

SOURCING RARE EARTH MINERALS IN CENTRAL ASIA

POLICY BRIEF BY CASPIAN POLICY CENTER

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EXECUTIVE SUMMARY

The availability and sourcing of rare earths are high-profile concerns for governments and corporations in the U.S., western Europe, Japan and elsewhere due to on-going supply chain disruptions and the essential role these materials play in a variety of civilian and defense products and technologies. Despite the name, rare earths are not especially rare, but what is “rare” is their being present in concentrations and quantities great enough for their extraction to make sense commercially. In 1993, the United States, for example, was a notable producer, but domestic production plummeted and by 2011 China controlled of 80 percent of the world’s supply and 90 percent of the rare earths needed for high-tech manufacturing. Finding alternatives to end this near monopoly has become a security imperative.

Central Asian states have promising, known deposits of rare earths and other important minerals. All these countries have sought to attract foreign firms to develop or expand production. However, for a number of reasons, including what experts report as a lack of readily available, up-to-date, and digitalized geologic data, and mining and other laws and practices that can disadvantage foreign firms in a competitive global economy, seem to have hampered developing these rare earth deposits. Good geology alone is not enough.

These issues can be addressed. Increased cooperation with entities such as the U.S. Geological Survey, something other countries have undertaken, can help with the reanalysis of existing data and help authorities in the region have better knowledge of the resources present and how to utilize them. The United States and other western countries can help facilitate interaction between their mining sector and those of Central Asian countries. Western partners and parties in the region can hold forums to raise the profile of the rare earth and other critical resources available in the region, forums which can also help authorities in the region identify laws, regulations, and procedures that need changing to attract and finalize new business in the mining sector. Agencies such as EXIM or the Development Finance Corp. might be able to help with needed financing – something that would also help undercut over-reliance in the region on Chinese investment.

Some of this work is already underway. Kazakhstan, Kyrgyzstan, and Uzbekistan, for example, have taken measures to exploit these resources by partnering with international firms and foreign investors. Much more, however, can be done which would place the Central Asian region on the map as a greater source of rare earth elements.

“Central Asian states have promising, known deposits of rare earths and other important minerals”

Securing Sources of Rare Earths for Essential Products

Rare earth elements are essential to modern economies. The set of 17 elements, which include 15 lanthanides on the periodic table as well as scandium and yttrium, are fundamental for numerous high-tech and everyday devices.¹ Rare earth elements can be found in over 200 types of machinery, including laser- and precision-guided missile technology, satellite communications, aircraft, tanks, and radar and sonar systems.² The versatility of rare earth elements in numerous commercial, industrial, and consumer products and their utility in several key defense systems make securing reliable supplies of these elements a focus for governments as well as businesses.

Permanent magnets, used in cell phones, computers, cars, and wind turbines, are one example of the critical role of rare earths.³ They play a key role in the hardware side of the IT revolution and comprise 38 percent of all rare earth mineral use.

Rare earth minerals are commonly used in clean energy technology. These resources are found in wind turbine magnets, electronic vehicles, and solar cells.⁴ Enterprises involved in the renewable energy sector have a vested interest in securing reliable supply chains of rare earth minerals and opening up multiple sources of reserves to boost resiliency in the event of unforeseen circumstances. Governments and other entities interested in green technologies, therefore, do so as well.

The following table sets out in more detail products and systems that utilize rare earth minerals.

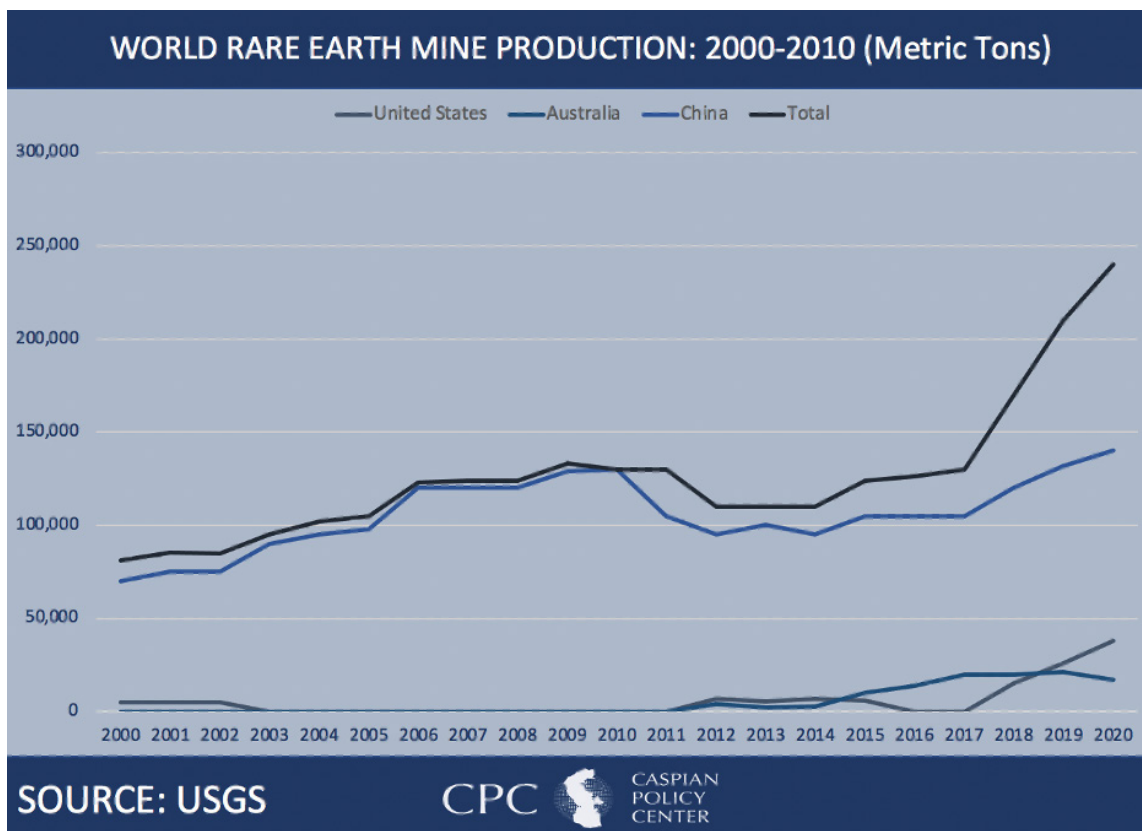
Table 1: Rare Earth Minerals and Their Uses⁵

Rare Earth Mineral	Uses
Neodymium	Loudspeakers, computer hard drives, permanent magnets for wind turbines and hybrid cars, laser rangefinders, guidance systems
Lanthanum	Camera and telescope lenses, studio lighting, cinema production, night-vision goggles
Cerium	Catalytic converters in cars, technology to refine crude oil
Praseodymium	Aircraft engines, protective visors
Gadolinium	X-ray and MRI scanning systems, television screens, possible use in refrigeration systems
Yttrium Terbium Europium	Television and computer screens, control rods in nuclear reactors

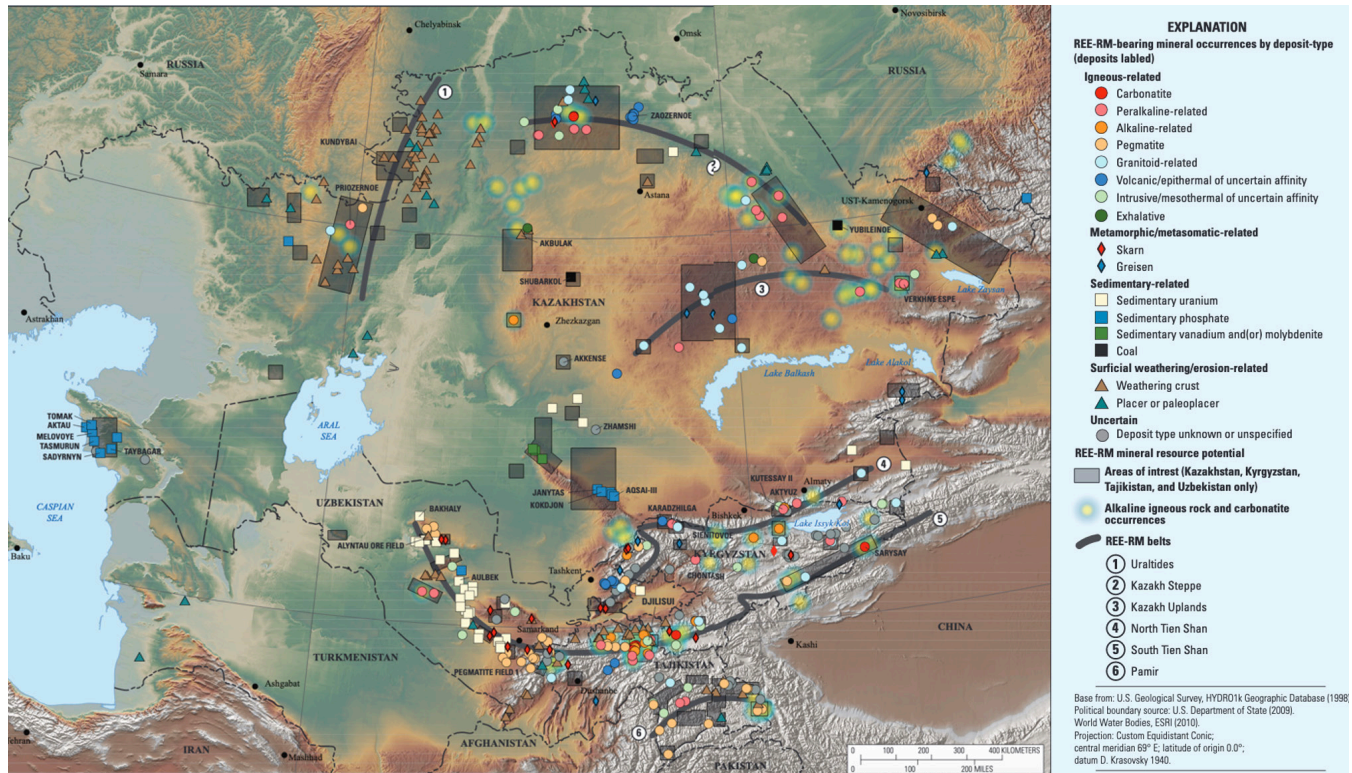
In 1993, the United States was a notable producer of rare earth minerals. However, domestic production of rare earth minerals plummeted and by 2011 China controlled of 80 percent of

the global rare earth element supply and 90 percent of the rare earths needed for high-tech manufacturing.⁶ The Trump administration identified China's virtual monopoly on rare earth minerals as a potential critical point-of-failure that could precipitate momentous ripple effects if supply chains were disrupted. China also produces a number of other key materials besides rare earths for a total of 31 out of the 35 minerals determined critical to U.S. national security.⁷ In October 2020, President Trump issued an executive order declaring a national emergency in the mining industry. His reasoning included the United States' growing dependence on China for supplies of rare earth minerals. Concern over access to these elements remains high; the Biden Administration has continued the search for diversified sources for critical minerals, albeit with a particular emphasis on developing sources within the United States.⁸

Given the role of rare earths in so many products central to modern life, Japan, EU members and others are prioritizing acquiring additional sources to offset dependence on China. Countries seek to do so not just for geopolitical reasons, but also to head off repeats of the supply chain disruptions that came with the onset of the COVID-19 pandemic. Seeking partnerships in resource-rich Central Asia could be a unique opportunity for the United States and others to attain new sources for rare earth minerals and thereby improve their economic and national security. For countries in the region, rare earth elements extraction represents an important commercial opportunity. However, expanding the production and export of these minerals will require important changes in policies, thinking, and ways of doing business. Good geology alone is not enough.



"The Biden Administration has continued the search for diversified sources for critical minerals."



This map is provided by the United States Geological Survey 2018 "Rare Earth Element and Rare Metal Inventory of Central Asia" report.⁹

Central Asia Can Be an Opportune Supplier of Rare Earth Minerals

Central Asia's republics possess vast expanses of known mineral resources, many of which have yet to be adequately developed. Numerous foreign investors have expressed interest in coordinating efforts to access these reserves and develop the region's rare earth element extractive sector. Progress to date, however, has been limited.

Kazakhstan

Kazakhstan's rare earth mineral deposits are primarily concentrated in:

- Uraltides Belt - large Kundybai deposit
- Kazakh Steppe Belt - mainly peralkaline, carbonatite, and granitoid
- Kazakh Uplands Belt - peralkaline, granitoid, and other igneous rock-related occurrences
- North Tien Shan Belt - Aktyuz cluster of deposits
- Southern Tien Shan Belt - peralkaline, granitoid, other igneous-rock related occurrences
- Pamir Belt - pegmatite, peralkaline, and granitoid.¹⁰

In addition, reports suggest considerable potential for recovering rare earths from the tailings of Kazakhstan's uranium mining and processing activities. Kazakhstan produces over 40 percent of the world's supply of uranium.

Some foreign partners have already acted on Kazakhstan's potential for extracting rare earth minerals. In 2012, Japanese Trade and Industry Minister Yukio Edano inked an agreement with Kazakhstan to construct a rare earths production facility in Stepnogorsk. Sumitomo Corp., Japan Oil, Gas, and Metals National Corp, and Kazatoprom were assigned to oversee the

project.¹¹ Furthermore, France and Germany signed agreements to develop rare earth element projects based in Kazakhstan.¹² The United States has also identified 384 critical raw material sources scattered across 160 sites in Kazakhstan.

Kyrgyzstan

Kyrgyzstan holds 20 rare earth mineral deposits, one of the largest of which was Kutessay II.¹³ The mine was developed under the USSR in the 1950s to refine rare earth minerals for the Soviet Union's nuclear program. For three decades, Kutessay II supplied the Soviet Union with 80 percent of its rare earth minerals. It retains large amounts of dysprosium, used in control rods for nuclear reactors, and terbium, found in low-energy lightbulbs and mercury lamps, both of which are highly coveted in international markets.¹⁴ Kyrgyzstan currently has more than 16,000 active mines and deposits, which can make it interesting for investors and buyers of rare earths and other such materials.

Kyrgyzstan has worked closely with Canadian investors to exploit its rare earth mineral reserves. In February 2021, Singapore's Neon Mining Company partnered with Canada's mining company Stans Energy Corp to expand Kyrgyzstan's rare earth mineral production sector. Neon enjoys 100 percent of the Choin-Kaindy Property's interest in Kyrgyzstan and hopes to explore the mine's potential for rare earth minerals. Neon Interest also aims to work with Stans Energy Corp to explore the Kutessay II and Kalesay rare earth minerals deposits. Stans Energy Corps acquired mining licenses for Kyrgyzstan in 2009.¹⁵

Uzbekistan

Uzbekistan's mineral resource potential amounts to \$5.7 trillion, even with only 20 percent of its territory studied.¹⁶ The country boasts 14 known deposits of rare earth minerals that have attracted foreign investors's attention. Turkish companies acquired the rights to conduct geological exploration in the Khurob region to seek rare earth minerals and gold. Similarly, Russian firms pledged to invest \$3 million to find copper and gold reserves in the Navoi region.

Uzbekistan strengthened its rare earth mineral extractive sector by working alongside South Korean research institutes to found the first rare earth mineral research center in Central Asia.¹⁷ The new center was constructed in Chirchiq, the former location of the refractory and heat-resistant metals plant. The center has provided Uzbekistan closer connections with the Korea Institute of Industrial Technology and the Korean Institute of Rare Metals.

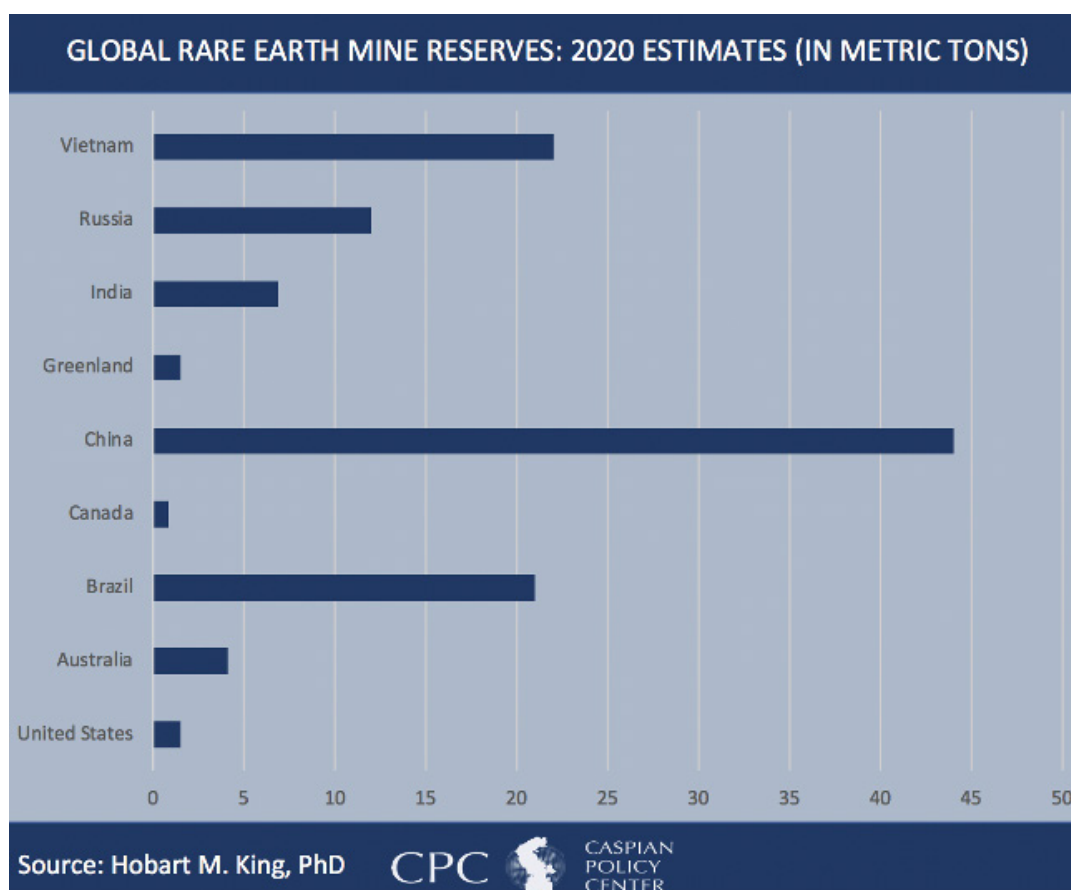
Diversifying Rare Earth Sources is Key to U.S. Foreign Policy and National Security

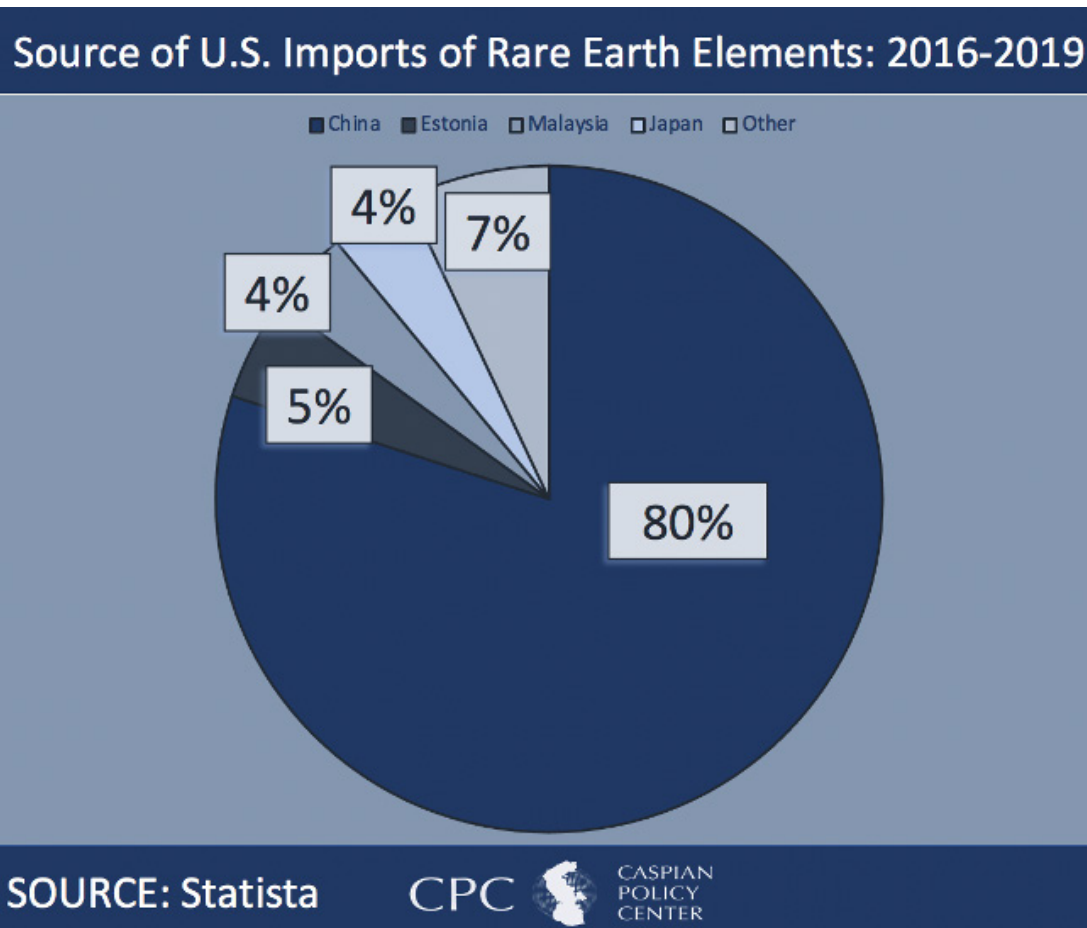
The United States actively seeks alternatives from China for rare earths and other critical minerals. Part of this effort stems from the overall focus on diversifying supplies and bringing back production to the United States, a result of the shortfalls and other weaknesses uncovered in global supply chains due to the COVID-19 pandemic as well as a desire to reshore American jobs. Another factor is a move to lessen dependence on China as a supplier for national security and foreign and economic policy reasons. The United States had met much of its demand for these elements domestically, but it became more attractive to import them, for price and other reasons, than to mine and process them domestically.

As part of the United States' priority on bolstering domestic rare earth mining and processing capabilities, the U.S. military's first large-scale financial investments in the rare earths extractive sector since the Manhattan Project is now underway.¹⁸ The Department of Defense granted the largest rare earth mineral mining and processing company operating outside of China, Lynas Rare Earths Ltd., a Defense Production Act Title III technology investment agreement to determine mechanisms to boost domestic processing capabilities in Hondo, Texas.¹⁹ Other companies, such as MP Materials, NioCorp Developments Ltd, Texas Mineral Resources Corp, and UCore Rare Metals Inc. have all also received federal government support to explore extracting or manufacturing opportunities in California, Nebraska, Texas, and Alaska respectively. The U.S. Department of Defense accounts for only five percent of U.S. rare earth element consumption, but the minerals are essential to a number of pieces of Pentagon equipment.²⁰

Private companies are exploring innovative solutions. Nissan is studying an approach to recover rare earth minerals used in electric motors. The company revealed it can recycle 98 percent of the rare earth minerals from a motor and plans to implement fully the procedure within the decade.²¹

Defense contracts and private companies driving innovation can contribute to offsetting the imbalance in rare earth mineral production. However, domestic production alone is incapable of matching Chinese production and manufacturing. The United States should broaden its partnerships and engage with countries in multilateral formats to secure reliable suppliers of rare earth minerals.





Other Rare Earth Consumers Also Seek Diversification

Other rare earth consumers have recognized the importance of diversifying rare earth mineral extraction and sourcing. Following China, Japan, the United States, and the European Union are the next largest consumers of rare earth minerals respectively. Japan and the European Union have cast a wider net to attain new sources of rare earth minerals to meet their demand.²²

The U.S. trade disputes with China, the focus on further developments in green technologies and other sectors, and COVID-related supply disruptions precipitated greater public and policymaker focus on rare earths. However, China's actions against Japan in 2010 were the first warning of the potential problem. In September, 2010, China halted loading rare earths on ships bound for Japan after Japan's coast guard detained the captain of a Chinese fishing vessel following his vessel's collision with two Japanese coast guard vessels as he tried to fish in Japanese waters claimed by China. Japan, the U.S., and others successfully challenged China's administrative action limiting rare earth exports in the WTO. Japan acted quickly to diversify away from Chinese rare earths. Soon after China implemented the restrictions, the Japan Oil, Gas and Metals National Corporation (Jogmec) adopted a new strategy to diversify its sourcing for rare earth minerals. Japan partnered with Australia's Lynas to supplement its rare earth imports while also instituting a program to find alternatives to rare earths. Japan, moreover, recently discovered reserves of rare earth minerals in its far eastern territorial waters. These

efforts combined to cut Japanese rare earth imports from China from over 90 percent to 58 percent within a decade, according to UN Comtrade data, and Tokyo has a goal of cutting that level to below 50% by 2025.²³

Japan also somewhat tapped into Central Asia's vast supplies of rare earth elements. In 2012, the joint Kazakh-Japanese company Summit Atom Rare Earth Company (SARECO) invested \$30 million to construct a rare earth element facility in Kazakhstan. The plant was designed to produce 6,000 tons of rare earth oxides five years after the facility opened.²⁴ In 2013, Japan also announced its intention to look at rare earth extraction in Kyrgyzstan.²⁵

In August 2021, South Korea announced plans to increase its national stockpile of rare earth metals to avoid supply chain bottlenecks. Most of its supplies still originates in China, which has been battered by COVID-19 related lockdowns.²⁶ While Seoul has indicated a preference for beefing up its domestic production, other countries could serve as an option in the interim, including the Central Asian republics.

India is the fifth largest consumer of rare earth elements and also a large supplier of these elements. Still, it needs more. Although strategic rivals, the country imports a majority of its supply from China. New Delhi supports the Indian Rare Earths Limited (IREL) corporation to develop the country's rare earth elements sector, but exploration, exploitation, and promotion of its materials will take some time to establish.²⁷

Shouldn't There be More Work with Central Asian States?

As the Director of the Defense-Industrial Initiatives Group at CSIS, Andrew Hunter stated, "You can never out-subsidize the Chinese. But the combined resolve of Australia, Japan, Germany, and the U.S. could be enough to prevent a Chinese monopoly."²⁸ Coordinating its efforts with allies and partners to uncover additional sources of rare earth minerals will ensure the United States and others can adopt a sustainable procedure for acquiring these elements. As noted above, there are significant deposits of rare earths in Central Asia, so why has there not been greater focus on tapping and devolping those resources?

While the Central Asian republics remain an attractive alternative for foreign countries aiming to diversify their rare earth mineral sources, investors could be adversely affected by domestic and regional circumstances. For example, Kyrgyzstan passed the Glacier Law in 2014 to hold countries that are deemed to have damaged glaciers financially liable.²⁹ Foreign firms criticized this law as a means for the Kyrgyz government arbitrarily to delay or suspend operations. Kyrgyzstan also banned foreign companies from developing substantial mining projects in the country, but existing operations were allowed to continue.³⁰

"There are significant deposits of rare earths in Central Asia, so why has there not been greater focus on tapping and devolping those resources?"



The Kumtor Gold Mine has been subject to Kyrgyz nationalization laws that make operations for foreign investors more difficult in the country (David Trilling | Eurasianet)

Disputes with foreign mining companies have also had an impact on Kyrgyzstan's reputation in its mining and extraction activities. In 2014, Bishkek revoked Stans Energy Corp's mining licenses by claiming that the acquisition of the licenses had been under false pretense. Although the arbitration tribunal ruled in favor of Stans Energy and awarded the company \$24 million in compensation, the situation tainted Kyrgyzstan's reputation as a reliable partner for rare earth mineral extraction.³¹ The government's dispute with the Canadian company Centerra Gold over the Kumtor gold mine also had a chilling effect. However the out-of-court settlement reached in April, 2022 could help improve the country's image as a place to do business and to invest.

Kazakhstan lacks all the necessary high-tech and other capabilities needed to develop fully its rare earth mineral deposits. Such technology is costly; thus, investors have preferred to finance copper, gold, silver, uranium, and iron extraction to receive quicker returns. Kazakhstan, while having a very advanced mining sector overall, is, according to outside experts, seen as highly proprietary and unwelcoming to foreign mining firms.

Experts also note that the state of knowledge about the resources present in Central Asian companies and their potential for commercial development is often inadequate and "stale." In many cases the geological maps and studies go back to the Soviet period and have not been reevaluated using today's more advanced methods. The lack of digitalization of these earlier studies is also a problem, particularly in Tajikistan and the Kyrgyz Republic. (Kazakhstan and Uzbekistan, however, have digitized their data.) American mining experts will point to a need for new approaches to understanding and developing mineral deposits in the region as well as to a need to bring in new, younger people.

Another Soviet-era legacy that limits foreign engagement is a tendency in many of the region's countries to be overly secretive when it comes to allowing access to geologic data. Western experts relay a story about those who provided mining data in 2011 to an East Asian firm about Kazakhstan being arrested and jailed. In some instances, even when authorities in one of the Central Asian states have been willing to share data, they have had to get Russian permission to do so.

Access to data, like a good legal regime for mining and doing business, is essential for attracting foreign business interest and possible investment. Moreover, without access to sound, accurate, up-to-date geologic and other pertinent data, it is impossible for national authorities as well as companies to make the best possible decisions when it comes to developing the sector, whether for mining rare earths or producing other minerals.

Chinese and Russian businesses have established stronger relations with actors in the Central Asian extractive sector that can trump U.S. and EU connections. Central Asian countries, except Turkmenistan, actively receive financial investment from China's Belt and Road Initiative. In addition, their proximity to China and Russia eliminates transport hurdles that impede the United States and the European Union. For example, Mongolia holds 16.8 percent of global critical mineral reserves.³⁵ A large majority of Mongolian mineral exports went to China and Russia because of their proximity to the country. That same story could be repeated in other countries in Central Asia.

Policy Recommendations

Central Asian governments will frequently flag their countries' mineral resources as a potential area for U.S. and other countries' firms to invest and engage commercially. Stronger business and other economic ties could also help address complaints that the United States is inadequately engaged in the region while simultaneously meeting American and other western needs for diversification. Such decisions, certainly when it comes to American and other western firms, will be made in the end on commercial, business considerations. These choices will also be made in the context of a competitive, global environment. However, there are steps governments and others in region can take to improve their competitiveness and attractiveness to foreign firms seeking new, diversified supplies of rare earths and other minerals. Moreover, there are steps the U.S. government can take to help Central Asian countries develop these resources and make themselves more competitive, and hence more prosperous and able to confront the political, economic, and other challenges these countries face.

To take advantage of the global need for rare earths and the current U.S. and international focus on diversifying supplies, countries in the region might:

- 1. Clarify the legal framework for foreign investors.** Laws and regulations regarding rare earth mineral extraction can be dizzying for foreign investors. Maneuvering through unforeseen hurdles cuts into profits. Furthermore, some local laws, such as Kyrgyzstan's Glacier Law deter investors because they would have to incur additional charges to accommodate new regulations or cease operations. The legal framework for rare earth minerals should be clarified and publicized for interested investors and others looking to do business in this sector.
- 2. Update and make available geologic and other pertinent mining studies.** Up-to-date,

digitized geologic information is essential for governments and other relevant domestic actors as well as for foreign businesses looking at opportunities in a country. Having, knowing how to interpret, and making available this information to international firms potentially interested in doing business in a country is critical for all concerned.

3. **Hold forums and invite interested foreign investors.** As major rare earth element consumers recognize the dangers of growing a dependency on a single supplier, other countries have started to promote their untapped resource pools. Central Asia's supply of rare earth elements is still not widely publicized, thus investors would likely choose to work with a country that has established mechanisms to support business operations.
4. **Be cautious when accepting Chinese investment in the rare earth sector.** Chinese investment has been shrouded in controversies regarding "debt-trap diplomacy," and asset acquisition. However, within the rare earth mineral sector, Chinese companies have faced extraordinary scrutiny from local officials and the public. For instance, the public forced the Chinese-owned Las Bambas copper mine in Peru to shutter after ecological deterioration from mining operations were realized. A Congolese court also ended a contract with China Molybdenum after it failed to pay millions of dollars in royalty fees. Greenland voters also ousted a party that favored a Chinese-backed REE mining venture.³⁴ While avoiding Chinese investment completely would be unlikely and unwarranted, Central Asian states should monitor already-present Chinese rare earth element investors in their countries, and establish regulations for new investors.

For its part, the United States should:

1. **Facilitate interactions between private domestic companies and Central Asian actors involved in rare earth mineral extraction.** China and Russia have established a rapport with entities responsible for overseeing rare earth mineral extraction in Central Asia. Moreover, the historical ties help Chinese and Russian investors to engage more effortlessly with the Central Asian extractive sector. The United States should do more than recommend its private industries to engage in the region; it should hold forums and meetings to facilitate this discussion. Agencies such as EXIM, the Development Finance Corp. (DFC), and the U.S. Trade Development Agency along with the Department of Commerce and U.S. embassies could play important roles here.
2. **Make available U.S. expertise.** The U.S. Geological Survey (USGS) is one of the world's top centers of excellence for geologic and other natural science studies. Moreover, it will undertake studies with an eye to providing timely, accurate information to government and other decision-makers. The USGS has done some work in the region in the past; it would be wise to employ its expertise again with interested Central Asian partners.
3. **Coordinate with allied countries to establish relationships in Central Asia.** Japan has been actively involved in Kazakhstan's rare earth minerals sector and is a close U.S. ally. Many Central Asian countries hold an affinity for Japan.³⁵ The Republic of Korea, the EU and many of its member states, as well as the UK, Canada, and Australia might also be interested in working with partners in the region on developing their rare earth resources.
4. **Fund rare earth minerals research institutes in the region.** Uzbekistan is the only country in Central Asia with a center dedicated to studying rare earth minerals in the region. South Korean research institutes worked alongside their Uzbek counterparts to create the center, granting Seoul the ability to directly engage with regional actors. The United States should follow suit by funding the establishment of such research institutes to further rare earth mineral research and develop interpersonal connections in the region.

- 5. Form a multilateral working group that includes the Central Asian republics and China.** It is unrealistic to assert that the Central Asian republics should sever rare earth mineral trade with China in favor of the United States. Therefore, China should be incorporated in regional discussions on rare earth mineral extraction in Central Asia. While the United States is dependent on China for processed rare earth products, China's demand for raw materials far surpasses its supply. Beijing depends on Washington to export its rare earth minerals for processing. Highlighting this point should make China more amenable to engaging in multilateral talks.



Mountain Pass, California is home to an open pit mine for rare earth elements (By Plazak - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=9782815>)

Conclusion

The United States was once a major player in rare earth mineral extraction. However, it has become overshadowed by China's immense processing capacity to fuel its large demand. Bolstering domestic capabilities is a positive first step but its limitations prevent it from becoming the ultimate solution to minimizing U.S. dependence on Chinese imports. The United States needs alternatives to boost its rare earth minerals stockpile and diversify its imports away from China. Central Asia has significant potential to meet more of the U.S. and others' needs for rare earths. Acting now can yield important benefits for both Central Asian states and global consumers.

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