

# US-CHINA STRATEGIC COMPETITION



## *A Guide for Policymakers:* **How to Meet US Strategic Mineral Needs**

The Trans-Caspian Corridor:  
Central Asia, the South Caucasus & Ukraine

# Contents

Introduction: What Rocks to Look Under .... pg. 2

Overview of Critical Minerals in Ukraine, the South Caucasus and Central Asia .... pg. 6

Solving the U.S. Mineral Dependence on China .... pg. 14

Green Energy Minerals .... pg. 20

The Minerals that Make our Military ..... pg. 26

U.S. and EU Policy Analysis .... pg. 32

U.S. Policy Recommendations: Finding Rocks in Hard Places .... pg. 38

Who's Got What: A Mineral Deposit Guide .... 42

Executive Order ... 65



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Introduction

# **What Rocks to Look Under:**

A Practical Guide for  
Policymakers to Strategic  
Minerals

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# What Rocks to Look Under: A Practical Guide for Policymakers to Strategic Minerals

By Dr. Eric Rudenshiold



Source: Shutterstock

**T**he United States faces a significant strategic challenge in securing access to rare earth elements and critical minerals essential for economic vitality and national security. Currently the United States imports significant amounts of refined rare earths and minerals from China. The geopolitical risks of reliance on a concentrated supply chain, particularly one dominated by Beijing, have long been acknowledged. This issue gained prominence under the previous Trump administration, which identified the vulnerabilities inherent in China's near-monopoly on refining and processing these indispensable materials. It is expected that the incoming Trump administration will continue to prioritize efforts to diversify and secure alternative sources of critical minerals.

China's dominance in critical mineral markets, combined with its ability to influence supply chains through protectionist policies or outright supply disruptions, presents a direct challenge to U.S. and global industries reliant on these resources. From advanced electronics and renewable energy technologies to defense systems, the strategic implications of supply chain dependence on Beijing extend beyond economic considerations, intertwining with national security concerns. As the United States intensifies its efforts to reduce risks and diversify its critical mineral supplies, regions such as the Caucasus, Central Asia, and Ukraine emerge as strategic partners, offering abundant reserves, favorable transport and logistics, as well as a strong interest in collaboration with the United States.

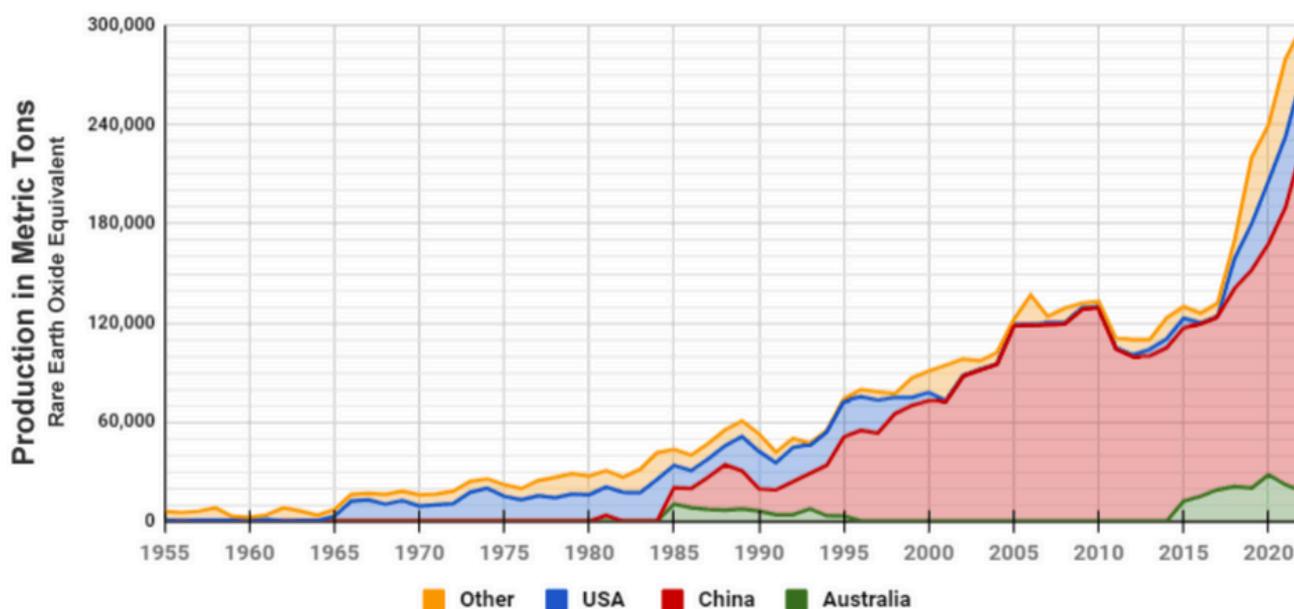
## China's Critical Mineral Supremacy

China's central role in the global critical mineral supply chain is not accidental. Over decades, Beijing has cultivated significant refining and processing capabilities alongside efforts to corner limited and strategic supplies, securing its current dominance in rare earth elements and other strategic minerals. These materials are essential to modern technological manufacturing and production in the fields of aviation, communications, renewable energy systems, and advanced electronics. By 2022, China controlled 100% of global graphite processing, 90% of rare earths, and 74% of cobalt, for instance, cementing its status as the world's primary supplier.

In stark contrast, the United States remains heavily reliant on imports, sourcing more than 50% of its annual consumption for 31 out of 35 critical minerals and entirely dependent on foreign supply for 14 of these materials. This reliance renders the U.S. vulnerable to external disruptions and price manipulation, particularly as China's critical mineral strategy prioritizes national security and geopolitical leverage alongside economic gain.

Recent actions, such as China's imposition of export controls on germanium and gallium in retaliation to U.S. semiconductor restrictions, underscore the potential for strategic mineral supply chains to be weaponized. These materials are integral to defense technologies and semiconductor production, and such measures demonstrate China's capacity to disrupt global markets in response to geopolitical tensions. The risks to U.S. industries—ranging from defense to renewable energy—are profound, as the availability and cost of these critical inputs remain at the mercy of Beijing's policy decisions.

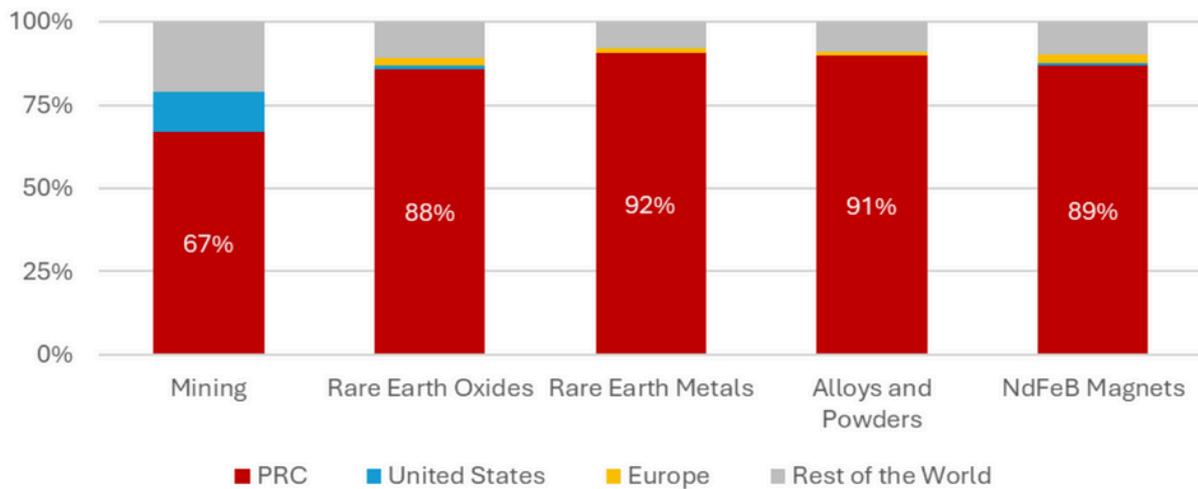
### Production of Rare Earth Elements Globally



Source: Geology.com

*China is the world's largest producer of rare earth elements (a subset of 17 strategic minerals). Production of these elements has increased drastically over the past decade as they are crucial for nearly every modern technology.*

## PRC's Global Market Share of Rare Earth Supply Chain, 2023



Source: Adamas Market Intelligence, SAFE

*China dominates every stage of the production process for rare earth elements while the U.S. and Europe lag behind. This dominance persists for many other strategic minerals.*

## ***The Strategic Value of the Caucasus, Central Asia, and Ukraine***

Amid growing awareness of these vulnerabilities, the Caucasus, Central Asia, and Ukraine present themselves as pivotal regions in addressing U.S. and global critical mineral needs. These areas are rich in strategic mineral reserves, with some nations possessing developed mining sectors while others possess unexplored mountainous areas that promise future development opportunities.

In addition to their resource abundance, these regions offer the geopolitical advantage of diversifying critical mineral supply chains away from China. By cultivating partnerships with nations eager to collaborate and bolster their own economic development, the United States and its allies can advance mutual strategic objectives.

To assist policymakers, the Caspian Policy Center has compiled this compendium of resources that explain the strategic mineral and rare earth terrain; provide a geopolitical overview of the Caucasus, Central Asia, and Ukraine, as would-be strategic mineral suppliers; explain critical uses and needs for these materials in U.S. defense and technology supply chains; compare U.S. and E.U. policy frameworks for mineral development; provide actionable recommendations for the in-coming Trump Administration; and offer a country-by-country analysis of what minerals are found in each.

By leveraging the strategic potential of the Caucasus, Central Asia, and Ukraine, the incoming U.S. administration can take decisive steps toward reducing reliance on a single strategic mineral supplier, strengthening U.S. supply-chain resilience, and safeguarding industries that underpin U.S. economic and national security interests. 🇺🇸

# Overview of Critical Minerals in Ukraine, the South Caucasus and Central Asia

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# Overview of Critical Minerals in Ukraine, the South Caucasus, and Central Asia

By Zachary Weiss, Joshua Bernard-Pearl



Photo: Kazatomprom

Workers at the Ulba Metallurgical Plant in Kazakhstan work to produce Beryllium. This is one of 3 companies in the world with a full production cycle from ore concentrate processing to finished product according to Kazatomprom.

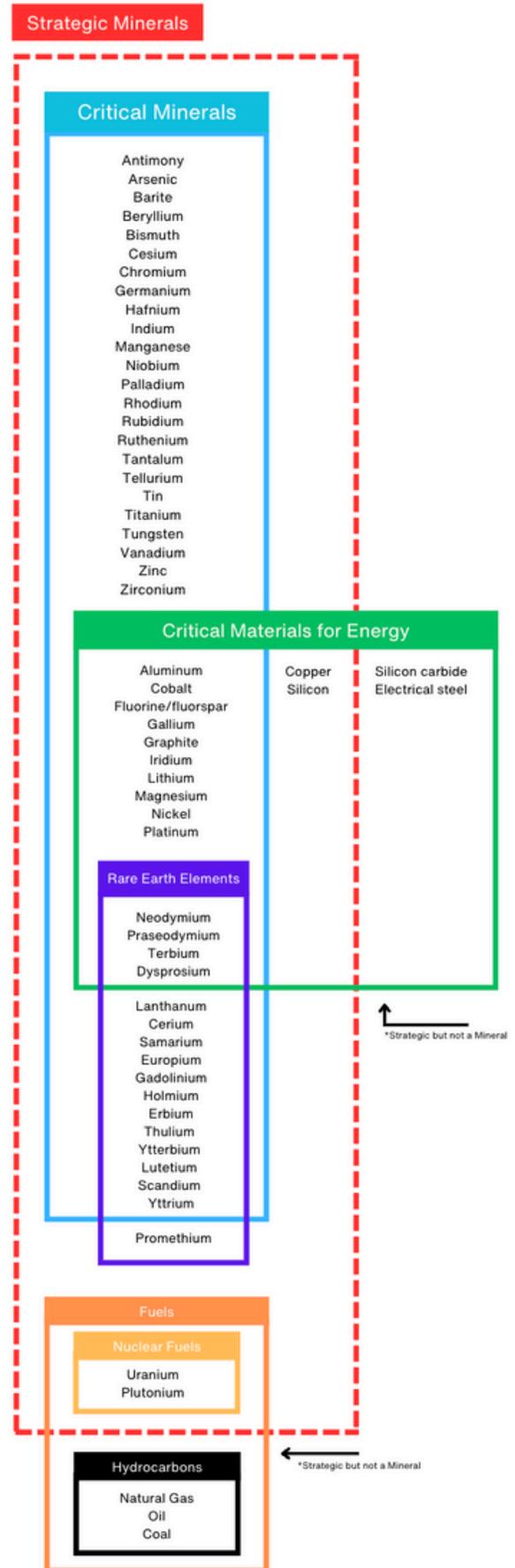
America's economic and political security depends upon a secure future supply of strategic minerals. With nearly every modern technology, from smartphones to jet engines to wind turbines, requiring the use of strategic minerals, the [World Economic Forum](#) has suggested they will be the new oil of the 21st century. Moreover, global appetite and scramble for strategic minerals is only increasing, with the International Energy Agency [estimating](#) that demand in the energy sector alone could triple by 2030. The People's Republic of China (PRC) currently dominates the sector, [controlling](#) 60% of global production and 85% of processing capacity. Due to this growing monopoly and resulting reliance on the PRC, future U.S. access to strategic minerals is under threat. A potential solution to this challenge can be found in the largely unexploited natural resources of Central Asia, the Caucasus, and Ukraine. Aggressive pursuit of these strategic resources now could be the key to supplying the United States with the minerals it needs, while providing the broader Caspian region and Ukraine with global market reach and inclusion. Meaningful participation in the global strategic mineral supply chain for Central Asia, the Caucasus, and Ukraine would be a major step towards achieving regional economic sovereignty and the ability for those countries to reduce their own dependence on Russia and the PRC.

### Defining Strategic Minerals

One of the greatest sources of confusion relates to understanding just what is a “strategic” or “critical” mineral, because there are differing definitions. [Executive order](#) 13817, signed in December of 2017, defines “critical minerals” as non-fuel minerals that are “essential to the economic and national security of the United States” and “the supply chain of which is vulnerable to disruption.” The United States Geological Survey (USGS), tasked with applying this definition, lists 50 minerals deemed “critical minerals.” This list includes a number of minerals crucial to U.S. strategic needs but several other official lists also exist. For example, [four additional materials](#) are listed as critical to energy technology by the Department of Energy (DOE). Uranium is also highlighted as a mineral with strategic importance, yet it does not fall into the narrow definition of a “critical mineral,” due to its classification as a fuel. The minerals and resources on each list pertain to the specific resources each agency prioritizes, though each is essential to overall U.S. interests.

### Mineral Dependence on China

The United States overwhelmingly relies on foreign nations for its critical mineral supply. In 2022, it depended on [imports](#) for over 50% of its supply for 31 minerals and 100% for 12, including minerals used for electronic equipment and military-grade metals. This import reliance is heavily skewed towards the PRC, with nine minerals supplied [exclusively](#) by China. According to an [estimate](#) from the International Energy Agency, by 2030, 77% of refined rare earth elements will come from China. Already, over 95% of the growth in battery-grade spherical and synthetic graphite production comes from the PRC.



Joshua Bernard-Pearl  
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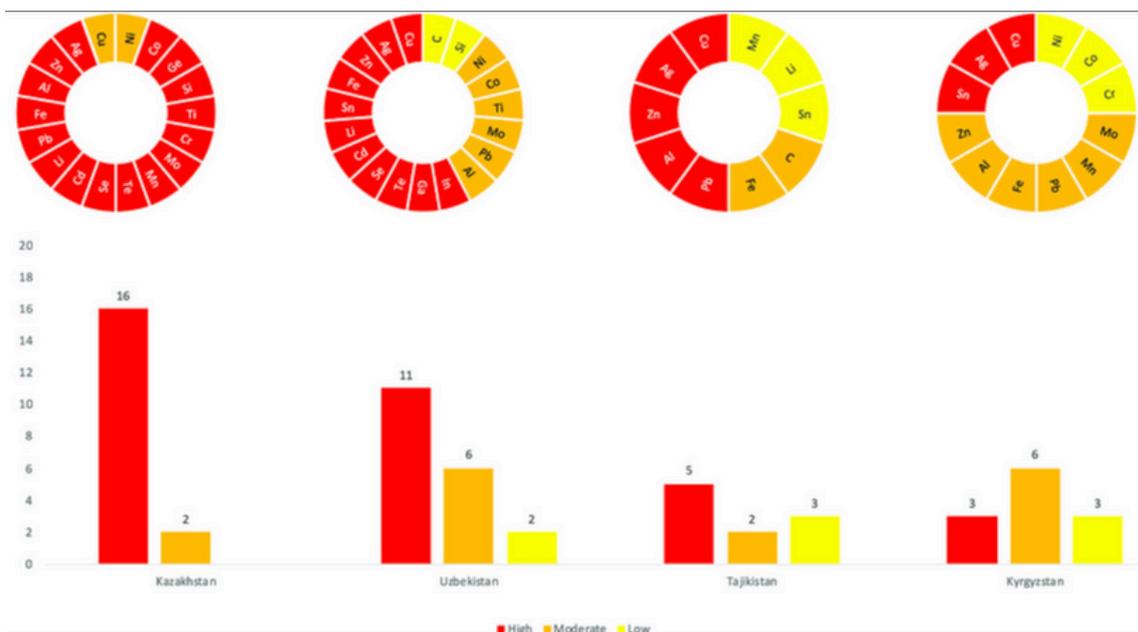
In fact, China's share of market value for mined materials overall is rapidly increasing, largely due to its growing output of copper and lithium. While the United States has significant reserves of both of these metals, it falls dangerously short in other areas, and that creates serious problems for the future of U.S. economic growth, defense capabilities, energy transition, and global competitiveness.

Critical minerals are especially important for energy and defense technology, but they are largely concentrated in China. In recent years, the PRC has made efforts to secure ownership and control of critical minerals extraction sites internationally. Beijing has sought to corner supplies of nickel and cobalt specifically, which are essential for energy and aerospace technology. China has in the past shown a willingness to weaponize this monopoly too. In 2010, China briefly [halted](#) its export of rare earth elements to Japan over a fishing dispute, sending Tokyo's automotive and technology sectors into crisis. Further efforts by Beijing to monopolize sources of critical and strategic elements could enable it to similarly weaponize supplies needed by the United States and its allies. There is a driving national security motivation behind U.S. efforts to seek alternative sources and extend its mineral supply lines.

### ***Minerals in Central Asia, the South Caucasus, and Ukraine***

Washington has most recently called for diversification away from Chinese sources in the [2023 National Defense Industrial Strategy](#) and [2024 National Defense Authorization Act](#). However, absent sufficient and alternative sources, implementation of this priority on the scale needed has been lacking. Central Asia, the South Caucasus, and Ukraine could play a vital role in this transition, given an abundance of available minerals, a desire to develop this sector of their economies, and a shared interest to promote greater connectivity with Western economies.

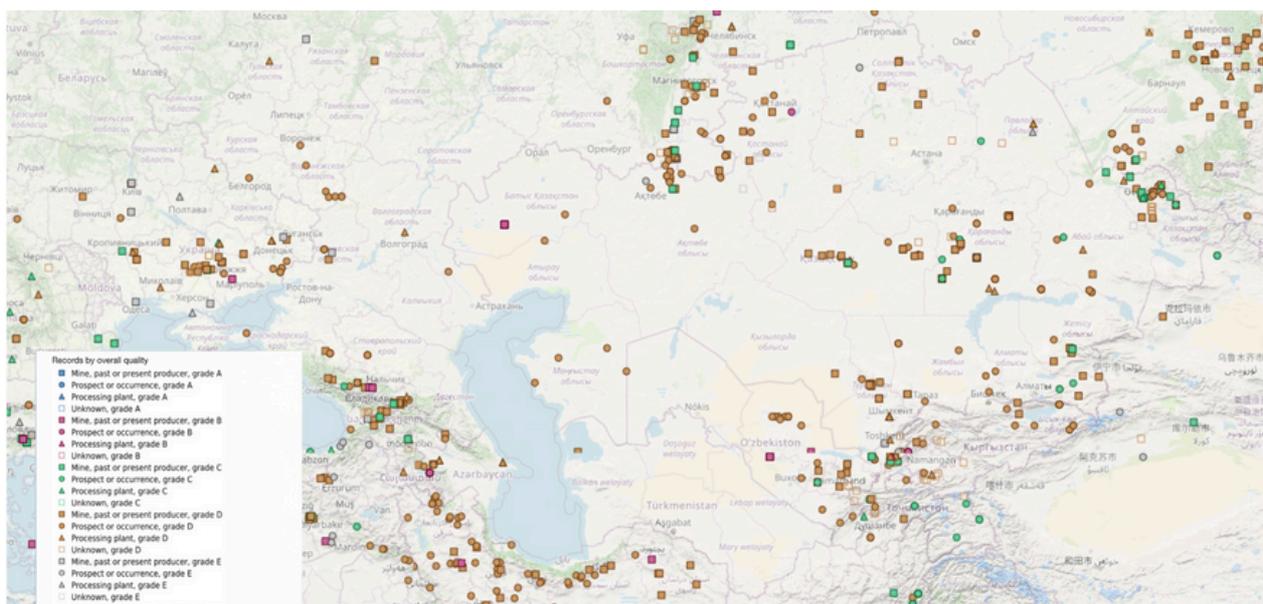
These three regions hold a collective abundance of strategic minerals. Due to a global reliance on Chinese sources and refining capabilities, however, Central Asia, the South Caucasus, and Ukraine's resources have often been overlooked until recently. Kazakhstan leads the region in its reserves of critical minerals, and it alone holds more Uranium than any other single nation, enjoying [approximately](#) 43% of global supply. The largest of the Central Asian republics also ranks [third](#) in global chromite production, producing significant amounts of copper, aluminum, and zinc, used for metal manufacturing, and aerospace technology, [according to Kazakhstan's Minister of Industry and Construction](#). Central Asia (Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan) overall [holds](#) 38.6% of global manganese ore reserves, 30.07% of chromium reserves, and 12.6% of zinc reserves, all of which are essential in the production of steel, batteries, and aerospace technologies.



Source: One Earth

An abundance of critical minerals can be found in Kazakhstan, Uzbekistan, Tajikistan, and Kyrgyzstan. A majority of them have high potential for mining with many already in production.

Less recognized, the South Caucasus (Georgia, Armenia, and Azerbaijan) are also home to significant critical mineral deposits, though comparably less than Central Asia. These minerals include copper and zinc, used for defense technology. Across the Black Sea, Ukraine has consequential reserves of lithium and rare earth metals valued in the trillions of dollars. Ranking seventh globally in manganese extraction, Ukraine holds major deposits of zirconium silicate, graphite, and lithium, used for defense and energy technologies. Ukraine’s extraction of graphite is limited, and lithium deposits have gone untouched due to the ongoing war and the need for new mining technology and investment.



Source: USGS

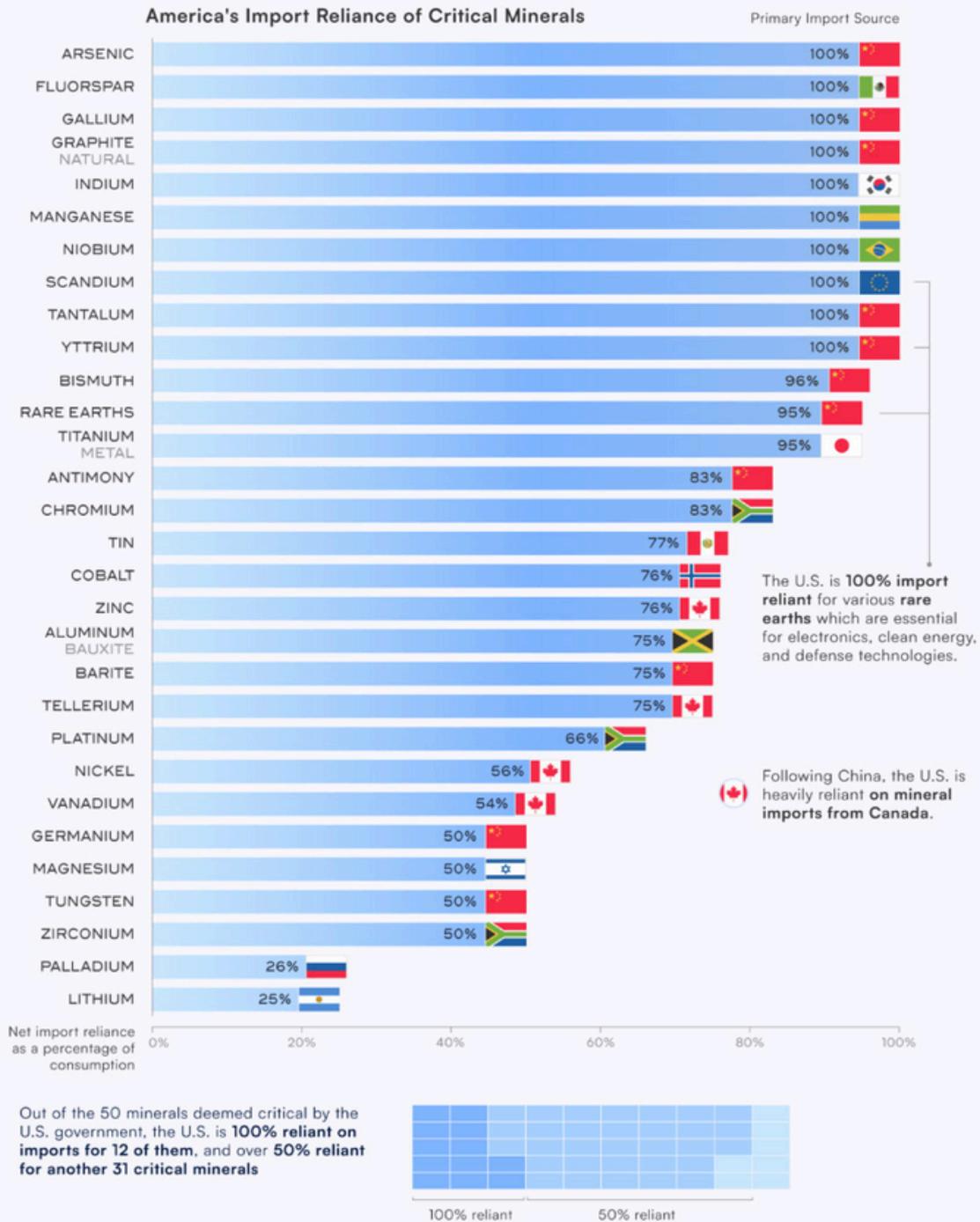
USGS data reveals abundant deposits, mines, and processing facilities for critical minerals across Central Asia, the South Caucasus, and Ukraine

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# AMERICA'S IMPORT RELIANCE OF CRITICAL MINERALS

The U.S. relies on a variety of nations to import critical minerals.

How dependent is the U.S. on imports for specific minerals, and which countries does the U.S. depend on most?



Source: elements.visualcapitalist.com

The US relies heavily on imports for several critical minerals. China is by far the largest supplier.

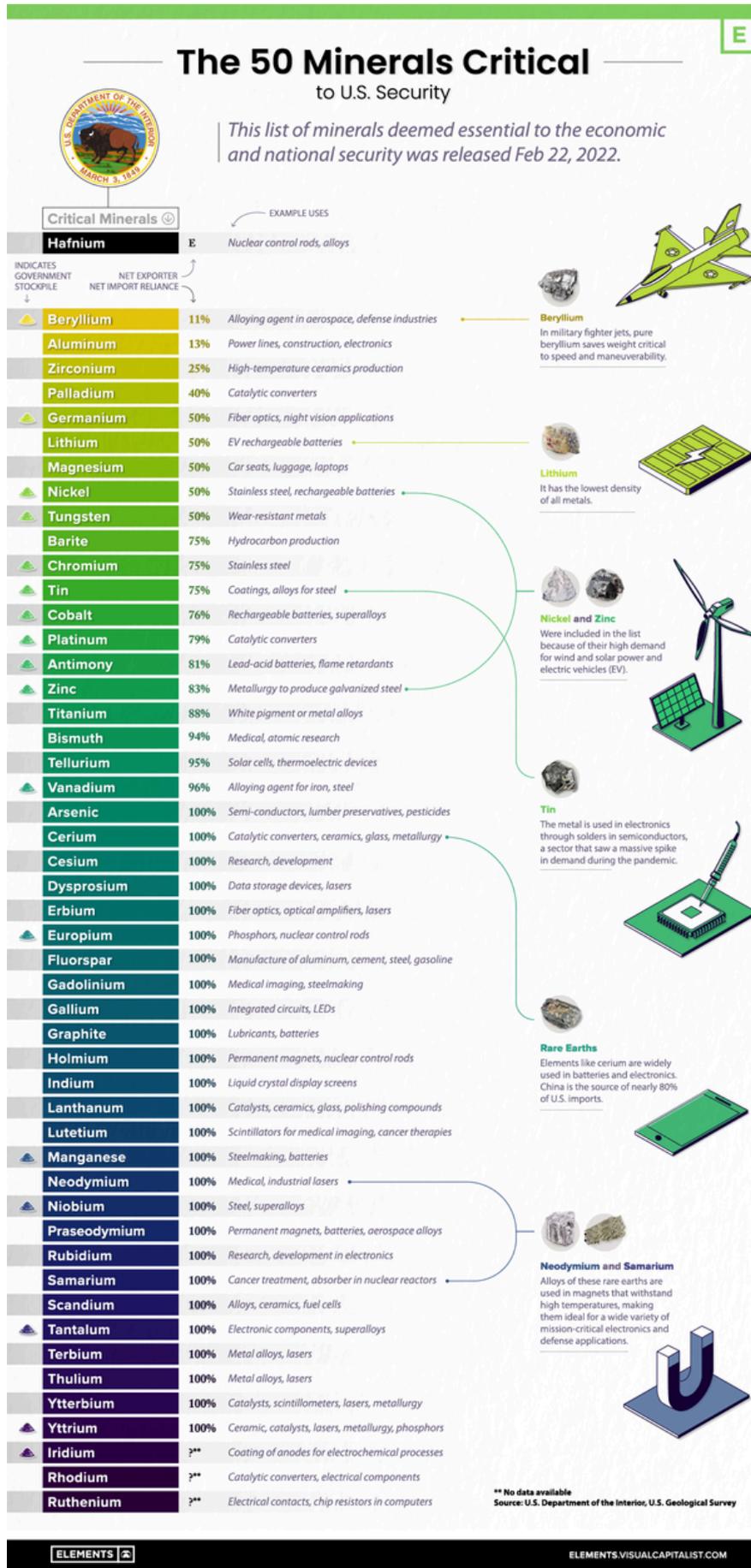
Ukraine and Countries in the South Caucasus and Central Asia could benefit from developing their mining sectors as a way to enhance their sovereignty. As Western markets seek outside sources of critical minerals, these nations can develop new export economics, independent of their past relationships, and redefine their value.

## Current Efforts

Thus far, the United States has started some initial efforts to acquire critical minerals and offset its reliance on China. Several high-level meetings of American and Central Asian leaders, including in the [C5+1 format](#), have involved discussions about extracting critical minerals from the region and developing infrastructure to transport the resources outside of the region. [The Middle Corridor](#) trade and transportation route through Central Asia and the South Caucasus has likewise sparked high-level discussions as a potentially secure and sanctions-safe conduit for transporting goods, including minerals, from Central Asia and the Caucasus to western markets and avoiding transit through Russia. These efforts have not just been exclusive to the United States amongst western nations. Recognizing the strategic importance of uranium for energy and the abundance of it in Central Asia, French President Emmanuel Macron attended several [high-profile meetings](#) with Central Asian and Caspian region leaders in late 2023 to strengthen these trans-continental alliances.

As need continues to grow and economic ties surrounding strategic minerals evolve with the western world, the region will gain a new relevance to U.S. policymakers. The former-Soviet regions of Central Asia, the South Caucasus, and Ukraine have historically been dominated by Russian political and economic influence. More recently Central Asia finds itself increasingly economically dependent on the PRC. A robust economic relationship with the United States and its allies based on the trade of strategic minerals offers a counterweight to Chinese and Russian influence. With more independence over their foreign economic relationships the region will be greater protected from the dominance of its neighbors and free to integrate further with the western world.

The United States needs a new strategy towards the region that enables it to take advantage of these new opportunities. Fostering national resilience, inter-regional connectivity, and a decoupling from the PRC and Russia should be priorities of the next presidential administration. More deposits must be identified, facilities for extraction and processing must be expanded, and the [Middle Corridor](#) must be further developed. The United States can [facilitate](#) this development. In order to understand the impact this could have, the next chapters this guide will focus on the use of those minerals present in the region for U.S. defense, communications, manufacturing, and energy needs. Future sections will explore the specific resources present in each country and U.S. government action on this issue in greater depth. 🇺🇸



Source: elements.visualcapitalist.com

Critical minerals are used to make a variety of technologies from fighter jets to wind turbines to computer chips. The US is heavily reliant on imports for many of these minerals and has created stockpiles of some to combat this.

# **Solving the U.S. Mineral Dependence on China**

What the United States  
Can't Produce, the  
Caspian Region Can

# Solving the U.S. Mineral Dependence on China

## *What the United States Can't Produce, the Caspian Region Can*

By Joshua Bernard-Pearl



Photo: Kazatomprom

*Kazakhstan's mineral resources are discussed at the Astana Mining & Metallurgy (AMM) Congress. Kazakhstan is an abundant source of many minerals for which the US currently relies on China.*

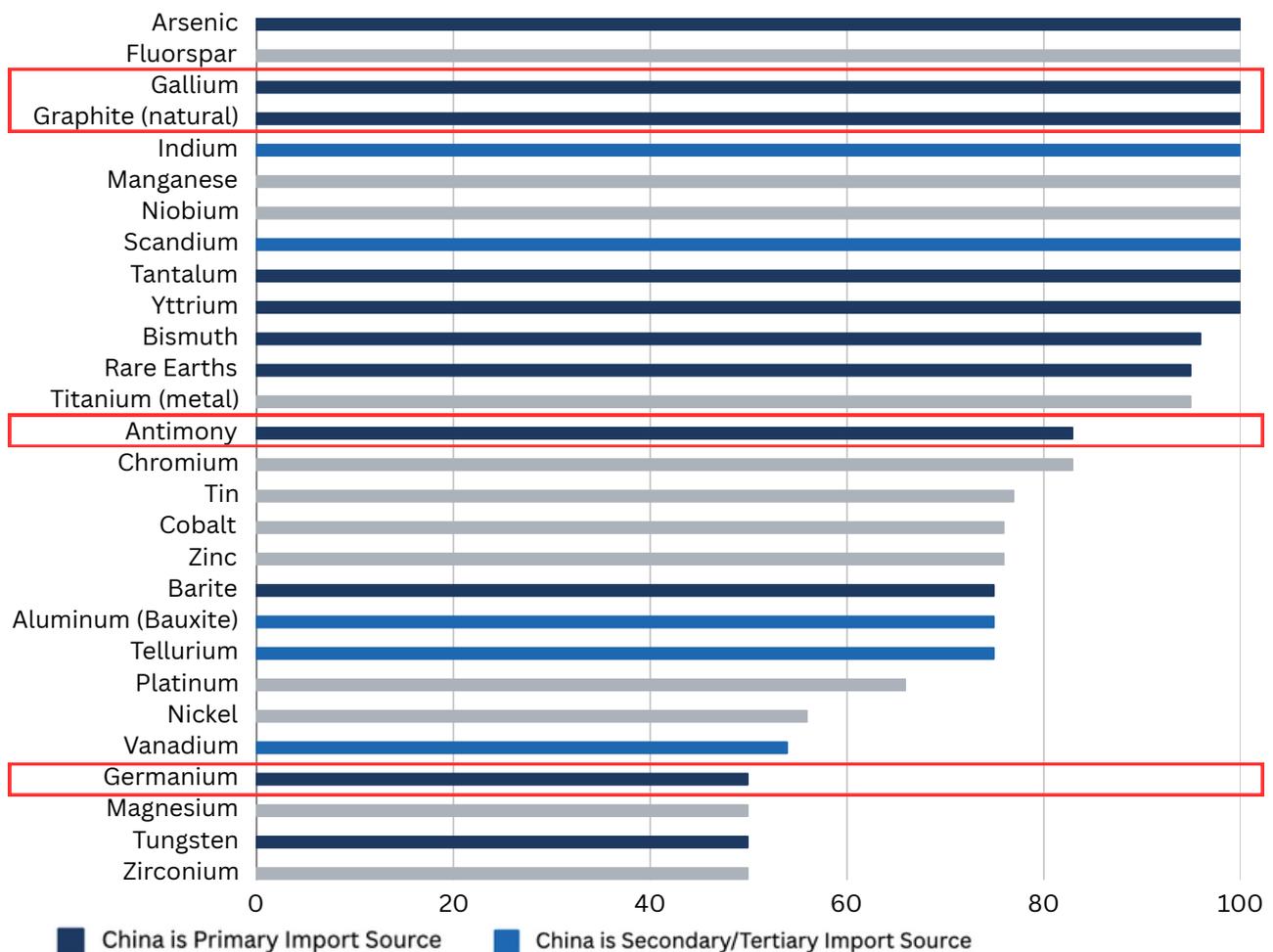
**F**rom semiconductors to solar panels to jet engines, strategic minerals are essential to the technology of the future and increasingly becoming the lifeblood of modern manufacturing. These resources are not just fundamental for the U.S. economy but also a crucial component of national security. Just as access to fossil fuels was key to the United States rise in the 20th century, if the United States hopes to maintain its superpower status in the 21st century a secure and reliable supply of strategic minerals is paramount. Due to a combination of low domestic production for many key minerals and a heavy reliance on China as a supplier, this supply is under threat. The United States is a resource-rich country but there exist [12 key minerals](#) that the U.S. simply does not have the reserves of or infrastructure to produce domestically. Meanwhile, China dominates as the top supplier for over half of these and has shown a willingness to weaponize this position.

For these 12 minerals and more, the United States is in desperate need of additional suppliers. The countries of Central Asia, the South Caucasus, and Ukraine have the potential to fill this strategic gap. With new [investments in east-west transport infrastructure](#) and a historic desire to diversify away from the economic dominance of Russia and China, these countries have proven themselves eager partners in increasing economic cooperation with the West. Moreover, they hold robust reserves and in many cases existing infrastructure to extract the exact resources the U.S. is in need of. Antimony from Tajikistan; chromium and barite from Kazakhstan; titanium from Ukraine and Kazakhstan; manganese from Kazakhstan, Ukraine, and Georgia; and Rare Earth minerals from across Central Asia stand out as key minerals that the United States needs and the region has to offer.

The United States government has released a number of overlapping lists designating strategic value to a variety of minerals and materials. The most robust of these lists is the “critical minerals” list, a set of [50 minerals](#) deemed “critical” by the United States Geological Survey (USGS) based on the [designation](#) that they are “essential to the economic and national security of the United States” and “the supply chain of which is vulnerable to disruption.”

The main source of disruption for many of these minerals is the fact that the United States is [overwhelmingly reliant](#) on imports, largely from China. The U.S. currently relies on imports for 100% of its supply of 12 critical minerals and is 50% or more reliant on imports for an additional 31 minerals. China is the primary supplier for 10 of these minerals, excluding rare earth elements, and the second or third largest supplier for an additional 5 minerals. For rare earth elements, a subset of 17 minerals often grouped together due to their proximity in deposits and similar properties, the US is 95% reliant on China. Altogether, China has major leverage over close to two thirds of the minerals deemed most critical and least accessible due to import reliance.

### ***The US Depends on Chinese Imports: Net Import Reliance (as % of Consumption)***



Source: USGS, Mineral Commodity Summaries, January 2023

*China banned exports of gallium, natural graphite, antimony, and germanium to the US. The US is over 50% reliant on imports for all of these minerals with China as the primary supplier.*

The People's Republic of China has already shown a willingness to weaponize its supply chains. In 2010, China briefly [halted](#) its export of rare earth elements to Japan, destabilizing Tokyo's automotive and technology sectors in response to a fishing dispute. On December 3rd of 2024, China turned this power against the US with a [ban](#) on the export of antimony, graphite, germanium, and gallium to the United States. This came in response to U.S. restrictions on computer chip-making equipment and software to the PRC. These three minerals all have crucial military and civilian applications including in the production of semiconductor chips. Given that the past Trump administration was known for starting a Trade war with China and the incoming Trump administration has made [tariffs](#) a key pillar of his foreign policy, it is likely that more retaliatory export bans of critical minerals from China are yet to come. Diversifying supply chains to the Caspian region would guard against these Chinese attacks at the expense of China's own supply chains in the region. Increased trade with the U.S. would mean a diminished supply of raw materials exported to the PRC that China could refine into critical minerals for export.



Photo: Wikimedia

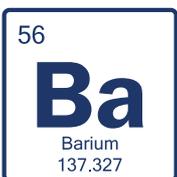
*US and PRC delegations meet at the 2018 G20 Buenos Aires Summit. Competition with China was a focal point of the first Trump administration.*

There is an abundance of trade opportunities within the Caspian region to replace Chinese imports for minerals the U.S. can not domestically produce in the quantities required. Antimony, Barite, Rare Earth Minerals, and titanium provide four notable examples.



### ***Antimony***

Antimony is primarily used in flame retardants, alloys, semiconductors, and batteries, with applications in electronics, defense, and energy storage. According to [USGS](#), Tajikistan is the world's second largest producer of antimony after China, accounting for a quarter of global production in 2023. Kazakhstan also produces a significant quantity of antimony while Kyrgyzstan produces a smaller amount but holds the 4th largest reserves in the world.



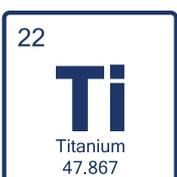
### ***Barite***

Barite is used in manufacturing paints, plastics, and rubber, as well as in medical applications like X-ray contrast media. It is also crucial to the oil and gas industry, used as a weighting agent to help control the pressure during drilling operations. Kazakhstan is a major producer of Barite, ranking 4rd globally in 2023 according to [USGS statistics](#). There is potential for growth in U.S. trade given that despite these high production levels, Kazakhstan was not listed by the USGS as a major Barite exporter to the United States. Additional reserves have also been [identified](#) in Georgia.



### ***Rare Earth Minerals***

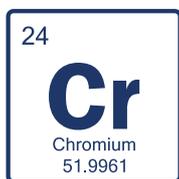
Rare earth elements are a group of [17 minerals](#) with unique magnetic, optical, and catalytic properties often grouped together due to these similar properties and their prevalence in combined deposits. They are crucial to almost every advanced electronic device, used in smartphones, electric vehicles, wind turbines, and military equipment. In 2016, the [USGS](#) listed 384 Rare earth and rare metal deposits across Central Asia. This included 160 in Kazakhstan, 87 in Uzbekistan, 75 in Kyrgyzstan, 60 in Tajikistan, and two in Turkmenistan. All of these countries have announced initiatives and measures to increase the identification and extraction of these deposits resulting in a constant stream of new discoveries. For example, 15 new major deposits were [identified](#) in Tajikistan in early December.



### ***Titanium***

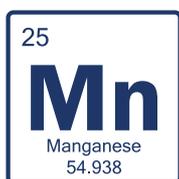
Due to its high strength, low weight, and resistance to corrosion, Titanium is widely used in aerospace, military, and medical applications. This includes the manufacturing of implants, aircraft parts, and desalination plants. Kazakhstan is a major producer of titanium. In 2023 the country was the 4th largest producer of titanium sponge in the world and had the capacity to nearly double that production, according to [USGS](#) estimates. With the largest titanium reserves in Europe, Ukraine was also a major producer before Russia's full-scale invasion, ranked as the 5th largest producer in 2021.

Even for minerals the U.S. can't supply domestically where China is not a major major exporter, such as Chromium and Manganese, the Caspian region can add extra layers of diversification to U.S. supply chains. Moreover, this trade further bolsters the United States's mineral relationships, benefiting from existing transport infrastructure and business networks.



### ***Chromium***

Chromium is used in the production of stainless steel for critical infrastructure, such as military vehicles, aircraft, and naval ships. It also has key applications in producing chemical catalysts as well as secure communication and electronics systems. Kazakhstan is tied as the second largest producer but has the capacity to expand even further, holding the world's largest Chromium reserves according to [USGS](#).



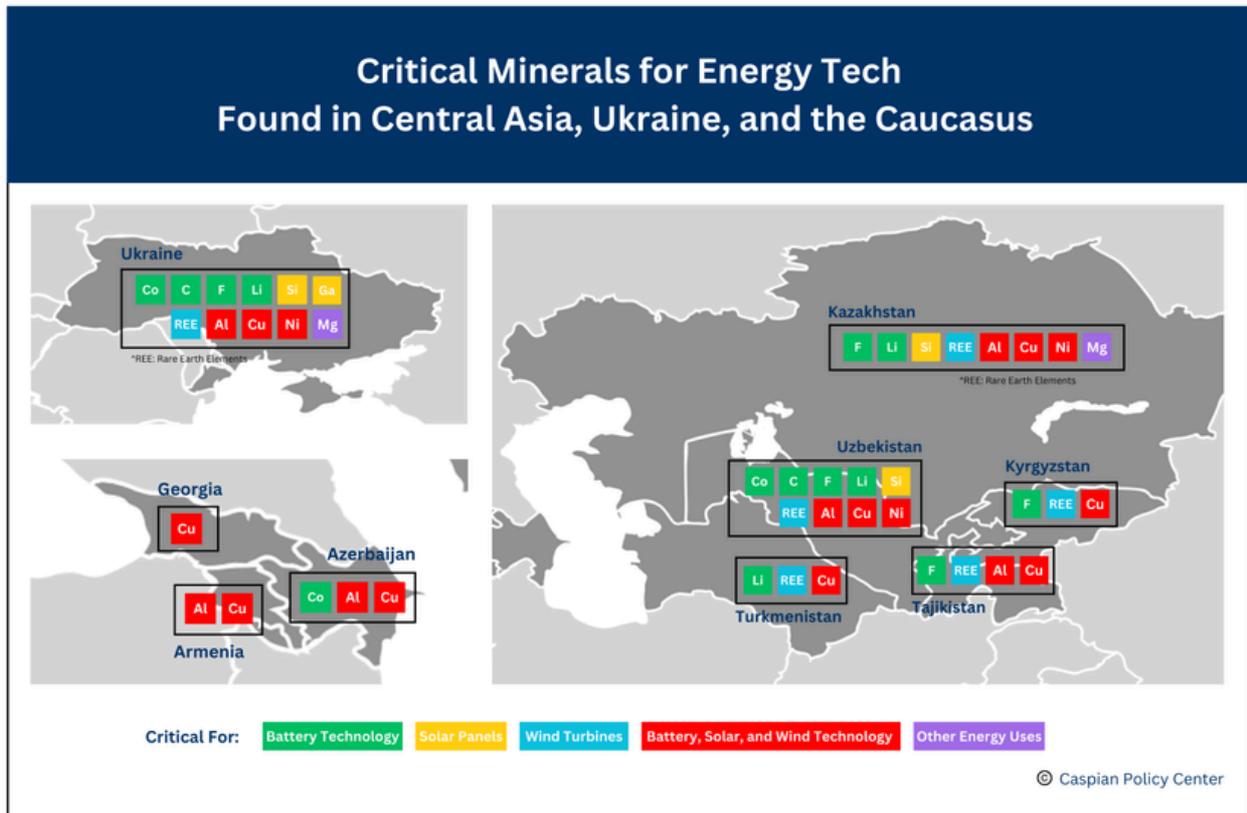
### ***Manganese***

Manganese is essential in producing steel for military-grade armor, bridges, and railways, where it enhances strength and corrosion resistance. It is also used in lithium-ion batteries, electric vehicles, and chemical catalysts. Kazakhstan, Ukraine, and Georgia all [produce](#) significant amounts of manganese. [World Bank](#) estimates claim Kazakhstan holds the second largest reserves of manganese ore while Ukraine holds the fifth largest reserves of the metal according to [USGS](#). 🇺🇸

# **Green Energy Minerals:** Strategic Opportunities in Central Asia, the Caucasus, and Ukraine

# Green Energy Minerals: Strategic Opportunities in Central Asia, the Caucasus, and Ukraine

By Joshua Bernard-Pearl



The critical minerals necessary to build green energy technologies like wind turbines, solar panels, and batteries can be found across Central Asia, Ukraine, and the South Caucasus.

As the world accelerates toward a greener future, the demand for clean energy technologies is soaring. Solar panels, wind turbines, and advanced batteries are at the forefront of this transition, promising a sustainable and environmentally friendly energy landscape. However, the realization of this green future hinges not only on technological innovation but also on securing a steady supply of strategic minerals essential for these technologies.

So-called “critical minerals,” ranging from aluminum and cobalt to rare earth elements like neodymium and dysprosium, are fundamental to the efficiency and functionality of renewable energy technologies. Yet, the global supply chain for strategic minerals is under strain. Skyrocketing demand and a heavy [reliance](#) on China are creating vulnerabilities and prompting a search for alternative sources.

Various U.S. government agencies have defined different minerals and materials as strategic or critical. The list most relevant to green technology, however, is the Department of Energy (DOE)’s [“Critical Materials for Energy List,”](#) containing 18 materials sometimes referred to as the “electric 18.” Within this list of 18 materials, there are 16 minerals: aluminum, cobalt, copper, dysprosium, fluorine, gallium, iridium, lithium, magnesium, natural graphite, neodymium, nickel, platinum, praseodymium, silicon, and terbium. The two remaining materials are electrical steel and silicon carbide.



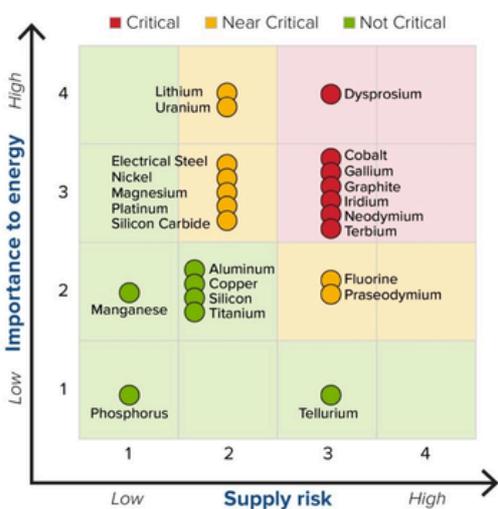
Photo: Wikimedia

Focusing on the 16 minerals critical for the future of green energy, it is worth noting that four of those minerals (terbium, dysprosium, praseodymium, and neodymium) are often referred to under the broader category of [Rare Earth Elements](#) (REE). REEs have similar electron structures and unusual electrical and other properties that make them valuable for a variety of industrial applications.

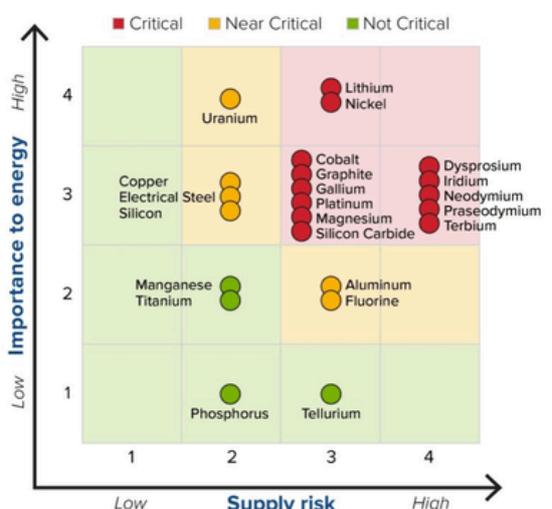
These critical minerals for energy minerals were designated as “critical” due to a combination of their importance to energy technologies and a high supply risk in the future. Their importance to energy comes from their use in key green energy technologies while much of the supply risks come from an overreliance on China.

Figure 1: DOE Criticality of Minerals Graphed

**SHORT TERM 2020-2025**



**MEDIUM TERM 2025-2035**



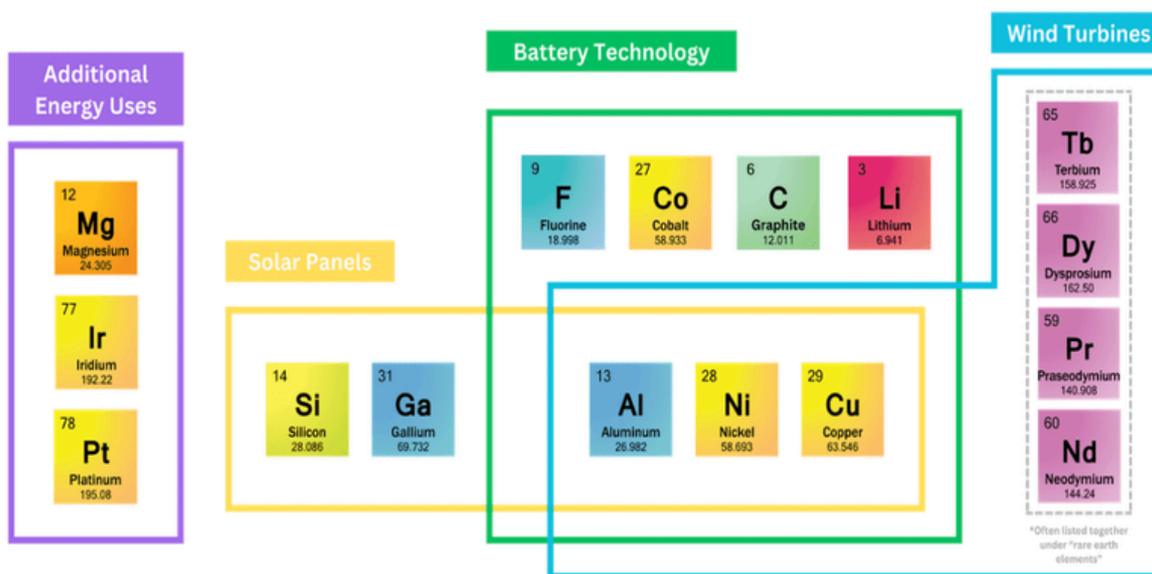
Source: U.S. Department of Energy

USGS charts display the levels of criticality for various critical minerals in the short and medium term. Seven minerals were deemed critical in the short term and 13 in the medium term.

Three green energy technologies often dominate the discussion: photovoltaic cells to capture solar energy, wind turbines to harness wind energy, and battery technology to store that energy for use regardless of whether the sun is shining or the wind is blowing. Aluminum, nickel, and copper are critical to all three of these technologies. [Aluminum](#) and [nickel](#) are part of the alloys used to make structural elements such as wind turbine blades, wind turbine towers, battery [casings](#), and solar panel frames.

Aluminum notably makes up over 85% of the [components](#) in solar panels. Copper, prized for its electrical conductivity, is [used](#) in many of the internal components such as internal wiring, current collectors in batteries, wind turbine generators, and the heat exchanger in solar panels. All three of these minerals are abundant across Central Asia, the Caucasus, and Ukraine. Kazakhstan is especially noteworthy as the 11th [largest](#) copper producer in the world.

Figure 2: Uses of Minerals Critical to Green Energy



Source: Caspian Policy Center

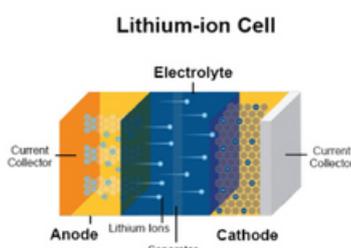
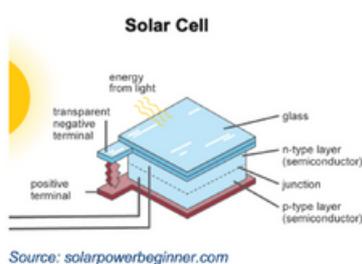
*These 16 critical minerals are used in green energy technologies such as solar panels, wind turbines, and batteries. These minerals will be crucial to building the necessary energy infrastructure of the future.*

Lithium-ion batteries are the most widely used type for energy storage and electric vehicles. In these [batteries](#), the anode is typically made up of graphite coated in a copper current collector, while the critical materials for energy most commonly used in the cathode are lithium, cobalt, and nickel oxides coated in an aluminum current collector. Ukraine is a noteworthy source of graphite, with 20% of global [reserves](#). The country likewise contains significant yet untapped reserves of [lithium](#), [designated](#) by the DOE as the mineral most important to energy in the short and medium term.

Uzbekistan, Kazakhstan, and Azerbaijan also contain reserves of minerals critical to battery production, though these minerals have yet to be extracted in any significant quantity. Without batteries, any expansion of renewable energy generation will be nullified. Long-lasting and energy-efficient batteries are a necessary component for electric vehicles and grid capacity. Untapped resources in Ukraine, Uzbekistan, Kazakhstan, and Azerbaijan could be the key to making sure a green future is attainable and affordable.

REEs neodymium, praseodymium, dysprosium, and terbium are critical to [manufacture](#) powerful permanent magnets used in wind turbine generators. Uzbekistan, Kyrgyzstan, Kazakhstan, and Ukraine have significant deposits of REEs, with other countries in the broader region possessing varying degrees of abundance. Growing demand and concern over Chinese dominance in the rare earth sector have sparked renewed investment in REE extraction in the region, including an Uzbek-Korean partnership in 2019 to create the first [center](#) for the study of REE in the region. Due to the high cost of extraction and processing technologies for REE, foreign investment is [crucial](#) to develop a supply of minerals in the Caspian Region that is not dependent on neighboring China and which can fuel wind turbine construction in the West and across the globe.

Building the infrastructure for solar farms requires two additional minerals designated as "critical for energy": silicon and gallium. Silicon is the semiconductor [used](#) in 95% of solar cells, while gallium is [used](#) as a component of the semiconductors in more efficient models. Kazakhstan is currently the 10th largest [producer](#) of silicon in the world, while Ukraine was the 13th largest [exporter](#) in 2021. Ukraine is also the world's fifth largest gallium [producer](#).



Sources: Solar power Beginner, Everything PE, Britannica

*Solar cells, lithium-ion cells, and wind turbines are crucial to green energy production. They all have components that require critical minerals to produce.*

Despite the vast mineral reserves of Central Asia, the Caucasus, and Ukraine, the regions face challenges related to geopolitical tensions, transportation, and processing. The war in Ukraine has led to a drop in mineral production overall, as valuable lithium and rare earth deposits lie [trapped](#) behind what are now Russian lines in Ukraine.

For minerals from Central Asia and the Caucasus, the future is looking more promising. A reliance on Russia for westbound transport networks is being replaced by local cooperation as the [middle corridor](#) continues to garner investment and to increase capacity. However, much of the [refining capacity](#) for the region is reliant on China, making more difficult diversification away from Chinese dependence or the establishment of direct mineral-related relationships with these new supply countries. Western nations seeking to capitalize on the mineral potential of the region need to keep in mind the need for processing facilities, in addition to extraction and shipping, when choosing how to invest.

## Reserves of Minerals Critical to Energy Technology

<u>Country</u>		Solar	Wind	Battery	Solar + Wind + Battery	Other
	Armenia	–	–	–	Al*, Cu*	–
	Azerbaijan	–	–	Co	Al*, Cu*	–
	Georgia	–	–	–	Cu*	–
	Kazakhstan	Si*	REE*	F, Li	Al*, Cu*, Ni*	Mg*
	Kyrgyzstan	–	REE	Co, C, F, Li	Al, Cu*	–
	Tajikistan	–	REE	F	Al*, Cu*	–
	Turkmenistan	–	REE	Li	Cu*	–
	Ukraine	Si*, Ga*	REE	Co, C*, F, Li	Al*, Cu*, Ni*	Mg*
	Uzbekistan	Si	REE	Co, C, F, Li	Al, Cu*, Ni	–

\*Indicates production in most recent USGS records from 2020-2021

– Indicates no reserves/not enough data on reserves to verify

REE: rare earth elements

Source: Caspian Policy Center

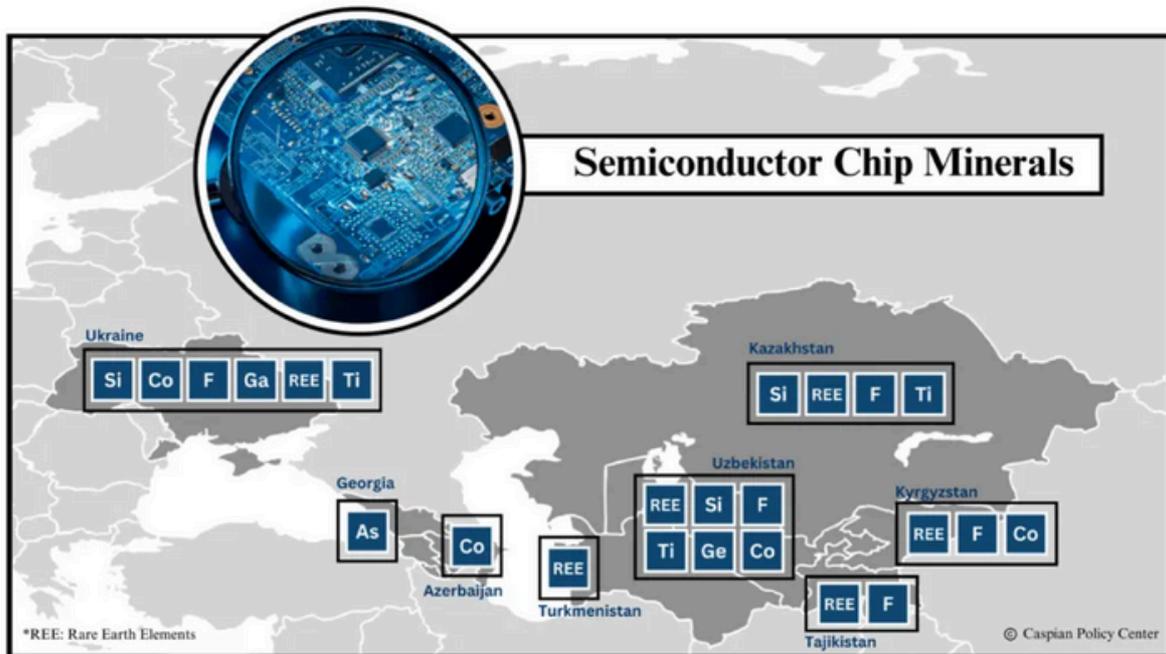
The pursuit of a greener future is intrinsically linked to the availability and management of strategic minerals essential for renewable energy technologies. As the world transitions to cleaner energy sources, the reliance on these minerals becomes increasingly vital. Central Asia, the Caucasus, and Ukraine, with their underdeveloped reserves, offer a promising alternative to the current Chinese-dominated supply chain. The regions' potential to diversify and secure the supply of essential minerals could significantly influence global energy dynamics and stability.

For Western nations, this represents both a challenge and an opportunity. By fostering investment and partnerships in these regions, Western countries can mitigate supply risks, reduce dependency on China, and ensure a more resilient and sustainable energy future. Strategic engagement in extraction, processing, and transport infrastructure will be vital to harnessing these resources effectively. This proactive approach not only supports global green energy goals but also strengthens geopolitical ties and economic stability for Central Asia, the Caucasus, and Ukraine in the face of evolving global challenges. 🌍

# **The Minerals that Make our Military:** Defense Implications of Ukraine and the Caspian Region's Critical Minerals

# The Minerals that Make our Military: Defense Implications

By Joshua Bernard-Pearl



Semiconductor chips are a crucial component for many military technologies. The minerals used to produce them can be found across the Caspian region in Ukraine, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Georgia, Azerbaijan, and Turkmenistan.

In the high-stakes world of defense technology, the United States likewise faces the vulnerability of overreliance on China for strategic minerals. These materials are crucial for advanced weaponry and cutting-edge tech and are also the backbone of U.S. national defense and economic resilience. In the [words](#) of U.S. Secretary of Defense Lloyd Austin, “Strategic and critical materials are vital to our national defense and economic prosperity, enabling the United States to develop and sustain emerging technologies.” By leaning so heavily on China, America risks crippling its own security in the event of conflict.

As a result, there is increased reason for the United States to pay attention to the relatively undeveloped strategic resources of Central Asia, the Caucasus, and Ukraine in order to de-risk its vulnerable supply chain. These regions are brimming with essential resources like rare earth elements, titanium, and gallium, which are critical for everything from night-vision goggles to precision-guided munitions. By pivoting to sources in Central Asia, the Caucasus, and Ukraine, the United States could break free from its China dependency, fortify its supply chains, develop new and strategic partnerships, and reclaim control over its technological and defense capabilities. A robust strategic minerals trade relationship with this trio of partners would also help meet a second U.S. defense-related interest. It strengthens the region’s connectivity and provides a source of economic independence from Russia, diminishing Russia’s global influence and promoting American soft power.

The Department of Defense has produced a list of 250 [“Strategic and Critical Materials”](#); however, this list differs from other “critical minerals” lists because it also includes downstream products and focuses on the manufacturing processes that are not relevant to the extraction or refining of the base minerals.

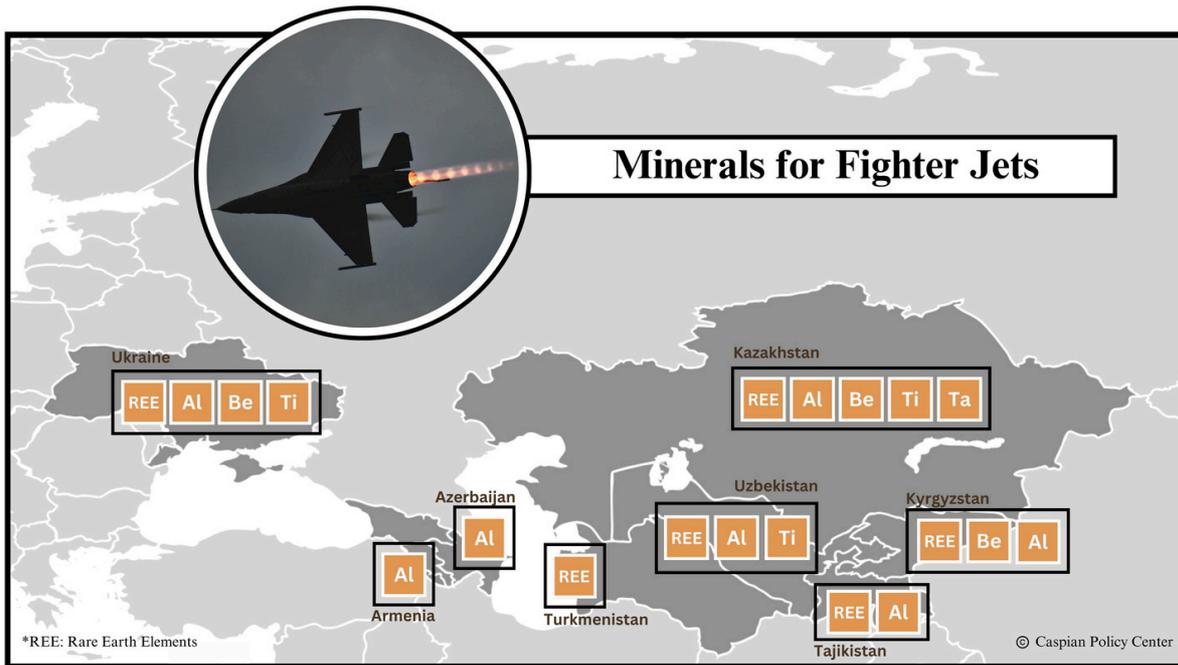
This section looks at strategic minerals as defined by a combination of the USGS critical minerals list, the minerals included in DOE critical materials for energy list, all rare earth elements, and nuclear fuel minerals in order to focus solely on the first step in the complex supply chains behind U.S. military technology.

Advanced semiconductor chips are a crucial component of any modern military equipment. These chips are used in almost every weapons system from drones to missiles to submarines. The importance of this technology has been especially highlighted over the past two and a half years through the extreme [lengths](#) Russia has gone through to secure semiconductors for its war in Ukraine by importing thousands of large appliances and other dual-use technologies just for their chips in order to circumvent sanctions.

**T**hese chips [require](#) over 300 materials to produce, including a number of notable strategic minerals. Silicon, germanium, gallium, and arsenic are the most widely used [semiconductor](#) materials. Kazakhstan, Ukraine, and Uzbekistan all contain reserves of silicon. Kazakhstan is currently the 10th largest [producer](#) of silicon in the world, while Ukraine was the 13th largest [exporter](#) in 2021.

Ukraine is also the world’s fifth-largest gallium [producer](#), a potential counterbalance to China’s virtual monopoly on this mineral’s [production](#) and its export [restrictions](#) of this vital circuitry element for advanced guidance systems. Crucial to infrared and other technologies, reserves of germanium exist in Uzbekistan but have yet to be exploited. China has also moved to [restrict](#) exports of this element.

Semiconductor chips also make [use](#) of cobalt and palladium, as well as rare earth elements scandium, titanium, and fluorite, for various components. All of these elements have deposits within Central Asia, the Caucasus, or Ukraine. Without semiconductor chips, not a single advanced weapons system would be able to function. Without a secure supply of minerals to produce these chips, all of the infrastructure and investment capital the United States has put into the manufacturing process through initiatives like the historic [chips and science act](#) will be futile.

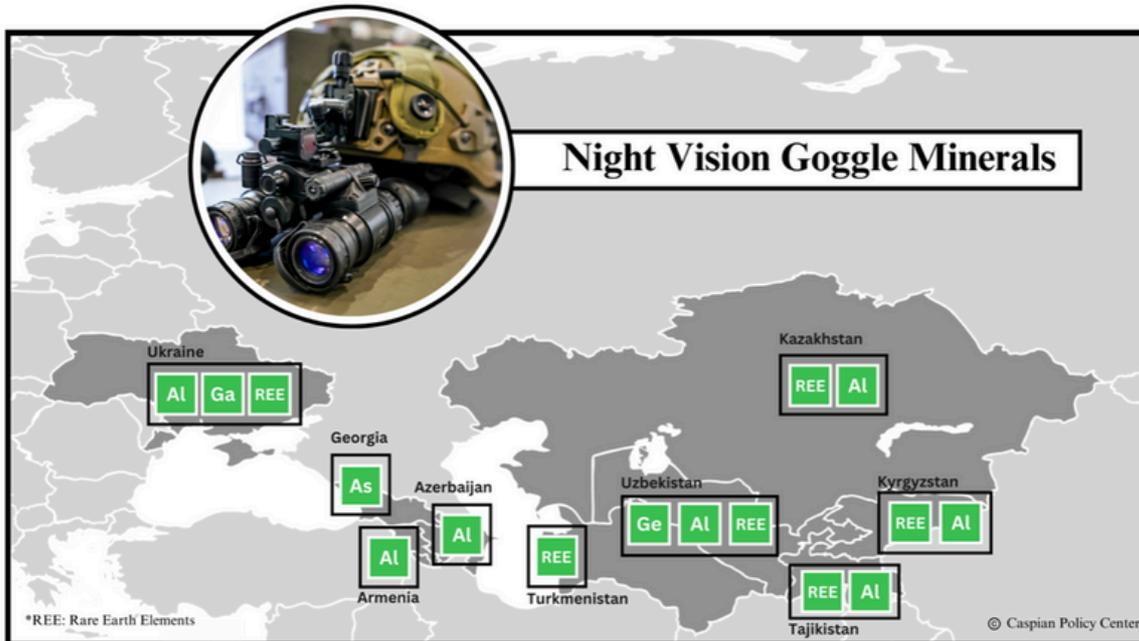


*The minerals necessary to produce US fighter jets can be found across the Caspian region in Ukraine, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Armenia, Azerbaijan, and Turkmenistan.*

In addition to computer systems, countless strategic minerals are used for their strength, durability, and unique properties in the mechanical components of most noteworthy weapons systems. For example, various rare earth elements are [used](#) to manufacture jet engines, while 80% of aircraft, including the F-16 fighter jet, are [made](#) from aluminum. Moreover, titanium and beryllium are also used and crucial for their durability, heat resistance, and lightweight properties in aircraft.

[Uzbekistan](#), [Kyrgyzstan](#), [Kazakhstan](#), and Ukraine all hold substantial deposits of rare earth elements (REEs), with the Central Asians all launching initiatives to increase production over the past four years. In 2023, Kazakhstan was the fourth-largest producer of titanium in the world, [producing](#) approximately 16,000 metric tons. Ukraine likewise has significant reserves, [estimated](#) by the United States Geological Service in 2022 to contain 8.4 million metric tons of ore, which is 1.12% of the world's titanium reserves. Other estimates have claimed that unexplored reserves bring that number up to 10% for this element vital to the production of modern aircraft.

Kazakhstan is likewise an important source of beryllium, containing one of only three beryllium production facilities in the world and producing 25% of the global supply, [according](#) to the Kazakh Minister of Industry and Construction. Aluminum is also abundant with reserves found in almost every country across Central Asia.



Night vision goggles are an important piece of military equipment. The minerals necessary to produce them can be found across the Caspian region in Ukraine, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan, Armenia, Azerbaijan, and Georgia.

Strategic minerals are just as necessary on a smaller scale in the personal equipment of soldiers. Some [examples include](#) nickel for body armor; aluminum, manganese, chromium, and vanadium used in the M4 Carbine rifle; or aluminum, gallium, arsenic, germanium, and other Rare Earth Elements used in night-vision goggles.

Kazakhstan is a [dominant](#) producer of both chromium and manganese. The country is the second-largest producer of chromium with 95% of the world's [reserves](#), and contains the second-largest [reserves](#) of manganese, estimated at 600 million tons. Ukraine and Georgia are likewise notable suppliers of manganese, [producing](#) ore with 600 thousand and 224 thousand metric tons of manganese content respectively in 2021.

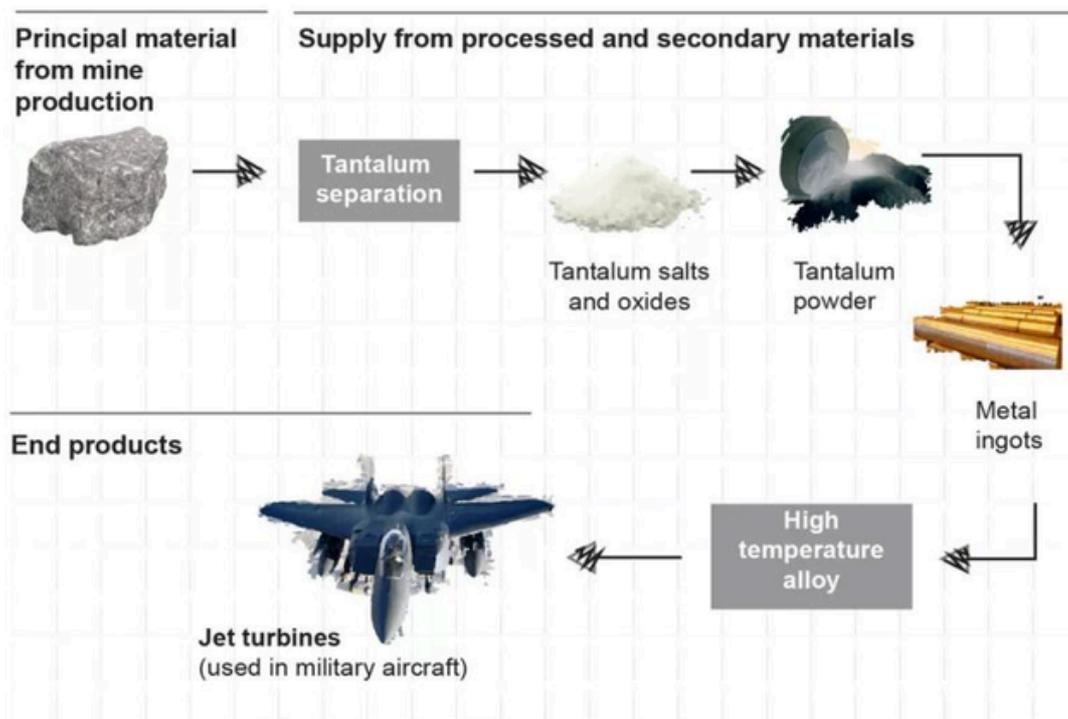


The M4 Carbine Rifle is the standard service rifle across the U.S. Army. The minerals necessary to produce them can be found across the Caspian region in Ukraine, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Armenia, Azerbaijan, and Georgia.

The current strategic minerals landscape reveals a pivotal opportunity for the United States to reshape its defense industry's future. Central Asia, the Caucasus, and Ukraine emerge as indispensable partners in this transformation, offering a wealth of resources critical to maintaining American technological and military superiority. Although the complete mineral requirements of the U.S. military is not publicly available information, anecdotal technologies reveal that the minerals required are diverse and expansive. A secure and abundant supply of strategic minerals is necessary to keep American technology dominant, American weapon systems operational, and American soldiers safe and properly equipped.

By diversifying its supply sources and tapping into the rich mineral deposits of these regions, the United States can not only secure its defense capabilities, but also reinforce its geopolitical stance through partnerships in these three regions. This strategic realignment promises not just a fortified defense infrastructure, but a strategic advantage that can shift global power dynamics. Embracing this potential will ensure that America remains at the forefront of military innovation while fostering stronger international alliances and American influence. The path forward is clear: by investing in these emerging mineral powerhouses, the United States will safeguard the production of critical defense technology against China's near monopoly of mineral refining and export restrictions on these vital materials. 🇺🇸

### Production Supply Chain for Tantalum used in Fighter Jets



Source: GAO analysis of United States Geological Survey and industry data (data). Global Advanced Metals USA, Inc. (images: tantalum ore, tantalum salts and oxides, tantalum powder, and metal ingots); © AVX 2016 (image: tantalum capacitors); United States Air Force (image: jet turbines). | GAO-24-107176

Source: Government Accountability Office (GAO)

*Tantalum is a critical mineral used to manufacture the turbine blades in fighter jets. The production and refining supply chain above highlights the many steps that critical minerals have to undergo from their extraction in mines to use in defense applications. Kazakhstan is home to one of only four tantalum manufacturers worldwide according to the press service of Kazakhstan's Prime Minister.*

# US and EU Policy Analysis

# US and EU Policy Analysis

By Rachel Shifman

**T**he United States (US) and the European Union (EU) represent two of the three biggest spenders in strategic mineral investments (the third being China), as well commanding much of worldwide demand. Both have been vocal about eliminating supply chain vulnerabilities and [express concern](#) about overreliance on China. As they seek to reduce import reliance, they have both turned [outward](#) for new mineral partnerships.

## US vs EU Policies

In both the US and EU, the major mineral policies enacted since 2020 primarily focus on reviving and modernizing domestic mineral production. This article will focus on the policy pieces that impact international outreach on strategic minerals in Central Asia, the Caucasus, and Ukraine. These mostly prescribe from where minerals may be sourced and how to invest in production abroad, but occasionally also touch on international mining standards and best practices. Strategic mineral policies in the US and EU generally fall into three broad policy categories- supply chain, trade, and diplomacy.

## US Policies

### Supply Chain Policies

In the US, supply chain policy for strategic minerals is written by various federal agencies and legislative bodies, including Congress, the Department of Defense, and the Department of Energy. The primary aim of the early policies was to cohesively define what minerals were to be considered "critical." Unfortunately in the US, those definitions are bandied about across different documents. The Energy Act of 2020 ordered the Department of Energy to revamp the "Critical Materials List," despite the existing annual USGS Critical Minerals List. Executive Order 14017 also made the Department of Energy and Department of Defense create separate definitions in 2022 with both of their policy strategy documents- U.S. Department of Energy "[America's Strategy to Secure the Supply Chain for a Robust Clean Energy Transition](#)" and the Department of Defense [Review of Critical Minerals and Materials](#). Of particular importance to the region, the Department of Energy's [Critical Materials Assessment](#) (CMA) of 2023 is the first US policy document to include copper and uranium, both highly prevalent materials in Caucasus, Central Asia and Ukraine.

Section 30D of the Inflation Reduction Act (IRA) details tax credits available for individual electric vehicle (EV) purchases. In the updated IRS guidance from spring 2024, an EV is eligible for a tax credit provided that 80% of the market value of the critical minerals in its battery must be extracted or processed in the US or any of the 20 free-trade countries with whom the United States holds a free-trade agreement (FTA). This effectively bans individual subsidies on EVs built with minerals originating from a "foreign entity of concern" (FEOC). While this does not completely stymie the Caspian region from providing minerals for US EV batteries, it complicates their processing, for many Caucasian or Central Asian extractors use Russian or Chinese refining companies. The US Infrastructure Investment and Jobs Act (IIJA) section 40210 similarly bans any research grants for mineral processing or battery manufacturing by FEOCs.

## Trade

The US Trade Representative makes use of a host of trade mechanisms with the region and within strategic mineral agreements. Most notably, because FTAs with critical mineral-producing jurisdictions are limited, the U.S. Department of the Treasury has designated the newly-created Critical Mineral Agreement (CMA) vehicle as an FTA for the purposes of the IRA EV tax credit. According to the [2024 Trade Policy Agenda](#), the USTR is pursuing CMAs with the EU, the U.K, and partners within the G7, G20, APEC, and OECD. None with the Caucasus, Central Asia, or Ukraine have been reported yet.

The region makes use of the US's other trade mechanisms - the Trade and Investment Framework Agreements (TIFAs) and Bilateral Investment Treaties (BIT)- though not equally across each country.

The U.S. International Development Finance Agency (DFC) was repeatedly pointed to in policy documents to spearhead foreign strategic mineral investment efforts, but as of yet, no specific policy or strategy has been released by the agency to guide the flow of those investments. As of now, the agency appears to send funding to the Mineral Security Partnership Finance Network for dispersant.

The [Partnership for Global Infrastructure and Investment](#) (PGII) calls for investments across the strategic mineral value chain as part of its "Clean Energy Supply Chain" portfolio. Though the partnership is technically a G7 collaboration, it is spearheaded and predominately funded by the US. Neither Ukraine nor any of the countries in the Caucasus or Central Asia have been tapped yet for strategic minerals project funding, but it is a possible avenue.



*US Capitol Building*

Photo: Wikimedia

## Diplomatic Policies

Notably, the US does not have a comprehensive policy regarding strategic minerals for any specific region. The Department of State country and regional strategy documents for Caucasus, Central Asia, and Ukraine barely mention strategic minerals or materials (the lone mention of minerals appears in Georgia's country strategy document, which calls for the "deoligarchization" of the mining sector). Instead, the US engages in diplomacy on strategic minerals with these countries through Strategic Partnerships, by signing bilateral Memorandums of Understanding (MOUs) or enhancing dialogues. These efforts have focused almost entirely on Central Asia, with the [C5+1 Critical Mineral Dialogue](#) (CMD) as the centerpiece of US-Central Asia mineral cooperation efforts. It is worth noting that the current MOUs and Strategic Partnership Dialogues that specifically call for strengthening cooperation in strategic minerals are only with [Kazakhstan](#) and [Uzbekistan](#), despite the fact that the US also maintains a Strategic Partnerships with Ukraine.

The Department of State-developed [Energy Resource Governance Initiative](#) (ERGI) is a toolkit that promotes environmental and social global standards for extractive industries. While not seemingly very used or advertised, this initiative was nonetheless mentioned in the DOE Strategy Report as a primary method for coordinating strategic mineral mining standards. Wider adoption of this resource would not only strengthen relations with mineral extraction countries, but also help ensure that the non-U.S. components of the mineral supply chains are resilient and subject to sound governance.

## EU Policies

### Supply Chain Policies

The 2020 Action Plan on Critical Raw Materials called for securing EU access to critical and strategic raw materials, primarily in rare earth and magnet value chains. Most importantly, it established [The European Raw Materials Alliance](#) (ERMA).

The [Critical Raw Materials Act](#) (CRMA) is the most current and comprehensive policy on strategic minerals the EU has released to date. Like the lists published by the US Department of Energy, it provides definitions for "raw materials," though it notably includes some materials excluded from US lists, like silicon metals. Most importantly to the region, the act determined a new class of agreements with non-EU countries called "strategic projects." It gives preference to establishing connections with raw material suppliers in non-EU countries that "with which the Union has established a strategic partnership (Strategic Partnership), a free trade agreement or other forms of cooperation covering raw materials." In absence of those connections, "emerging markets or developing economies" can also designate strategic projects if the project would "add value" to the third country and be sustainably implemented. Currently, the only free trade agreement between the EU and the region is made with Ukraine.

## Trade Policies

The EU makes use of two main trade policies with the region- the Generalized Scheme of Preferences (GSP) for developing nations, and bilateral Trade Agreements. The European Union is also looking to expand its network of the newly-created “Sustainable Investment Facilitation Agreements” of Free Trade Agreements. All of these offer preferable opportunities for the region to trade with the EU generally, but none specifically mention strategic minerals.

[Global Gateway](#) is the EU’s primary investment mechanism to strengthen digital, energy and transportation systems globally. In the Caucasus, it is funding mining through the “Critical Raw Materials Exploration Facility” Eastern-European Regional Initiative. In Central Asia, the “Critical Raw Materials” project is administered by a separate Regional Initiative. On an individual country level, only Kazakhstan is receiving any funding for strategic minerals through the “Implementation of partnership on raw materials, batteries and renewable hydrogen” project.

## Diplomatic Policies

In contrast with the US, the 2024 update to [EU Strategy on Central Asia](#) explicitly mentions critical raw materials as a point of cooperation and seeks “secure and competitive access” for the EU. The EU also established Strategic Partnerships with Kazakhstan and Uzbekistan on strategic minerals, separate from their existing Partnership agreements. The closest country arguably to the EU of this region is Ukraine with a strong “Association Agreement,” though that has no mention of strategic minerals.



*EU Parliament Building*

Photo: Multimedia Centre – European Parliament

## **US - EU Joint Policies**

The US - EU Critical Minerals Agreement (CMA) is currently being negotiated, the process having begun in March 2023 over disagreements on the IRA's Section 30D. While its lack of passage does not completely preclude the two actors from collaborating on strategic mineral policy, it is limiting how much they can align on definitions of "minerals."

More critically, the US and EU are principal partners within the [Minerals Security Partnership](#) (MSP), a consultative body of mineral consuming and producing economies that promote resilient supply chains. The MSP aims to secure responsible, ESG-principled mineral supply chains worldwide through commercial projects in member economies. Recently, the MSP created an internal financing network for its members that also leverages some of the world's largest private sector investors. Of the countries in Central Asia, the Caucasus, and Ukraine, only Kazakhstan, Uzbekistan, and Ukraine are members.

## **US and EU Joint Policy Recommendations**

The U.S. and the EU align on more strategic mineral policy goals than they differ. Despite the long negotiations over the CMA, it is reasonable to anticipate that an agreement will come about eventually. Their mutual goal towards strategic mineral policy with Central Asia, the Caucasus, and Ukraine, is above all, to secure diverse and stable supply streams to lessen dependency on China. And with the immense demand pouring in from both economies, time is running out. The IEA noted in its [2024 Global Critical Minerals Outlook](#) that, despite significant policy efforts in the last five years, "recent progress on diversifying supply sources has been limited."

In order to make the most of these opportunities, the US and EU should consider the following recommendations:

1. **Encourage innovation, not just production:** The US and EU should recognize that while the opportunity for establishing secure supplies with Caucasus, Central Asia, Ukraine is exciting and very pressing, the reality is that the mining infrastructure for some of the resources is very nascent.
2. **Fill gaps in minerals/materials definitions:** The US should follow the EU's lead and release a complete, cohesive strategic mineral list. The current gaps between some lists do not favor the region's particular mineral makeup. The EU should also look into including some minerals absent from its list that favor the region, like uranium.
3. **Strengthen regional cooperation:** Following the US's lead with the C5+1 CMD format, the EU should strive to approach each country as a part of its region. The regional strategy in its updated diplomatic approach to Central Asia should be replicated to the Caucasus and Ukraine as well. These countries are looking to build stronger connections and leverage their shared mineral wealth. As demonstrated above, some are not as engaged with. Inviting them all to the table will provide more cohesive and realistic mineral supply chain policies. 🇧🇪

**U.S. Policy  
Recommendations:  
Finding Rocks in Hard  
Places**

# U.S. Policy Recommendations: Finding Rocks in Hard Places

By Dr. Eric Rudenshiold

**C**hina's dominance in critical mineral processing poses a significant risk to U.S. national security, technology, and energy sectors. Diversifying supply chains through partnerships with the Caucasus, Central Asia, and Ukraine offers a vital opportunity to mitigate this vulnerability.

While these regions hold untapped mineral wealth and strategic geopolitical value, challenges such as infrastructure deficits, regulatory inconsistencies, and geopolitical tensions must be addressed. The U.S. can lead by fostering investment in mining, modernizing operational standards, and supporting regional supply chain development.

By implementing these policy measures, the Trump administration can secure access to critical minerals for U.S. industry, support regional stability, and reduce U.S. reliance on China, thereby strengthening global supply chain resilience and advancing broader geopolitical objectives.



Photo: Wikimedia

*Donald Trump signed 71 bills and 221 executive orders during his first term in office, including the "Executive Order on Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries."*

# Policy Options

## 1. Establish Bilateral Agreements

- Formalize trade and investment agreements with the Caucasus, Central Asia, and Ukraine to foster critical mineral development.
- Include provisions for public-private partnerships, technical assistance, environmental safeguards, and resource-sharing.
- Introduce bilateral tax incentives to attract American businesses to invest in mining infrastructure and co-develop strategic mineral projects.

## 2. Build Institutional Capacity

- *Invest in education and training programs for mining and business management in the Caucasus, Central Asia, and Ukraine.*
- *Offer scholarships and exchange programs to bring expertise from the U.S. to the region.*
- *Establish regional vocational training centers and partner with U.S. institutions to advance technical knowledge in mining and sustainability practices.*

## 3. Develop Regional Processing Capabilities

- Facilitate the creation of state-of-the-art processing facilities to reduce reliance on Chinese infrastructure.
- Support pilot projects for refining critical minerals while promoting facilities that meet international standards.
- Encourage regional cooperation to establish shared processing hubs, reducing costs and fostering cross-border collaboration.

## 4. Encourage Private Sector Investment

- Develop public-private partnerships to share risks and rewards in mining and processing ventures.
- Organize trade delegations and networking events to connect U.S. firms with regional partners.
- Provide financial incentives, such as low-interest loans, risk insurance, and tax benefits, to encourage U.S. companies to invest in the region.

## 5. Strengthen Regional Supply Chains

- Partner with regional governments to create efficient logistics networks that improve access to Western markets.
- Invest in critical infrastructure, including railways, highways, and ports, to enhance the transport and export of raw and refined minerals.

## 6. Strengthen Multilateral Engagement

- *Build a coalition of like-minded nations to counterbalance Chinese and Russian influence in critical mineral markets.*
- *Collaborate with allies such as the EU, Japan, South Korea, and Canada to develop alternative supply chains for critical minerals.*
- *Promote joint initiatives with international organizations like the World Bank and Asian Development Bank for infrastructure and resource development projects.*

## 7. Promote Transparent Governance

- Support transparency and anti-corruption measures in mining operations to foster U.S. business engagement.
- Provide technical assistance to modernize regulatory frameworks and train local officials in governance best practices.
- Endorse initiatives like the Extractive Industries Transparency Initiative (EITI) to ensure accountability and attract investment.

**C**reativity in policy is paramount in solving strategic problems. The recent adoption by the Export-Import Bank of the United States (EXIM) is an imaginative example of a new financing tool designed to strengthen U.S. supply chains and reduce reliance on the People's Republic of China (PRC) for critical minerals and rare earth elements. The Supply Chain Resiliency Initiative (SCRI) is a creative approach cheered by Congress to provide targeted financing to develop projects that secure critical minerals and rare earth elements, essential for transformative technologies from trusted international partners.

According to Bloomberg, an estimated \$30 billion in critical mineral investments by 2030 is required to meet the growing demand from the U.S. and Europe. Financing from the SCRI can directly support agreements between U.S. manufacturers and global minerals suppliers in trusted partner countries, with the goal of ensuring the metals flow into U.S.-based production facilities. Normally, EXIM's financing is tied to U.S. exports, but through this innovative approach it is linked to the agency's import authority. SCRI agreements will work to ensure critical minerals flow into U.S.-based production facilities, fostering growth in domestic supply chains. Meanwhile, the State Department's Energy Resource Governance Initiative (ERGI) can provide guidance to trusted mineral extracting countries in order to ensure resilience at this crucial first step in the supply chain.

U.S. policymakers do have existing tools and policy opportunities at their disposal to diversify supply chains for strategic minerals. The Development Finance Corporation, the Commerce Department, and other public and private institutions can all contribute to developing closer strategic partnerships with Central Asia, the Caucasus, and Ukraine in ways that benefit all economies and break dependencies on the PRC. 🇺🇸

# Who's Got What: A Mineral Deposit Guide

*by Joshua Bernard-Pearl, Rachel Shifman, Zachary Weiss*

This section compiles data to answer where strategic minerals are located, who is producing them, and what is the overall landscapes of each country's mineral industries. It is intended to demonstrate the immense strategic potential of the region and act as a guide for western investment into this geopolitically and economically vital industry. It is organized alphabetically by country.

CPC

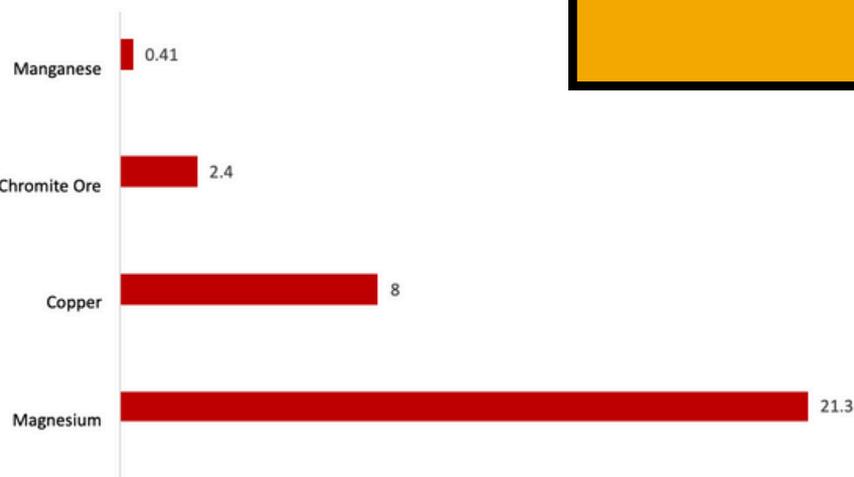
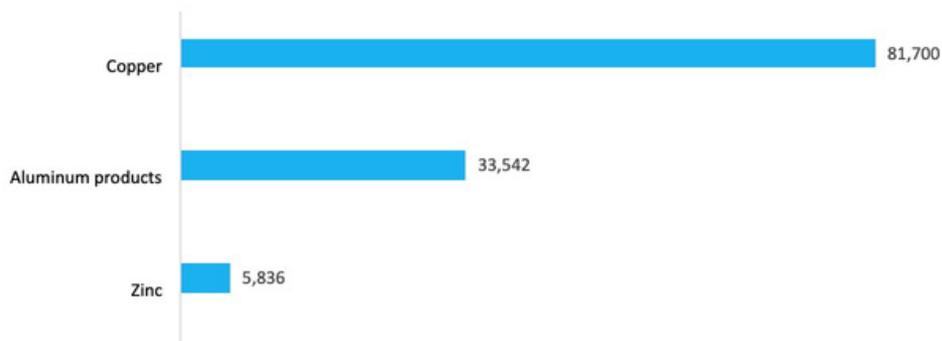


CASPIAN  
POLICY  
CENTER

# Armenia



**Largest Strategic Mineral Production (2021, metric tons)**



**Largest Strategic Mineral Reserves (2021, million metric tons)**

## Armenia cont.



Though Armenia is not as rich in strategic minerals as some of its neighbors in the region, the mining industry has been a longstanding pillar of its economy. Mining accounted for 37% of the country's exports in 2023. Strategic minerals found in Armenia primarily include copper, zinc, antimony, and aluminum, of which copper is the most abundant and extensively mined. The largest copper deposits are located in the Lori province, the southeast Kapan area, and the southwestern part of the Zangezur mountain range. Of the eleven active copper mines, the Kajaran, Agarak, and Shamlugh mines are the most productive in the country. Aluminum is primarily found in the center of the country, with Hrazden as the largest mine. However, Armenia primarily imports unwrought aluminum from Russia and exports it as finished aluminum products, like foil. In 2022, Armenia exported only 6,000 tons of unwrought aluminum for \$14 million. The government also reports that there are scattered deposits of bismuth and some rare earth elements, including indium.

Mining and mineral issues are under the purview of the Ministry of Territorial Administration and Infrastructure, which underwent a major bureaucratic reorganization in 2019. The main regulatory legislation is the Mining Code and the Land Code. Other important pieces of legislation include the Law on Environmental Supervision, the Law on Environmental and Natural Resource Use Fees, and the Law on Environmental Impact Assessment and Environmental Expertise.

The Armenian government is eager to bolster its mining capacity and increase its strategic mineral exports. In 2023, the government adopted the "Mineral Sector Development Strategy of Armenia 2035." Its goal was to modernize licensing and permitting procedures, create a digital database for subsoil data, reform mining revenue collection, and increase compliance with international standards. However, the World Bank notes in a recent analysis that production output is declining, regulation remains weak, and new investors have low perceptions of competition in the industry due to the concentrated ownership of the most productive mines by a few established companies. Armenia's mining industry receives a lot of foreign direct investment, with copper mining receiving the most significant portion. Russia is the dominant investor and owner of the most productive mines. The World Bank reports that Russian-owned mines accounted for nearly 80% of 2021 mineral sales.

## Armenia cont.



The leading producer of copper is the Zangezur Copper Molybdenum Combine (ZCMC), Armenia's largest taxpayer and responsible for 60% of annual turnover in the mining sector.

Until 2023, it was 45% owned by the Russian-based GeoProMining (GPM). The entire stake was sold due to Western sanctions on GPM's owners, the Trotsenko family. Now, the Armenian government holds roughly 25% of shares in ZCMC, 12.5% are held by the hotly contested Walnort Finance company, and GPM's stake was sold to Svetlana Ershova, a longtime business partner of Roman Trotsenko. GPM also owns the second-largest copper company, Agarak Copper-Molybdenum Combine (ACMC). Teghut, a major copper mine currently inactive due to environmental concern, is owned by sanctioned Russian bank VTB.

The most prominent aluminum company, ARMENAL, is a wholly owned subsidiary of RUSAL, the world 2nd largest aluminum producer. As of December 2023, RUSAL was majority owned by the EN+ Group and Sual Partners, both energy and mineral funds created by Russian oligarchs. The largest zinc-producing company is Chaarat Gold Holdings Limited, a British Virgin Islands-based company whose majority shares are held by its British former executive. Its next largest shareholder is the China Nonferrous Metals International Mining Company.

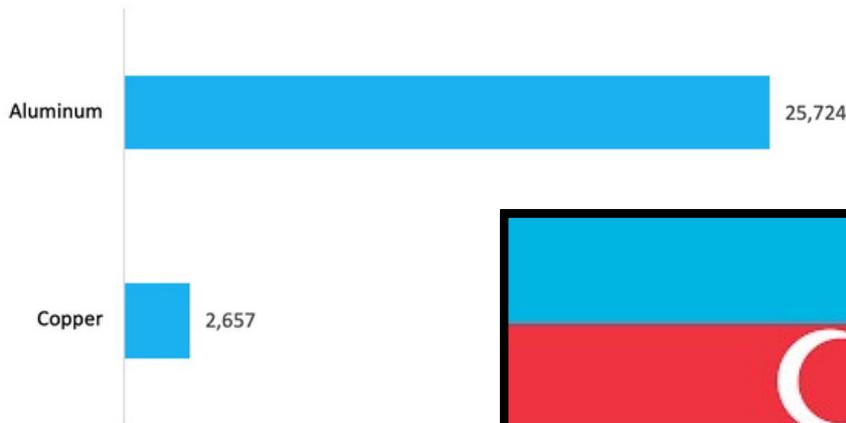
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# Azerbaijan



Largest Strategic Minerals Production (2021, metric tons)



Reserve data is insufficient to graph

Azerbaijan possesses a wide range of minerals and is actively trying to diversify investment towards its strategic mineral extraction capabilities. Of those minerals, Azerbaijan contains economically extractable reserves of cobalt, copper, zinc, and aluminum. Cobalt is used on the production of rechargeable batteries while zinc is necessary for the manufacturing of galvanized steel, used for its corrosive resistant properties.

The most prominent economic regions for mining include Dashkasan, Shaki-Zagatala, and East Zangezur. The U.S. Geological Survey reports that in 2021, Azerbaijan produced 25,724 metric tons of aluminum and 2,657 metric tons of copper. Production and reserve data for other minerals are currently being compiled into a public database by the state geological regulators. Through new partnerships with Türkiye, Pakistan, and others, Azerbaijan is looking to develop international surveying and mining cooperation.

## Azerbaijan cont.



Mining in Azerbaijan is governed by the Ministry of Ecology and Natural Resources. The ministry sets the state policies to be carried out by several newly created agencies: the State Agency for Utilization of Mineral Resources, the Geological Survey Agency, and the State Geological Information Fund. Until 2019, Azerbaijan's extractive capacity centered on its hydrocarbon industry. However, the 2020 "State Program for the Geological Study of Subsoil and Efficient Use of the Mineral Resource Base until 2024" was approved to focus on critical mineral mining. The main mining code in effect remains the 1998 "Law on Subsoil Use," which primarily regulates oil and gas extraction, but has been expanded upon in 2022 to focus on critical minerals. The most prominent companies mining strategic minerals in Azerbaijan today are Azeraluminum (an entirely government-owned company) and the UK-based Anglo Asian Mining PLC (AAM) (whose majority shares are held by a dual UK and Azeri citizen). The Azerbaijan International Mining Company Limited (AIMC), a subsidiary of AAM, is the first company to begin using modern mining equipment and technology to extract critical minerals.

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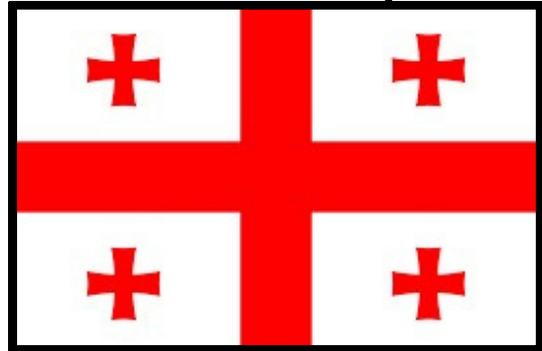
# Georgia



Georgia: 2021 Production (metric tons)



Georgia: Most Current Reserve Estimates (metric tons)



Georgia's strategic mineral profile is smaller than some other Caspian nations and is not being utilized to its full extraction potential. Nonetheless, the industry is expected to experience growth in the next five years. In December 2019, the Georgian government devised a strategy to better optimize the mining industry. This strategy included a mandatory minimum investment for a company to pay before receiving a production license. In addition, this strategy strongly encourages the refinement of mining and strategic mineral resources within Georgia, prior to export. The mineral industry as a whole is overseen and regulated by Georgia's National Agency of Mineral Resources.

## Georgia cont.



The two most prominent strategic minerals present in the country's active mining industry are copper and manganese.

Manganese crucial to increase the strength of steel, with manganese steel used for railway tracks, safes, rifle barrels and prison bars. Chiatura Manganese Company is the only enterprise in Georgia that is active and producing manganese. This company is owned by Georgian American Alloys Inc. (GAA) of the United States. The GAA plans to construct a manganese processing plant in proximity to the mine to optimize production. In the latest data from 2019, Manganese production went down as compared to 2018, due to work force strikes.

Georgia's copper industry ranks 19th worldwide in export size, and the top destination for Georgian copper is China and Bulgaria. The industry is actively expanding, as the Georgian Copper and Gold company and the Caucasian Mining Group have begun a large project near the city of Bolnisi to explore vast reserves of copper and gold resources.

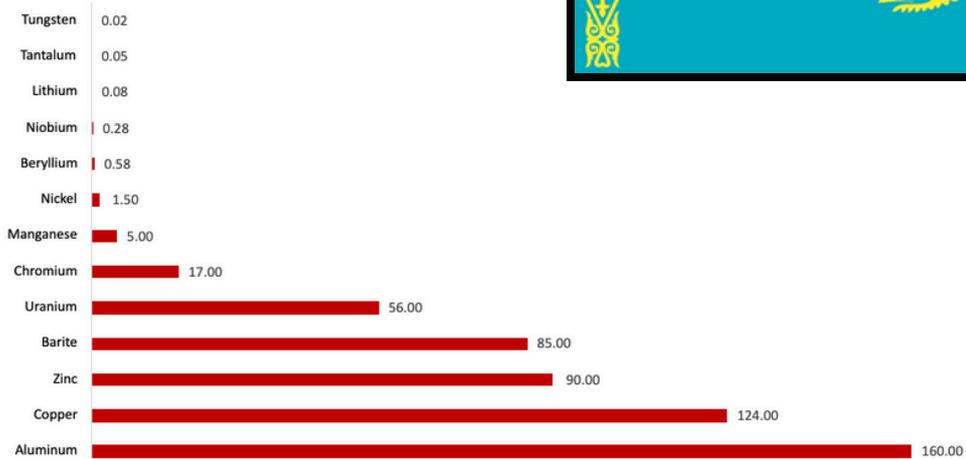
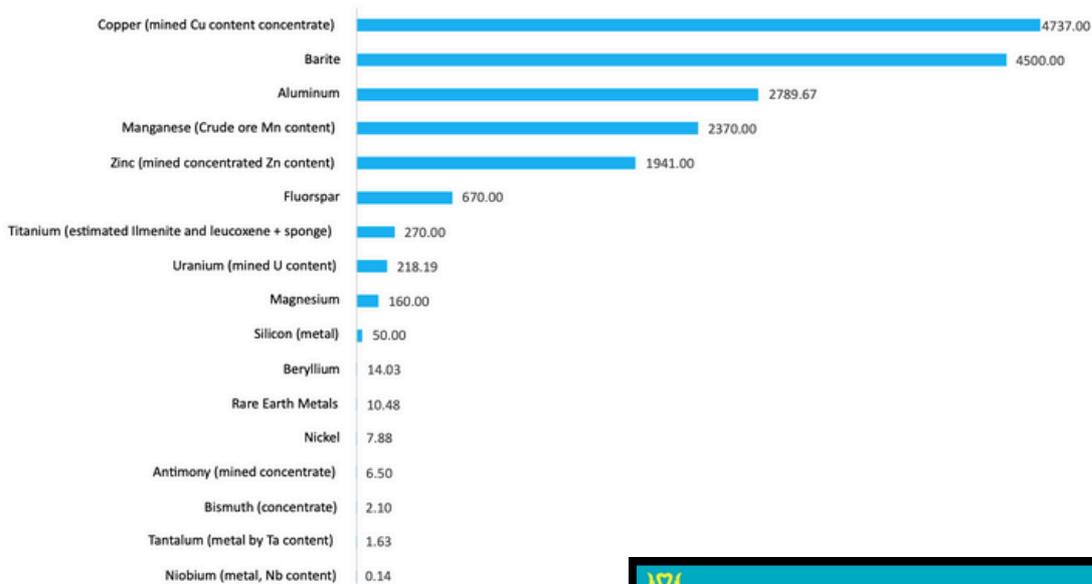
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# Kazakhstan



**Largest Strategic Mineral Production 2021 (most current estimates, hundred metric tons)**



**Largest Strategic Mineral Reserves (most current estimates, million metric tons)**

## Kazakhstan cont.



Kazakhstan is richly endowed with a diverse mix of minerals and is actively devoting considerable resources to promote extraction and refining capacity. Kazakhstan ranks first in global reserves of chromium, second in uranium and manganese, seventh in zinc, and 11th in copper. The country also has great untapped potential in terms of lithium, nickel, and rare earth metals. Chromium is a crucial component of stainless steel while lithium and nickel are both used to make batteries.

The most significant strategic mineral in Kazakhstan by far is uranium. The uranium mining industry, dating back to Soviet Union-era exploration, is well-developed. In 2009, Kazakhstan became the world's largest uranium producer. The government is heavily investing in increasing extraction capacity, with large reserves being discovered through new state surveys. Though there is currently no domestic demand for its uranium products, the government announced earlier this year a plan to increase nuclear energy's share of the national generation mix to 5% by 2035. China and Russia are the main destinations for Kazakhstan's uranium exports.

The long-standing mining sector is diversifying out from its traditional focus on gold, silver and lead, and developing more international partnerships to exploit its considerable wealth of strategic materials. According to Kazakh Invest, the government's business development agency, the country is currently implementing a wide range of measures aimed at promoting private sector investment. This includes simplifying permitting processes, data digitalization, and granting priority rights. In December 2023, Kazakhstan adopted "The Complex Plan on Rare Metals and REM for 2024-2028," which called for an investment of around \$5.3 billion on the development of rare earth metals. The most metallurgically productive regions of the country are Pavlodar, East Kazakhstan, and Karaganda. The U.S. Geological Survey reports that the country's strategic mineral refining capacity is mainly limited to zinc and copper refining.

The mining sector is overseen by several national regulatory bodies, most directly by the Ministry of Industry and Infrastructure and Development (MIID). Housing the Committee on Geology, the National Geological Survey, and Kazgeology National Geological Exploration Company, MIID is responsible for subsoil exploration, permitting, and development policies. The Ministry of Finance oversees tax collection from "strategic" state assets, including strategic minerals. The current Subsoil Use Code is being reformed to be more competitive with international models and attractive to private exploration of greenfield deposits. However, the World Bank reported that these reforms are delayed due to lack of government coordination and publication of information.

## Kazakhstan cont.



Many of the largest mining companies in the country are either state-owned and operated, partially owned by the state, or owned by Kazakhstani citizens. The government-owned Kazatomprom dominates the uranium industry with over 40% ownership of the country's supply. Tau Ken Samruk, a government holding mineral company, partially owns Kazzinc, one of the largest zinc producers in the country, though it is majority owned by Glencore, the world's largest commodity trader. Eurasian Resources Group, one of the world's largest mining companies overall, is 40% owned by the Ministry of Finance's State Property and Privatization Committee, while the other 60% is owned by its Kazakh founders.

Kazakhmys, the largest copper producer in Kazakhstan and a significant zinc producer, is privately owned by its founders Oleg Novachuk and Vladimir Kim. As of 2022, they also own the Nova Resources consortium, the new majority owner of one of leading copper producers in Kazakhstan, Kaz Minerals. In contrast to the other big operators, Central Asia Metals is a London-listed company, with its largest shareholders including Fidelity International, Black Rock, and JO Hambro Capital Management. Kazakhstan has also partnered with the U.S. and European countries directly through the Mineral Security Partnership (MSP) in the production of graphite through the Sarytogan Graphite Project.

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# Kyrgyzstan



Strategic Mineral Production (2021, metric tons)

Copper (Cu Content) 6900



Largest Strategic Mineral Reserves (Most current estimates, thousand metric tons)

Kyrgyzstan's mineral sector has seen some decline in recent years due to increased production costs and lower commodity prices. Despite this, mining remains the largest sector in the country's economy. Although gold remains the largest component of Kyrgyzstan's mineral sector by value, there are significant reserves of several strategic minerals, recent investments in rare earth mineral production, and a renewed interest in uranium mining in the country.

## Kyrgyzstan cont.



Kyrgyzstan has proven reserves of strategic minerals including copper, antimony, uranium, tin, tungsten, beryllium, fluorspar, zinc, and various rare earth elements. However, according to the most recent USGS data from 2021, the only strategic mineral currently produced in significant quantity is copper, with Kyrgyzstan producing 6,900 metric tons of copper concentrate a year. Historically, Kyrgyzstan has been a dominant player in rare earth mineral production, at one point providing the Soviet Union with 80 percent of its rare earth supply. USGS has identified 20 sites within Kyrgyzstan with rare earth mineral occurrences that could indicate considerable undiscovered resources.

Over the past decade, Kyrgyzstan has also produced notable quantities of antimony and uranium. Antimony was previously processed in Kyrgyzstan's Kadamzhay complex with raw materials from Russia and Tajikistan, owing to the lower quality of Kyrgyzstan's own antimony reserves, however production was halted in 2017 due to financial problems and a lack of raw materials. In 2019, the complex announced plans to restart production, with USGS data indicating an output of 40 metric tons in 2023.

Uranium production has not occurred since 2016 but appears set to resume in the near future. In 2019, the Government banned the exploration and mining of uranium and thorium deposits following protests in the Issyk-Kul region. However, this ban was lifted in July of 2024, with Kyrgyzstan's President Sadyr Japarov announcing the resumption of mining could generate \$2 billion for the state.

Since its creation in 2021, the Ministry of Natural Resources, Ecology and Technical Supervision has been responsible for overseeing and regulating the mineral industry in Kyrgyzstan. The Kyrgyz government has generally emphasized state involvement in mineral production, playing a dominant role in identifying deposits and consolidating state control with recent legislative changes.

Kazakhstan is one of the largest foreign players in Kyrgyzstan's strategic mineral industry. The largest company currently involved in copper production is KAZ Minerals. Kazakh investors also played a major role in antimony production before it halted, through the ATF Bank of Kazakhstan.

## Kyrgyzstan cont.



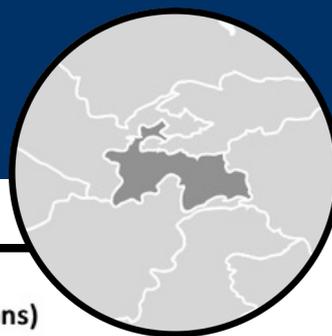
Canada has been a major investor in Kyrgyzstan's rare earth production. In February 2021, Canada's Stans Energy Corp and Singapore's Neon Mining Company partnered to expand the rare-earth sector in Kyrgyzstan. However, little information exists on the current state of these efforts. The Canadian company, Centerra Gold Inc, was also formerly the operator of Kyrgyzstan's largest mine, Kumtor, until April of 2022, when the Kyrgyz state-owned mining company took full control of the mine following a long dispute over environmental management and division of revenues.

Another major player is Russia, which historically dominated Kyrgyz uranium mining through the Renova Group, a Russian-owned conglomerate. Kyrgyz officials have not released any statements on which companies will be involved in the resumption of uranium mining. However, ongoing Kyrgyz cooperation to build a nuclear reactor with the Russian state-run entity, Rosatom, indicates a willingness to partner with Russia in the nuclear sector.

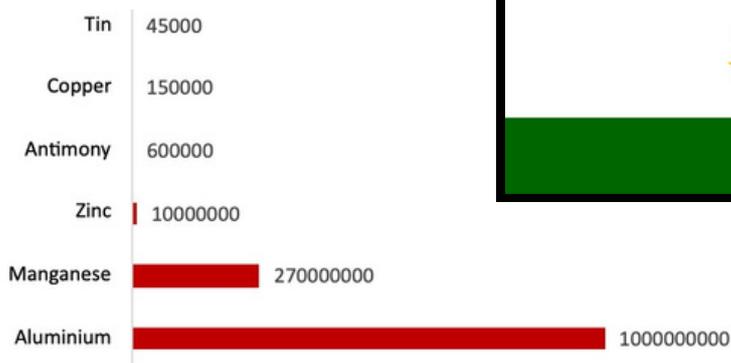
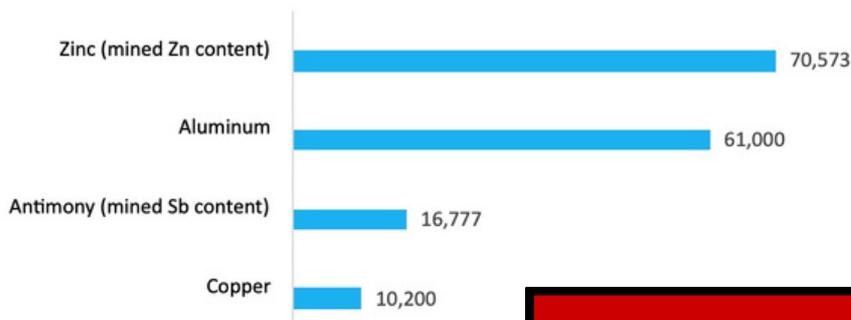
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# Tajikistan



**Largest Strategic Mineral Production (2021, metric tons)**



**Largest Strategic Mineral Reserves (most current estimates, metric tons)**

Tajikistan has a smaller and less-diverse strategic mineral profile than some of its Central Asian neighbors, but still boasts significant aluminum, antimony, and zinc industries. It also possesses deposits of copper, bismuth, tungsten, fluorspar, uranium, and some rare earth metals. The most productive are the Karamazar mountains in the Sughd Region and the Hissar district in the Central Republic Controlled Region.

Tajikistan is the fourth largest antimony producer in world at around 25% of global production in 2023. Antimony is primarily used to increase the hardness of alloys alongside lead for batteries and lead, copper, or tin for machine bearings. It also has various other useful applications in the production of flame retardants, semiconductors, glass, and ceramics. In the defense sector, antimony is used to make armor-piercing ammunition, night vision devices, infrared sensors, and precision optics.

## Tajikistan cont.



Tajikistan's antimony production is especially significant given that China, the world's largest supplier, passed a serious of export restrictions on antimony products on August 14th. Tajikistan is still heavily reliant on China for the refining of antimony, accounting for 78 percent of the country's antimony exports. However, this situation could be changed with increased external investment in Central Asia's processing facilities, such as the Kadamzhay complex in Kyrgyzstan. The aluminum industry is also noteworthy with plans to increase aluminum production to 380,000 tons by 2030. The IAEA reports that there are some exploitable uranium deposits in the southern parts of the country, despite most of its supply being depleted under the Soviet Union.

The minerals industry is governed by Tajikistan's Ministry of Finance, which issues permits and allowances, and the Main Directorate of Geology, which conducts surveys and develops best practice policies for mining. The main law governing mining, the "Law on Subsoil Use," last amended in 2013, details all conditions necessary for mining production in the country. Foreign companies are permitted to invest in the industry, though must abide by the 2012 "Law on Production Sharing." Most of the companies involved in critical mineral mining are state-owned. TALCO is a 100% state-owned company and the singular aluminum producer in the country, as well as the largest mining company in the country. TALCO often partners with foreign firms to mine other resources. The nation depends on foreign investment and expertise for developing their mineral extraction potential, which has resulted in an abundance of Chinese investments and influence in this sector. In antimony production, the largest companies are the state-owned Isfara plant and the American-owned Anzob Company. Zinc production is split between government ownership of the large Adrasman and Kansayskoye complexes, and the Tibet Summit Industry Company (a Shanghai-based firm whose controlling shares are owned by Chinese billionaire, Huang Jianrong) and the Tajik-China Mining Company (a subsidiary of Tibet Summit Industry Co.).

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# Turkmenistan



Production and reserve data is insufficient to graph



Turkmenistan has only just begun exploring its strategic mineral exportation potential. According to state geologists, there may be lithium reserves in the Balkan province and rare earth materials in the Lebap province. The country also has proven copper reserves, but their economic viability needs to be assessed. The International Atomic Energy Agency (IAEA) reported that there are occurrences of uranium in the country's north-western areas, but there is insufficient data to estimate potential uranium resources.

Unlike its hydrocarbon sector, Turkmenistan does not allow for any foreign ownership or leasing of mineral rights. Mining is dominated by the public sector through the Ministry of Energy's Türkmengeologiýa State Corporation. Despite government claims of reforming the industry to include more private sector participation, the World Bank has reported that tight administrative controls have hindered private mining expansion. Apart from the hydrocarbon sector, foreign direct investment remains limited.

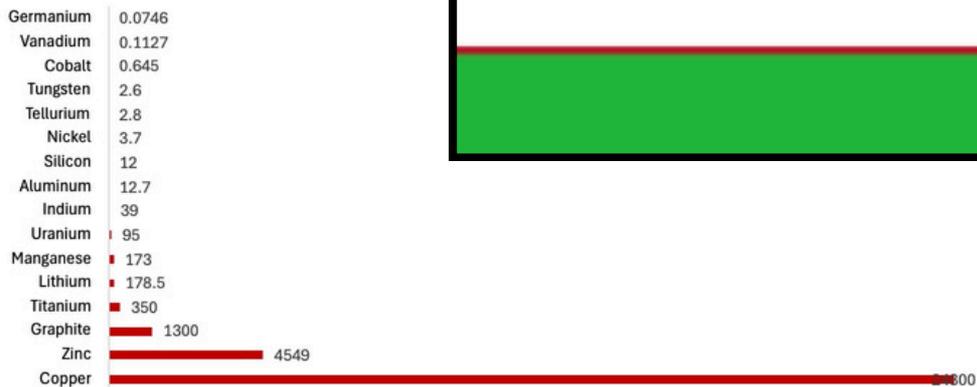
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# Uzbekistan



Uzbekistan: 2021 Production (thousand metric tons)



Largest Strategic Mineral Reserves (most current estimate, thousand metric tons)

\*Tellurium production data is for 2024

Production of germanium, cobalt, nickel, titanium, and rare earth elements may exist but there is not enough data to quantify

Reserves of cesium, fluorspar, rubidium, and rare earth elements may also exist but there is insufficient data to quantify them

Uzbekistan's mineral industry is thriving, with production either increasing or remaining constant for the majority of mineral commodities according to the most recent USGS data. Notably copper, uranium, and zinc are among the strategic minerals expected to increase in production. Accompanying this steady growth are several government initiatives to promote private investment, mineral exploration, and foreign partnerships.

## Uzbekistan cont.



Uzbekistan ranks fourth in the world for tellurium reserves, sixth for tungsten, ninth for indium, 11th for uranium, and 12th for copper. Tellurium is used in semiconductor technology, solar panels, in the vulcanization process to harden rubber, and as a coloring agent in glass and ceramics. Tungsten is utilized in high-temperature applications like lightbulb filaments, aerospace components, cutting tools, and as an alloying element to enhance the strength and durability of steel.

Uzbekistan also has notable reserves of manganese, zinc, graphite, and titanium. Various deposits contain lithium, silicon, nickel, aluminum, cesium, fluorspar, rubidium, cobalt, and germanium. Significant reserves of rare earth elements have also been identified across 14 deposits. In recent years Uzbekistan's government has made a number of changes and investments to promote its mineral sector. In July 2020, the government introduced auctions as one way to obtain an exploration or mining license. This auction system is overseen by the State Committee on Geology and Mineral Resources (Goscomgeology) through the streamlined online trading platform, E-IJRO AUKSION.

The auctions are intended to promote development in areas with a high level of exploration and potential for production through more accessible data and competition. In 2018, only 20 percent of Uzbekistan's territory had been studied for mineral resources. In recent years, the government has invested in new geological surveys, spending roughly \$390 million from 2017 to 2021, to identify a number of new deposits including copper, tungsten, uranium, and zinc.

Two major players in Uzbekistan's mineral industry have historically been the Almalyk Mining and Metallurgical Complex (Almalyk GMK) and the state-owned Navoi Mining and Metallurgical Complex (Navoi GMK). These companies hold a monopoly on copper and uranium mining respectively in addition to involvement in the extraction of other mineral commodities. In 2020, the Uzbek government decided to split Navoi GMK into three new entities: AO Navoi GMK, a stock company to attract private investment; Navoiuran, a state-owned company responsible for developing uranium and rare earth deposits; and Fund of Navoi GMK, a state organization responsible for socio-cultural aspects of production such as residential buildings and educational facilities.

## Uzbekistan cont.



The largest foreign investors in Uzbekistan's mineral sector in 2023 were China, Russia, the Republic of Korea, Russia, Kazakhstan, and Turkey. The EU has also shown a desire to become involved. In April 2024, Uzbekistan and the EU signed a Memorandum of Understanding to create a "strategic partnership for the development of sustainable value chains in the field of critical raw materials (CRM)."

The Government of Uzbekistan has made the exploitation of its abundant rare earth element reserves a focal point of development in the mineral industry. In 2017, South Korea and Uzbekistan signed an agreement on joint activities in rare metals. In 2019 this resulted in a partnership between Almalyk GMK and the Korean Institute of Rare Metals to create Central Asia's first center for the study of rare- earth metals. In April 2024, Uzbekistan's President Shavkat Mirziyoyev added to these efforts, instructing his government to develop \$500 million worth of rare-earth development projects alongside foreign partners.

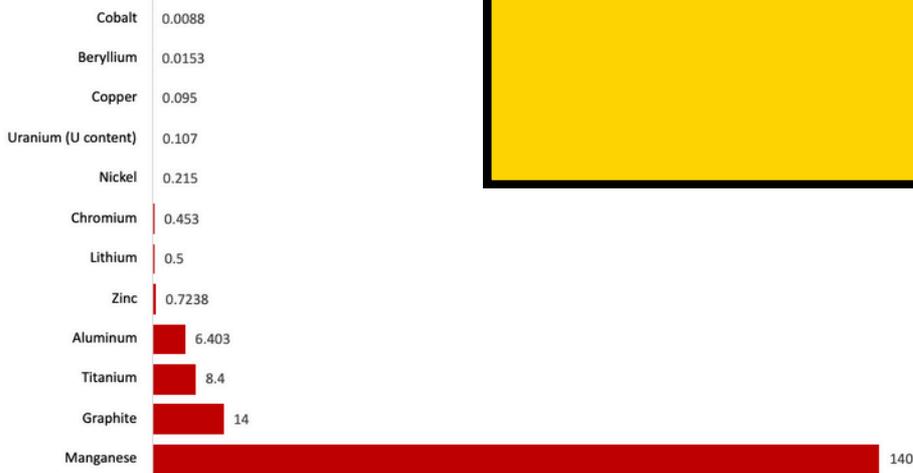
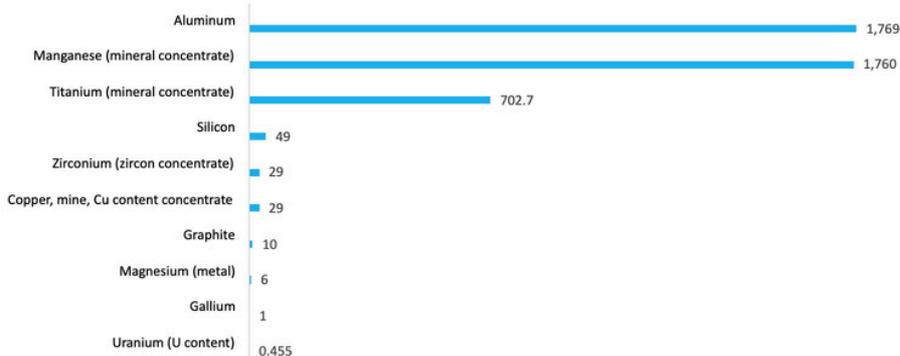
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# Ukraine



**Largest Strategic Mineral Production (2021, thousand metric tons)**



**Largest Strategic Mineral Reserves (most current estimate, thousand metric tons)**

Also contains reserves of silicon, gallium, magnesium, and zirconium but there is insufficient data to quantify

## Ukraine cont.



Ukraine's mineral sector, once robust, has struggled to meet external demand following Russia's invasion beginning in February of 2022. Transporting minerals outside of Ukraine has been a particular hindrance to the industry.

Ukraine has notable reserves of titanium, manganese, lithium, graphite, beryllium, gallium, uranium, zirconium, and more minerals. It has the largest reserves of titanium in Europe, with about seven percent of global supply. The country likewise contains expansive reserves of graphite, accounting for 20% of global resources according to the World Economic Forum. Lithium in Ukraine is not mined, though it accounts for three percent of global supply.

Before Russia's invasion, Ukraine was targeting over 3,000 mineral deposits for extraction, making up about 15% of the nation's total reserves. Ukraine was at that time supplying much of Europe with titanium, lithium, gallium, and other critical minerals. Disruptions stemming from the war have both increased costs and slowed the speed of Ukraine's exports. From 2021 to 2022 metallurgy ore exports dropped by 60%. That figure grew to an estimated 80% reduction by 2023.

Several noteworthy mineral deposits are located in Russian-occupied territories of Ukraine, including a significant lithium deposit in Zaporizhzhia and three rare earth deposits. The mines in these regions were seized by Russian forces and now ship minerals back to Russia. More deposits, including a lithium deposit in Donetsk, are close to the front lines and have ceased extraction. Moreover, Russia continues to shell roadways and attack Ukrainian shipping making the transport of any raw materials to external markets difficult. A key political objective of Moscow has long been to destroy Ukraine's economic potential and these attacks on Ukraine's strategic mineral industry may well be a prime example.

The immense potential of Ukraine's mineral industry attracted the attention of the European Union, prior to Russia's invasion. In July of 2021, Ukraine and the European Union entered a formal strategic partnership to ensure that raw materials, including some strategic minerals, were extracted and traded more efficiently. After the war began, Ukraine made additional international efforts to keep its mineral industry afloat, with representation at a European raw materials forum. The future of Ukraine's mineral industry going forward, including allied efforts to aid this strategic economic sector, remains in limbo as the war drags on.

## Ukraine cont.



A number of companies have been at the center of Ukraine's mineral industry. Onur Group, a Turkish company, invested \$50 million in a graphite mine in Ukraine. Volt Resources, an Australian company, owns the rights to another deposit until the year 2035. Velta LLC, with involvement from Ukraine and the United States, operates the biggest titanium processing facility in Ukraine. While most major mineral industry companies are privately owned, some state-owned enterprises exist.

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## Executive Order on Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries

“I, DONALD J. TRUMP, President of the United States of America, find that a strong America cannot be dependent on imports from foreign adversaries for the critical minerals that are increasingly necessary to maintain our economic and military strength in the 21st century...

“Our country needs critical minerals to make airplanes, computers, cell phones, electricity generation and transmission systems, and advanced electronics. Though these minerals are indispensable to our country, we presently lack the capacity to produce them in processed form in the quantities we need. American producers depend on foreign countries to supply and process them. For 31 of the 35 critical minerals, the United States imports more than half of its annual consumption. The United States has no domestic production for 14 of the critical minerals and is completely dependent on imports to supply its demand...

“The United States now imports 80 percent of its rare earth elements directly from China, with portions of the remainder indirectly sourced from China through other countries...

“I therefore determine that our Nation’s undue reliance on critical minerals, in processed or unprocessed form, from foreign adversaries constitutes an unusual and extraordinary threat, which has its source in substantial part outside the United States, to the national security, foreign policy, and economy of the United States. I hereby declare a national emergency to deal with that threat...”

DONALD J. TRUMP  
THE WHITE HOUSE,  
September 30, 2020.

# ABOUT US

The Caspian Policy Center (CPC) is an independent, nonprofit research think tank based in Washington D.C. Economic, political, energy, and security issues of the Caspian region constitute the central research focus of the Center.

CPC aims at becoming a premier research and debate platform in the Caspian region with relevant publications, events, projects, and media productions to nurture a comprehensive understanding of the intertwined affairs of the Caspian region. With an inclusive, scholarly, and innovative approach, the Caspian Policy Center presents a platform where diverse voices from academia, business, and policy world from both the region and the nation's capital interact to produce distinct ideas and insights to the outstanding issues of the Caspian region.



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