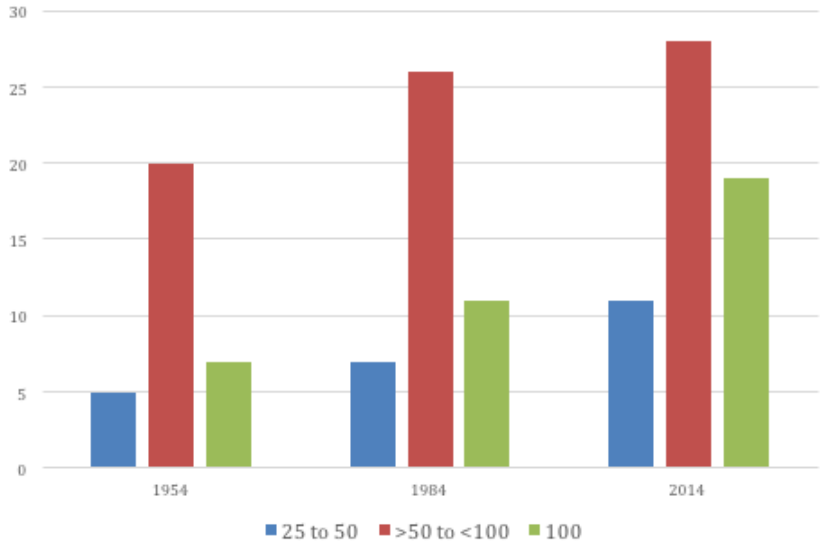
The broad term "minerals" captures a variety of elemental metals and compounds with unique and varied properties. Collectively, minerals are essential to the manufacture of energy equipment, medical devices, electronics, agricultural products, household items and a range of goods essential to the national defense. Some minerals are so necessary to military operations that the Pentagon's Defense Logistics Agency maintains 37 mineral commodities as part of the U.S. National Defense Stockpile.

So why is the domestic minerals industry closing up shop? A 2016 study by the Government Accountability Office, "Strengthened Federal Approach Needed to Help Identify and Mitigate Supply Risks for Critical Raw Materials," details the government's approach to addressing critical materials-supply issues. It's an overdue first step and concludes that government must do much more to stem foreign

1. SNL Metals & Mining, "U.S. Mines to Market," National Mining Association, September 2014. http://nma.org/wp-content/uploads/2016/09/NMA_Report_Mines_to_Market_FINAL.pdf

2. U.S. Geological Survey, "Mineral Commodity Summaries 2017," U.S. Department of the Interior, Sept. 13, 2016. https://minerals.usgs.gov/minerals/pubs/mcs/2017/mcs2017.pdf

FIGURE I: U.S. NONFUEL MINERAL NET IMPORT RELIANCE



NOTE: Number of nonfuel mineral commodities for which the United States was at least 25 percent reliant in 1954, 1984 and 2014.

SOURCES: U.S. Bureau of Mines (1957, 1985); U.S. Geological Survey (2015).

mineral imports, particularly by addressing waning domestic mineral mining.[3]

This paper explores import trends for critical and strategic minerals in the context of public-resource policies and articulates that minerals import dependence is a willful product of policy that can and should be reversed.

U.S. MINERAL IMPORTS —OUT OF CONTROL?

Mounting imports are cultivating a risky import dependency for critical and strategic minerals. Over the past half-century, the United States has become more dependent on mineral imports to meet its domestic needs than at any time in its history.

We can draw valuable lessons about our mineral reliance from the history of unsustainable petroleum imports. In the 1970s, the Arab members of the Organization of Petroleum Exporting Countries used their control of petroleum supplies to assert diplomatic leverage against the United States. In retaliation for international support of Israel in the Yom Kippur war, OPEC cut production and prohibited the export of petroleum to the United States and a number of other nations that sided with Israel. President Richard Nixon attempted to manage the situation through diplomatic means and to increase domestic production, but the response was slow and insufficient; prices for oil more than quadrupled, consumers and corporations had trouble accessing sufficient affordable oil supplies and the global economy raced toward recession. Only after significant concessions were made by the United States and its allies was the embargo lifted.

There's no cartel for minerals, but there doesn't have to be. The asymmetric distribution of mineral wealth across the globe allows individual countries to be the majority supplier of any number of minerals. Though we import minerals from a number of countries, two trade partners stand out as particularly significant: Russia and China. China is by far the largest global source of minerals production and has already used its mineral wealth as a diplomatic weapon (see Sidebar 1). As Chinese statesman Deng Xiaoping said in 1992: "The Middle East has its oil, China has rare earth."[4]

Supply chain vulnerabilities

Three distinct trends in U.S. mineral imports have become strikingly evident:

1. The United States is dependent upon imports for a growing variety of minerals;
2. The United States is importing an ever-greater share of individual minerals; and
3. There is a shift in the geographic distribution of the

3. U.S. Government Accountability Office, "Strengthened Federal Approach Needed to Help Identify and Mitigate Supply Risks for Critical Raw Materials," September 2016. http://www.gao.gov/assets/680/679577.pdf

4. Dian L. Chu, "Seventeen Metals: 'The Middle East has oil, China has rare earth,'" *Business Insider*, Nov. 11, 2010. http://www.businessinsider.com/seventeen-metals-the-middle-east-has-oil-china-has-rare-earth-2011-1

countries that supply these minerals to the United States.[5]

Because global distribution of mineral resources, reserves and deposits is not uniform, the United States has always been reliant on other countries to supply imports for certain key minerals. Over the past six decades, however, the United States has nearly doubled the number of minerals for which it is more than 50 percent dependent upon imports.[6]

With declining domestic production, the United States is highly trade exposed. According to the latest data from the U.S. Geological Survey (USGS), the United States is 100 percent dependent upon imports for at least 20 key minerals and more than 50 percent import-dependent for another 30.[7] Of course, it's not just import reliance that determines trade vulnerability, but also whether there are any alternative supply prospects, potential substitutions, opportunities for recycling or conservation or available stockpiles; how the minerals are used and how important the products made from those minerals are; how many suppliers there are for any particular mineral; and, of course, which nations are the major suppliers. [8]

Of the 50 minerals for which the United States is more than 50 percent import-dependent, 28 are imported from China and 11 are imported from Russia. Both these countries have used their domestic resource wealth as a diplomatic and trade weapon. This presents a straightforward challenge: In the event that our trading partners limit imports, can the United States successfully adapt? For illustration, we briefly address three highly specialized critical minerals for which China is our most significant supplier.

Rare earth elements

The suite of 17 individual minerals that constitute the rare earth elements (REE) are, "the vitamins of chemistry," with unique attributes like magnetism or temperature and corrosion resistance.[9] REE are essential to the military for the production of high-performance permanent magnets, GPS guidance systems, satellite imaging and night-vision equipment and to civilians for everything from cell phones to sunglasses.

The last rare earth mining company in the United States, Molycorp Inc., filed for bankruptcy in 2015, and two other REE manufacturers closed up shop, leaving the country entirely dependent upon imports.

As recently as 1993, China produced 38 percent of world REE, the United States produced 33 percent, Australia produced 12 percent and there were smaller contributions from Malaysia, India and several other countries. By 2011, China accounted for 97 percent of the world's REE.[10] Currently, 72 percent of all REE imports come directly from China and the remainder are imported from countries that process Chinese-mined materials.[11]

Tantalum

Demand for tantalum is exploding in the United States because it is a key component of smartphones, computers, tablets and other electronic components. Because of its ductility, tantalum can be drawn into fine wires or filaments, and is ideal for manufacturing surgical instruments and implants. It can also be used to produce a variety of metal alloys that have high melting points, strength and ductility, including steel used in making carbide tools for metalworking equipment, chemical-processing equipment, steel alloys for jet-engine components, nuclear reactors and missiles. In short, it is critical to national defense.[12]

There has been no significant tantalum production in the United States since the 1950s and the few resources that have been discovered are low-grade. Though the majority of global production is developed in Rwanda and Congo, China is far and away the largest supplier of tantalum to the United States, with imports increasing 93 percent in 2012 alone.[13]

Gallium

Gallium is another exotic material that is indispensable as a component in semiconductors. It has been dubbed a "smart metal" because it readily combines with other elements, forming a variety of semiconductors that are useful in microchips and optoelectronic applications, including smartphones, wireless equipment, solar technology, LED lighting, photodetectors, solar cells, industrial and medical equipment, and other goods.[14]

5. National Minerals Information Center, "Comparison of U.S. Net Import Reliance for Nonfuel Mineral Commodities—a 60 Year Retrospective (1954-1984-2014)," U.S. Geological Survey Fact Sheet 2015-3082, Dec. 14, 2015. https://pubs.usgs.gov/fs/2015/3082/fs20153082.pdf

6. Ibid.

7. U.S. Geological Survey, 2016.

8. D.G. Haglund, "Strategic minerals and Canada: CRS Perspectives," Queen's University, Kingston, Ontario, Canada, no. 17, p. 1-2, December 1983.

9. Sarah Zielinski, "Rare Earth Elements Not Rare, Just Playing Hard to Get," *Smithsonian*, Nov. 18, 2010. http://www.smithsonianmag.com/science-nature/rare-earth-elements-not-rare-just-playing-hard-to-get-38812856/?no-ist=

10. Jan Ishee, Ethan Alpern and Alex Demas, "Going Critical: Being Strategic with Our Mineral Resources," U.S. Geological Survey, Dec. 13, 2013. https://www2.usgs.gov/blogs/features/usgs_top_story/going-critical-being-strategic-with-our-mineral-resources/

11. U.S. Geological Survey, 2016.

12. U.S. Geological Survey, 2016.

13.Sandra Wirtz, "Why Tantalum should be on U.S. stakeholders radar," American Resources Policy Network, April 12, 2013. http://americanresources.org/why-tantalum-should-be-on-u-s-stakeholders-radar/

14. U.S. Geological Survey, 2016.

Gallium is a coproduct of aluminum, and most gallium is derived from processing bauxite or aluminum ore. Only a small percentage of the gallium metal contained in bauxite is economically recoverable using current techniques. In addition, despite abundant domestic bauxite resources, aluminum recycling makes developing those resources less attractive. Again, China is the largest supplier of gallium to the United States, with relatively fewer imports from Germany, the United Kingdom and Ukraine.[15]

In all cases, the United States is entirely import-dependent and disproportionately dependent upon imports from China. In reference to REE, one defense-industry analyst recently stated: "absolutely, China could cut off the supply," yet the same could be said of nearly any mineral produced in substantial amounts in China.[16] Short-term supply of minerals, like most mined resources, is almost perfectly inelastic. Any production or trade limitations would be difficult to compensate for and would challenge the economic security of the U.S. technology industry and, critically, customers in the military base. As a matter of direct concern to national security, it is vitally important that the United States reassess its approach to minerals production and trade.

THE GREAT MINERALS TREASURE

The United States is a mineral-rich nation. For its first 150 years, the nation was largely self-sufficient in mineral requirements, and had a surplus trade balance in minerals until the late 1920s. That wealth emanated largely from western public lands that house enormous mineral wealth. One of the largest mineralized regions on earth is found in the geologic terrain that extends from Colorado to the Pacific Ocean. This mineral belt contains world-class deposits of antimony, arsenic, chromium, cobalt, copper, fluorine, gold, iron, lead, manganese, mercury, molybdenum, nickel, platinum, silver, tin, titanium, tungsten, uranium, vanadium and zinc—many of which are critical minerals important to the economy.

What is unusual about this western "mineral belt" is the abundance and concentration of a diversity of minerals within such a vast area—especially compared to other mineral belts on earth.[17] For example, this area is home to some of the largest mines in the world, such as Colorado's Climax molybdenum mine; Alaska's Red Dog lead-zinc mine; Nevada's Carlin and Cortez gold mines; the Morenci copper mine in Arizona; and the Greens Creek polymetallic mine in Alaska.[18]

The USGS, from its inception in 1879, has published numerous reports on the U.S. "mineral belt" and has compiled lists of major mineral deposits, which number in the hundreds of thousands of mineral "occurrences" (i.e., the existence of a valuable deposit irrespective of size). Well over a thousand of these occurrences are thought to be significant, and most of the mineral resources and mining production in the United States are associated with a small number of large deposits.[19]

SIDEBAR 1: JAPAN FEELS THE SQUEEZE

A longstanding territorial dispute between Japan and China over the waters of the Senkaku Islands came to a head in September 2010. A Chinese fishing trawler collided with two Japanese coast guard vessels while fishing in disputed waters. The Japanese detained the trawler captain.[1] In retaliation, the Chinese applied pressure, using administrative means to prevent shipments to Japan of REE.[2]

At the time, Japan was importing more than half its rare earths from China, transforming them into important export products like magnets and hybrid electric vehicles. Prices for rare earths quickly spiked, resulting in worldwide disruptions and immediately casting doubt on the survival of major Japanese industries. Because China used administrative means to block shipments—staging customs officials at ports to prevent the loading of shipments bound for Japan—rather than publishing regulations or declaring official policy, Japan had no recourse for appeal to the World Trade Organization.

Japan released the fishing trawler captain after just 17 days.[3] While the global minerals industry responded by identifying new resources, China still dominates global REE production. Japan and other manufacturing customers remain susceptible to supply chain disruptions of rare earth materials and other rare metals.[4]

On reflection, a Japanese scholar suggested that the incident would, "raise questions about why Japan pushed the issue in the first place, if it couldn't follow through with meeting China's challenges."[5] Without a secure domestic source or sufficiently diverse import sources of REE and other minerals, the United States should ask itself if it is has the ability to weather similar diplomatic challenges.

1. Sheila A. Smith, "A Sino-Japanese Clash in the East China Sea," Council on Foreign Relations, April 22, 2013. https://www.cfr.org/report/sino-japanese-clash-east-china-sea
2. Keith Bradsher, "Amid Tension, China Blocks Vital Exports to Japan," *The New York Times*, Sept. 22, 2010. http://www.nytimes.com/2010/09/23/business/global/23rare.html
3. Martin Fackler and Ian Johnson, "Japan Retreats With Release of Chinese Boat Captain," Sept. 24, 2010. http://www.nytimes.com/2010/09/25/world/asia/25chinajapan.html
4. David S. Abraham, *The Elements of Power: Gadgets, Guns, and the Struggle for a Sustainable Future in the Rare Metal Age*, Yale University Press, p. 319, 2015.
5. Fackler, 2010.

15. Sandra Wirtz, "Through the Gateway: Of Pokémon and Co-Products—a Look at Gallium," American Resources Policy Network, July 28, 2016. http://americanresources.org/through-the-gateway-of-pokemon-and-co-products-a-look-at-gallium/

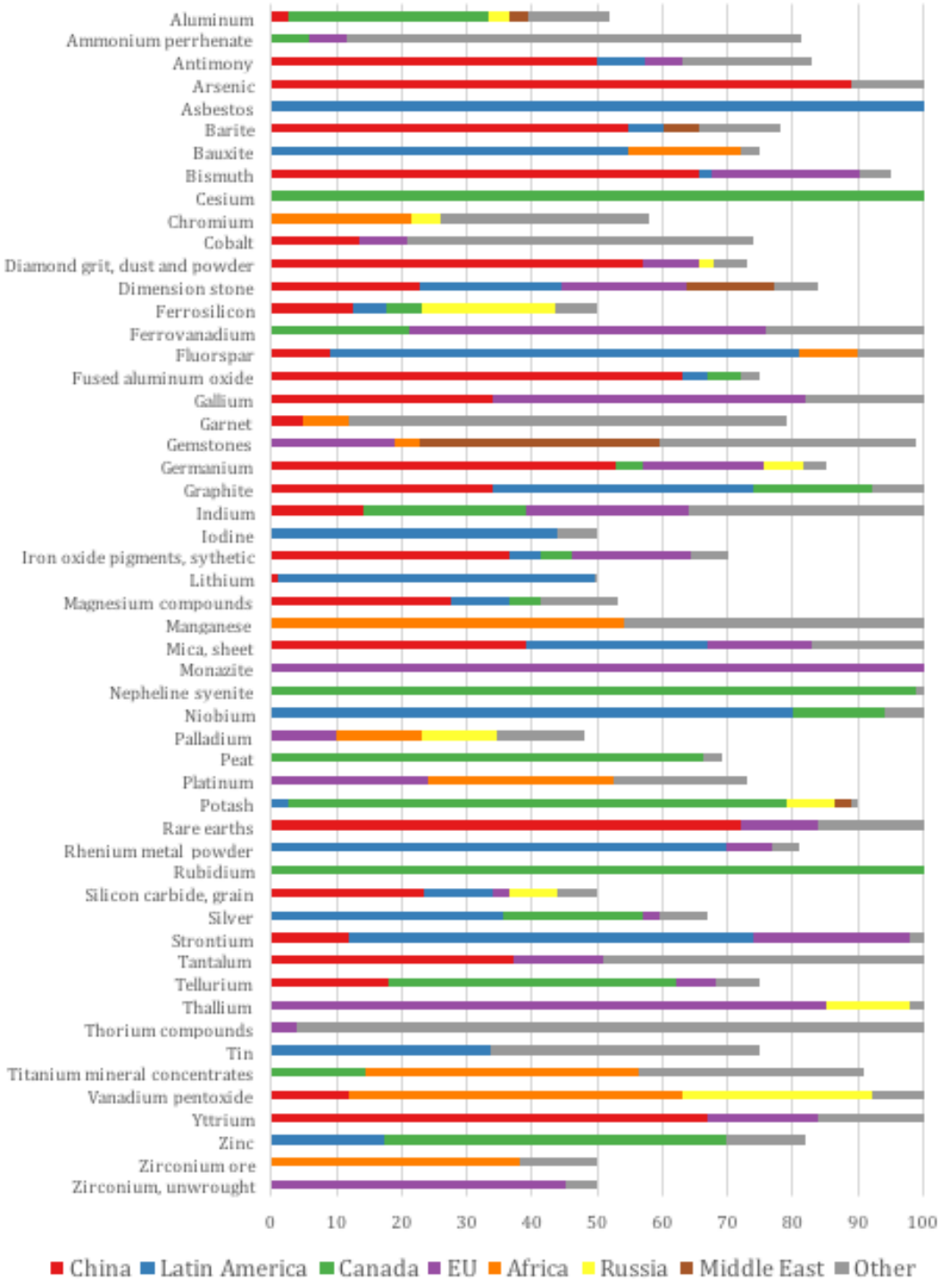
16. Moody, John, "China's secret Trump card: Could Beijing deprive our military of critical defense components?," *Fox News*, Feb. 3, 2017. http://www.foxnews.com/opinion/2017/02/03/chinas-secret-trump-card-could-beijing-deprive-our-military-critical-defense-components.html

17. Gordon P. Eaton, "Mineral Abundances in the North American Cordillera," *American Scientist*, vol. 72, 1983.

18. SNL Metals & Mining, 2014.

19. Michael L. Zientek and Greta J. Orris, "Geology and Nonfuel Minerals Deposits of the United States," U.S. Geological Survey Open File Report 2005-1294A, 2005. https://pubs.usgs.gov/of/2005/1294/a/index.html

FIGURE 2: 2016 U.S. NET IMPORT RELIANCE FOR KEY MINERALS



NOTE: Percentage imported (horizontal axis) from major import sources are an average of annual imports from 2012 to 2015.
SOURCE: U.S. Geological Survey

USGS reports indicate the United States has discovered enormous metallic deposits of copper, gold, iron ore, lead, molybdenum, nickel, platinum, silver, tin, tungsten and zinc, and many other metals and also nonmetals. As of 2003, U.S. mines provided between 5 and 50 percent of production for a number of important metals and nonmetals, such as barite, beryllium, boron, bromine, copper, garnet, gypsum, salt, iron, molybdenum, palladium, phosphate rock, soda ash and titanium.[20] USGS assessments of deposits of some of the most valuable metals in the economy—gold, silver, copper, lead and zinc—indicate that "identified" and "undiscovered" deposits of these metals dwarf all that has been produced thus far.[21]

Clearly, the resources of the U.S. western "mineral belt," as well as the rest of the country, are extremely abundant and critical to the economy. However, the National Mining Association has indicated that, although U.S. mineral wealth exceeds an estimated $6 trillion, many abundant minerals still need to be imported in large quantities because of land access and regulatory issues.[22]

POLICY, NOT GEOLOGY

With such abundant resources, it is indeed remarkable that the United States quadrupled its mineral trade deficit between 1973 and 1980. This sharp rise in imports can be traced directly to a conspicuous failure to issue mining leases on federal lands.[23] Indeed, the actions and decisions of the federal government suggest that policy—not available resources—determines when, where and if U.S. minerals will be mined.

Three factors contribute to the domestic minerals downturn. First, the permitting process for mineral development on federal lands is too long and drawn out. Second, environmental opposition to mining triggers litigation delays and burdensome regulations that increase development costs. Third, federal lands withdrawals have closed large swaths of the West, often with permanent restrictions on mining. These factors have taken a toll on domestic mining.

Permitting delays

U.S. mining projects require multiple permits and the involvement of the relevant federal land management agencies, other federal agency stakeholders, nongovernmental organizations, local indigenous groups and the general public. Obtaining input from all these groups requires substantial coordination and can force mining companies to alter plans or mine designs, revise timelines and otherwise accommodate these varied interests. But potential new mines also must solicit an additional layer of analysis related to environmental impacts as prescribed by the National Environmental Policy Act (NEPA), which can substantially slow the process. Poor agency coordination and unconstrained timeframes make NEPA the lengthiest step toward a permit.[24]

On average, the NEPA process to plan mining operations can take three to five years. Most mining projects require an environmental impact statement (EIS), the most rigorous form of NEPA analysis. An EIS must offer a comprehensive assessment of potential direct and indirect environmental and community impacts, as well as consideration of potential project alternatives. The EIS can require more studies to be undertaken, mine plans to be modified and more time for consultation, a process that can easily require seven years. When accounting for the other required documentation, the permit timeline for major mining projects can exceed 10 years. Other countries that have major mining operations, such as Australia and Canada, limit their permitting processes to roughly two years.[25]

The significant delays increase uncertainty for investors and close out potential development of available mineral resources. As the National Mining Association described the problem:

> A permitting process that appears to be 'bogged down,' and takes longer than projected, increases the risk profile for the project. If investors associate the delay with the increased possibility the project may ultimately not proceed, or the delay will decrease the returns from their investment, they may re-evaluate their financial commitments to the project and withdraw their funds.[26]

The Bear Lodge REE deposit in Wyoming's Black Hills National Forest offers a telling example. Developer Rare Element Resources submitted an application to develop a large REE deposit in 2012 and met with officials at the White House and the departments of Defense and Energy, among others. Despite considerable political support and the promise of a

20. Ibid.

21. National Minerals Resource Assessment Team, "1998 Assessment of Undiscovered Deposits of Gold, Silver, Copper, Lead, and Zinc in the United States," U.S. Geological Survey, 1998. https://pubs.usgs.gov/circ/c1178/c1178.pdf

22. National Mining Association, "Newsletter," Feb. 27, 2017 http://mineralsmakelife.org/assets/images/content/resources/Newsletter_Feb.pdf

23. Subcommittee on Mines and Mining, "U.S. Minerals Vulnerability: National Policy Implications: a report," U.S. House Committee on Interior and Insular Affairs, September 1980.

24. SNL Metals & Mining, "Permitting, Economic Value and Mining in the United States," National Mining Association, June 19, 2015. http://nma.org/wp-content/uploads/2016/09/SNL_Permitting_Delay_Report-Online.pdf

25. Ibid.

26. Ibid.

new domestic REE supply, the U.S. Forest Service has yet to officially complete the EIS required by NEPA.[27]

Environmental opposition and regulations

Activist engagement before, during and after the permitting process also may substantially extend the timeline to develop a project and the uncertainty surrounding the project permit. In the last few years, activists have been moving away from strategic litigation and other forms of obstructionism and have found it advantageous to prod federal agencies—the Environmental Protection Agency, in particular—to exact influence over the permit-approval process.

Consider the recent example of environmental opposition to developing the "Pebble Project" in southwest Alaska. Among the most significant metallic mineral deposits ever discovered, the Pebble mine would allow for development of 6.44 billion metric tons of copper, gold, molybdenum and silver. The site is located on state lands in southwest Alaska that were secured in 1974 as part of a land swap with the federal government, specifically for its mineral potential. The site has since been designated through two public land-use planning processes for mineral exploration and development.

While developer Pebble Limited Partnership was pursuing a permit to develop the deposits, the Environmental Protection Agency (EPA) used an obscure section of the Clean Water Act to step in and block the project. In a 2014 proposal, the EPA's Region 10 office, which covers the Pacific Northwest, wrote that it would take action to prevent the mining operation "because of the high ecological and economic value of the Bristol Bay watershed and the assessed unacceptable environmental effects that would result from such mining."[28]

Crucially, the EPA released this proposal in advance of any formal permit application from Pebble Limited Partnership. In effect, the EPA "veto" of the Pebble Project was based on less information than would have been included, considered and vetted by a broad range of stakeholders in the statutorily required NEPA process.

A 2015 independent investigation of the EPA's decision revealed that there were significant gaps in the EPA's analysis, in particular that the agency "failed to address important considerations that would be included in the NEPA process, including meaningful participation by other state and federal government agencies, mitigation and controls as proposed by the developer, and an array of public interest factors."[29] The same investigation revealed that, for the EPA to conduct the study in advance of a permit application, the agency "made assumptions about potential mine operations in the Pebble Deposit Area and created hypothetical mine scenarios based largely on a preliminary economic analysis prepared for the Pebble Partnership."[30]

The current White House administration has refocused work on the Pebble mine and reached a legal settlement with Pebble Limited Partnership to revive the project and restart the NEPA process. But this is far from the only example of environmental activists lobbying to obtain preemptive vetoes from the EPA.

The EPA also has faced pressure to intervene preemptively in a number of similar cases. The Bad River Band of the Lake Superior Tribe of Chippewa is challenging an iron ore mine in Iron County, Wisconsin, because it might harm tribal wild rice beds. An environmental group in Minnesota is attempting to kill a nickel-platinum-palladium mine in the northeastern part of the state because it is a popular wilderness vacation destination. The EPA also faces pressure to veto a planned nickel mine in Oregon near a tributary of the Smith River to protect fish stocks.[31]

Daniel McGroarty of the American Resources Policy Network (ARPN) summarizes the problem:

> What these projects have in common is that none has put forward an actual mine plan. This action would trigger a thorough mine review as required under the National Environmental Policy Act. For more than 40 years NEPA has defined process by which a mine plan is evaluated. Under the law, every one of the concerns raised by opponents to the Wisconsin, Minnesota and Oregon mines would be aired publicly, examined by scientists and a range of technical experts, before approval is granted or denied. Now, using the Pebble mine as precedent, anti-mining activists are urging the EPA to ignore NEPA and bar mining projects with no review necessary.[32]

27. William Perry Pendley, "The threats to America's minerals," *The Washington Times*, Nov. 1, 2015. http://www.washingtontimes.com/news/2015/nov/1/william-perry-pendley-the-threats-to-americas-mine/

28. Environmental Protection Agency, "Proposed Determination of the U.S. Environmental Protection Agency Region 10Pursuant to Section 404(c) of the Clean Water Act, Pebble Deposit Area, Southwest Alaska," July 2014. https://www.epa.gov/sites/production/files/2014-07/documents/pebble_es_pd_071714_final.pdf

29. William S. Cohen, "Report of An Independent Review Of The United States Environmental Protection Agency's Actions In Connection With Its Evaluation Of Potential Mining In Alaska's Bristol Bay Watershed,"
The Cohen Group - DLA Piper LLP, Oct. 6, 2016. http://files.cohengroup.net/Final/Final-Executive-Summary.pdf

30. Ibid.

31. Daniel McGroarty, "Miners Struggle With a Federal Cave-In," *Wall Street Journal*, July 24, 2014. https://www.wsj.com/articles/daniel-mcgroarty-miners-struggle-with-a-federal-cave-in-1406243847

32. Ibid.

Federal land withdrawals

A particularly pernicious obstacle to domestic mineral development is the increasing withdrawal of public lands from development opportunities. Vast tracts of public lands have been and are being withdrawn from entry to mineral exploration, mining, geothermal leasing and other public activities for any number of reasons, including designation of wilderness areas, habitat preservation and even military use. The Obama administration dramatically increased withdrawals. President Barack Obama used the Antiquities Act 29 times to establish or expand national monuments and was the first president to use the Outer Continental Shelf Lands Act to withdraw coastal areas from mineral-leasing activities.

Consider the proposed plan from the Bureau of Land Management to protect the greater sage-grouse and its sagebrush habitat. The BLM plan would restrict federal land from future mining operations by putting 10 million acres across Idaho, Montana, Nevada, Oregon, Utah and Wyoming off limits in favor of habitat conservation. The National Mining Association has stated that the massive land withdrawal would hurt mining-industry jobs, decrease revenues and further restrict access to critical minerals, because the states subject to the withdrawal, along with other western states, account for 75 percent of U.S. metals production. In addition, because half the nation's federal hard-rock minerals already are off-limits for minerals development, a final decision on the sage-grouse withdrawal would have continued impact on U.S. import reliance on those minerals.[33]

Such large, usually irreversible withdrawals fail to acknowledge the cumulative effects on future exploration and development of domestic resources, including minerals. Rather than fitting within the conservation ethic that has guided our public lands policies, land withdrawals are usually decided without regard to the unique geologic location of resources that could be available for development. Withdrawing acreages that contain important resources has the potential to create artificial shortages and increase imports, as has been readily apparent in the domestic minerals market.[34]

Americans will probably never know the full extent of mineral resources located in the public domain, because withdrawals discourage the necessary tasks of geologic mapping and mineral resource evaluation. Therefore, if the government were to consider public land mineral wealth as a bank account or a strategic reserve, it would not know, and may be able unable to evaluate the "balance" of the American mineral account. Has the U.S. government already withdrawn so much land from exploration and development as to seriously disrupt the future supply of domestic minerals?

SIDEBAR 2: CRITICAL AND STRATEGIC

There is no official U.S. government definition of "critical" or "strategic" minerals, an obstacle that sometimes makes it difficult to pin down which substances are relevant to this discussion. This paper adopts the definitions articulated by the National Science and Technology Council in its 2016 *Assessment of Critical Minerals* report.[1]

- Minerals are nonfuel elements or compounds directly obtained from mining or refined from mined products. Minerals include a wide variety of useful inputs, including clays, metals and salts.
- Critical minerals are those minerals that have a supply chain that is vulnerable to disruption and that serve an essential function in the manufacture of a product. Losing access to critical minerals inherently implies a significant economic or security impact. Minerals are designated as "critical" if they are not easily substituted, are substantially imported as raw materials or refined product, and if suppliers are few.
- Strategic minerals are a subset of critical minerals. The "strategic" designation is reserved for those minerals that are essential for the manufacture of materials with national security applications.

1. John P. Holden, "Assessment of Critical Minerals: Screening methodology and initial application," Product of the Subcommittee on Critical and Strategic Mineral Supply Chains of the Committee on Environment, Natural Resources, and Sustainability of the National Science and Technology Council, March 2016. https://www.whitehouse.gov/sites/whitehouse.gov/files/images/CSMSC%20Assessment%20of%20Critical%20Minerals%20Report%202016-03-16%20FINAL.pdf

MINERALS NEED TO BE MINED, NOT UNDERMINED

As recently as 1990, the United States was the world's largest minerals producer. Over the past four decades, just as our standard of living and defense industry have increased demand for critical and strategic minerals and metals, the U.S. mining industry has been in precipitous decline. As we've demonstrated, the decline is not related to the availability of resources domestically, but is certainly accelerated by tight-fisted land-use policy and extremely active environmentalist opposition to domestic resource development. The United States must reassess its commitment to conservation, adopt policies that pair environmental protection with resource access and reflect the potential instability of international supply chains for these critical and strategic mineral resources.

33. National Mining Association, "Federal Land Withdrawals Threaten U.S. Minerals Security and Undermine Conservation Efforts," March 22, 2016. http://mineralsmakelife.org/blog/details/federal-land-withdrawals-threaten-u.s.-minerals-security-and-undermine-cons

34. Ned Mamula, "Poor Federal Stewardship Threatens Energy Development of Our Public Lands," *Deseret News*, July 1, 2015. http://www.deseretnews.com/article/865631658/My-view-Poor-federal-stewardship-threatens-energy-development-of-our-public-lands.html

Conservation versus preservation

As of 2011, the BLM administers mineral resources on approximately 700 million acres of federal lands—about one third of the entire nation's landmass. Of that total, roughly 167 million acres have been withdrawn from any type of development and another 182 million acres are "restricted" from future minerals development. This puts 349 million acres, or half of all BLM-administered lands, off limits to the mining industry. Other federal and state agencies have similar restrictions, further reducing the total amount of land on which minerals development could occur, whether or not the geology is favorable to development.[35]

These land withdrawals are part of a longstanding debate about whether the goal of public policy should be to conserve our natural resources or to preserve those resources. Preservation protects resources for their own intrinsic value, typically closing out development completely, and has been the focus of the naturalist and environmentalist movements for well over a century. The management of public lands in the United States, however, took up a different, conservationist ethic that manages public resources for the public good. In his memoir, Gifford Pinchot, the founding chief of the U.S. Forest Service, defined conservation as: "the wise use of the earth and its resources for the lasting good of men."[36]

Conservation balances environmental protection and unwise, careless resource exploitation, preserving the usefulness and productivity of our natural resources over the long term for the benefit of the U.S. economy. This approach provided for the development of resources and for the benefits of that development to accrue to taxpayers through rentals and royalty payments.

American minerals policy has abandoned adherence to the conservationist ethic. Excessively long permitting timelines, land withdrawals and capitulation to environmental opposition—especially outside the normal consideration process—all favor the preservation of resources over their value to the U.S. economy and citizenry. The many agencies that have bearing over resource development are failing in their obligation to be good stewards of the public domain. Congress and the executive branch can and should respond with clearer direction that provides for resource development, especially of such a strategic nature.

Managing American mineral wealth

Thankfully, after years of downturn, investments in mineral exploration are beginning to increase, particularly for projects in the United States, Canada and Australia—all of which are characterized as "safe bets" due to lower operating risks and their relatively higher technology standards for mineral exploration.[37]

Recent investments in existing mines in those three countries are also up. Sibanye Gold of South Africa sees enough promise in the U.S. market that it has acquired Montana's Stillwater Mining—the only U.S. producer of platinum and palladium, from one of the richest deposits of its kind in the world.[38] Interestingly, Chinese investors own a large stake of Sibanye, signaling their desire eventually to create a new platinum supply chain leading from the United States to China. Foreign investment in the U.S. minerals market presents a prime opportunity for the United States to change tack in its approach to minerals development. To revive the domestic mining industry, secure supply chains for critical and strategic minerals and better support the nation's economy and defense sector, there are reasonable measures within reach of Congress and the executive, particularly the land management functions at the Interior Department and the Forest Service.

In its 2016 study, the GAO recommended the executive branch define the roles and responsibilities of relevant federal agencies, articulate joint strategies to assess and improve mineral access and develop a reporting structure that allows all agencies to assess progress. The GAO also suggested that access to critical and strategic minerals is too narrow a target. The executive branch has no internal metrics to judge whether a resource is either critical or strategic (see Sidebar 2), and so should develop a strategy to prioritize resource development according to need. Finally, the executive branch must engage with industry stakeholders to appreciate private sector needs more fully.[39]

One such need is to shorten permitting timelines for mining projects. The United States is the largest consuming nation for minerals and metals, but ranks seventh in the world in mining output because of overregulation and lengthy, uncertain permitting processes. Canada and Australia have environmental permitting process that are as stringent as the United States, but their permitting timelines are relatively rapid.[40] In a separate study, GAO indicated that better government and industry cooperation ostensibly would shorten

35. Society for Mining, Metallurgy & Exploration, "Access to Public Lands for Mineral Exploration," July 2011. http://www.smenet.org/about-sme/government-affairs/advocacy/technical-briefing-papers/access-to-public-lands-for-mineral-exploration

36. Gifford Pinchot, Breaking New Ground, Island Press, 1947.

37. Sandra Wirtz, "As Resource Dependence Deepens, Miners Pivot Back to U.S. For Exploration," American Resource Policy Network, Feb. 16, 2017, http://americanresources.org/as-resource-dependence-deepens-miners-pivot-back-to-u-s-for-exploration/

38. Tanisha Heiberg, "U.S. extends scrutiny of South Africa's Sibanye Gold takeover of Stillwater," *Reuters*, March 3, 2017. http://www.reuters.com/article/us-stillwater-minng-m-a-sibanye-gold-idUSKBN16A11N

39. GAO, 2016.

40. SNL Metals & Mining, 2015.

review and permitting timelines—a favorable start toward addressing this contentious issue.[41]

The process of federal land withdrawals should also be examined seriously. Federal land withdrawals, especially those determined unilaterally by the executive, have become untenable and unaccountable to the legal framework that provides for environmental protection. President Obama's uses of the Antiquities Act and the Outer Continental Shelf Lands Act were unprecedented. Such decisions were made without regard to, or perhaps directly because of, the amount and type of mineral resources found in the lands proposed for withdrawal. Under a recent executive order, President Donald Trump has initiated a review of Antiquities Act designations made over the last 20 years. The review may provide opportunities to roll back protections already designated, although such actions likely would face opposition in the courts. More permanent changes to inject greater discipline into future Antiquities Act designations and more comprehensively consider the costs of withdrawing public lands would require new legislation.

Another recommendation for the executive is to complete the planned USGS update of its classic publication titled "Mineral Resources of the United States," first published in 1973. According to the USGS, the update will emphasize the current state of knowledge of the geology of critical minerals, known resources in the United States and worldwide and the geological possibilities to find additional deposits in the United States and worldwide.[42] When that report is published, the executive should request recommendations from USGS, informed by the land management agencies, of particular areas on existing public lands—including those currently closed to exploration—that present the most promise to develop critical and strategic mineral resources. Such recommendations would allow Congress and the president to reconcile U.S. public lands policy with its original conservation ethic.

Congress must similarly prioritize minerals development. During debate over energy legislation in the 114th Congress, both the Senate and the House considered legislation that called for an assessment of critical mineral resource needs and approaches to tackle permitting delays.[43] Though the energy package ultimately failed to pass, Congress has demonstrated its interest in addressing resource policy constraints. Already in the 115th Congress, the Nevada delegation has introduced the National Strategic and Critical Minerals Production Act in both chambers (S. 145 and H.R. 520), "to require the Secretary of the Interior and Secretary of Agriculture to more efficiently develop domestic sources of the minerals and mineral materials of strategic and critical importance to the economic and national security and manufacturing competitiveness of the United States."[44] The legislation has significant early support and may enable both an increase in domestic mining and a decrease in critical mineral imports. With a presidential administration particularly focused on improving the balance of trade and devoted to eliminating burdensome regulations that limit the domestic mining industry, this may prove to be a higher and more actionable priority for the current Congress.

CONCLUSION

Decades of public policy choices favoring the preservation of public lands over responsible stewardship of our collective resources have painted the United States into a corner. Secure access to critical and strategic minerals is a necessary prerequisite to maintain a thriving manufacturing industry. Government policy has failed to reflect this need over the last half-century, contributing to unnecessary dependency on potentially hostile trade partners for access to mineral commodities.

Not only does the United States need to foster a national conversation about the risks of import dependencies for strategic goods, it must ask serious questions about what ability government and industry have to navigate the potential for short-term supply disruptions. The cumulative impacts from decades of shortsighted minerals decisions require a number of compensatory policies that will prepare the United States to weather trade disputes that could prompt cascading impacts through our technology manufacturing sector.

More substantive policy reforms to expand domestic minerals mining and production should follow. Again, the U.S. oil industry offers a helpful comparison. Recent technological breakthroughs in oil development have moved the United States from import-dependent to the largest oil and gas producer in the world. The same can be done for U.S. mineral wealth if the domestic industry were to be granted access to abundant public resources and unleashed from a restrictive, unpredictable regulatory paradigm. Recent actions under the Trump administration are moving lands policy in the right direction, but much more work remains to manage our mineral risk.

41. U.S. Government Accountability Office, "BLM and Forest Service Have Taken Some Actions to Expedite the Mine Plan Review Process but Could Do More, January 2016. https://www.gao.gov/assets/680/674752.pdf

42. U.S. Geological Survey, "United States Critical Mineral Resources in a Global Context," Dec. 15, 2016. https://minerals.usgs.gov/science/criticalglobal/index.html

43. The U.S. House passed the National Strategic and Critical Minerals Production Act of 2015 (H.R. 1937). Sen. Lisa Murkowski, R-Alaska, chair of the Senate Energy and Natural Resources Committee, introduced the American Mineral Security Act of 2015 (S. 883).

44. 115th Congress, "H.R.520, National Strategic and Critical Minerals Production Act," Jan. 13, 2017. https://www.congress.gov/bill/115th-congress/house-bill/520/text

The United States is blessed with expansive mineral and ore deposits and a more secure mineral future is within reach. Conscientious policy reforms to cultivate a smaller, less intrusive, more strategic government will more successfully balance the development of public resources with environmental protection, empower the marketplace and shift the United States away from overreliance on imports of critical and strategic minerals from China, Russia and beyond.

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