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Critical Minerals Geopolitics and Security

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Critical for Military Applications

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- Platforms
  - Virginia-class attack subs
  - B-52H, B-1B
  - FMTVs, JLTVs
- Munitions
  - Mk 48 torpedoes
  - JASSM-ER, LRASM
  - Long-range fires, including hypersonic glide vehicles
- Example: Pressure hulls of Virginia-class attack subs are HY-100 steel, which contains iron, nickel, chromium, molybdenum, carbon, and other elements.

Critical for Military Power

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- Primary thesis: A state's access to secure mineral supplies thus significantly influences—and can serve as a proxy for—its military capabilities.

- Secondary thesis: When a state's mineral power and resulting military might reach significant levels, it can attain great-power status in the international system, exerting substantial influence on security-related matters.

Historical Grounding

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- 1916: US Secretary of the Interior Franklin K. Lane prioritized minerals as the foremost “foundations of power.”
- 1917: US Geological Survey Director George Otis Smith affirmed “that mineral wealth is the foundation of power.”
- 1939: Geologist C. K. Leith highlighted, “Military power used to be measured principally by man power, but is coming more and more to be measured in terms of guns, ships, automobiles, and airplanes, and the fuel to drive them. These mean minerals.”
- Consensus: **Mineral supplies influences military power.**

Sources of Mineral Power*

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1. Domestic mineral production
2. Government mineral stockpiles
3. Overseas mineral production by domestic companies
4. Aligned imports, which are imports from states aligned geopolitically or commercially with the importing state

*In the computation of mineral power, domestic production and government stockpiles receive greater weighting because the sources are more secure, especially in times of conflict.

Case Study 1: US in early 20th century

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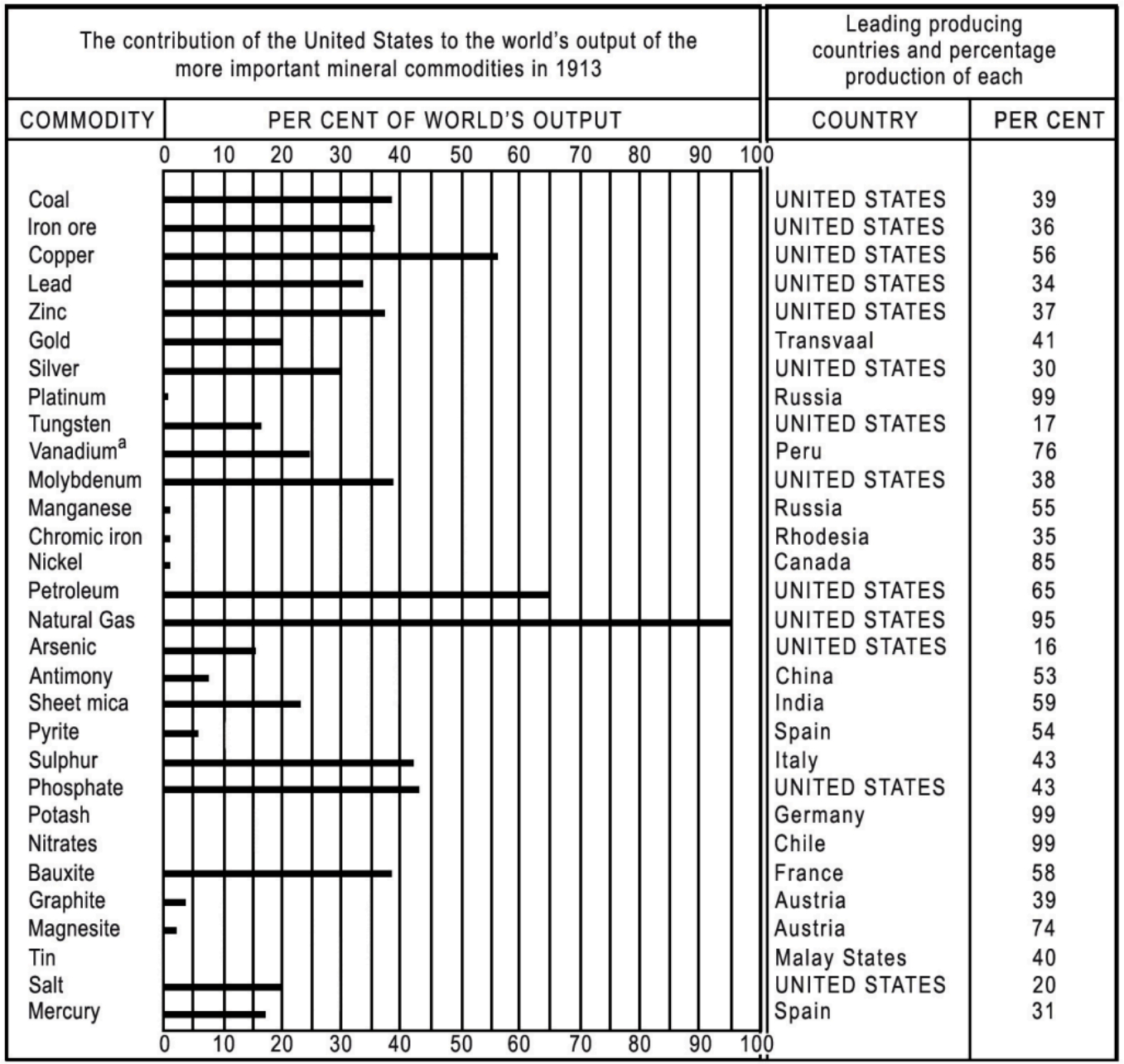
- 1898: US emerged as a great power
- 1899: US produced the greatest amount of iron ore by a single state to that point in history.
- 1900: US represented nearly 30% of global mining production
- 1913: United States led in the production of 13/30 key minerals, and ranked second in the production of an additional 4 minerals
- 1917: US was “the world’s greatest producer of mineral wealth”

Case Study 1: US Mineral Power in the Early Twentieth Century



[a]The figures are for 1912, as the mines of Peru were temporarily closed in 1913

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US mineral production as a percentage of global mineral production for various minerals in 1913

Case Study 1: US in early 20th century

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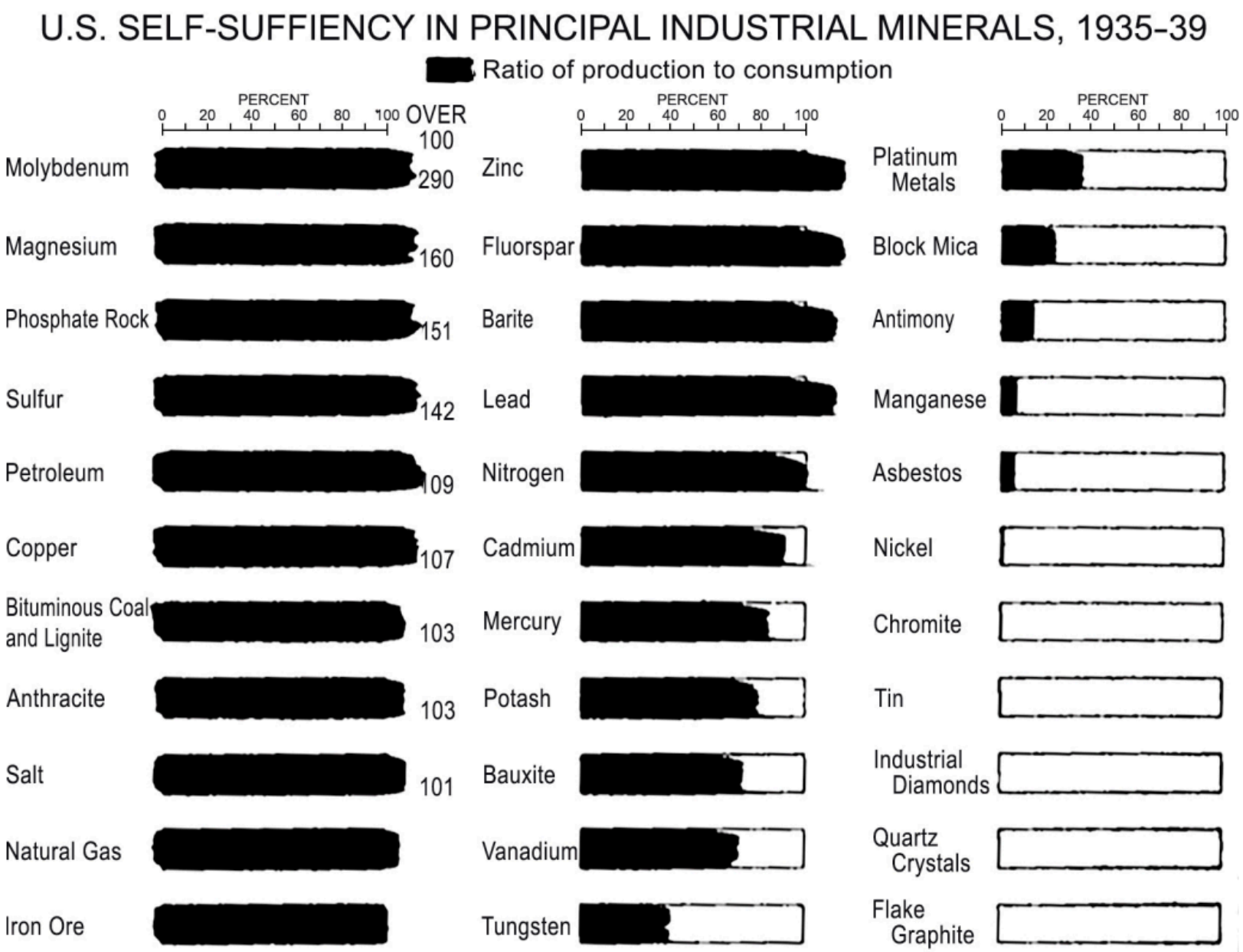
- Late 1920s: Four largest US copper firms—owning assets across the Western hemisphere—alone commanded over 50% of the world's copper production.
  - Dominant control over other elements, like nickel production in Canada and vanadium production in Peru
- 1938: US and British Empire collectively controlled 75% of global mineral supplies.
  - British sphere of influence like Malaya and Rhodesia were key mineral producers
- US policies: tariffs and financial assistance
  - 1899–1939: “The principal effect of fiscal policy upon mineral extraction is through the tariff.”



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- **US mineral self-sufficiency—that is, domestic mineral production as a percentage of domestic mineral consumption—for various minerals from 1935 to 1939**

Case Study 2: China in early 21st century

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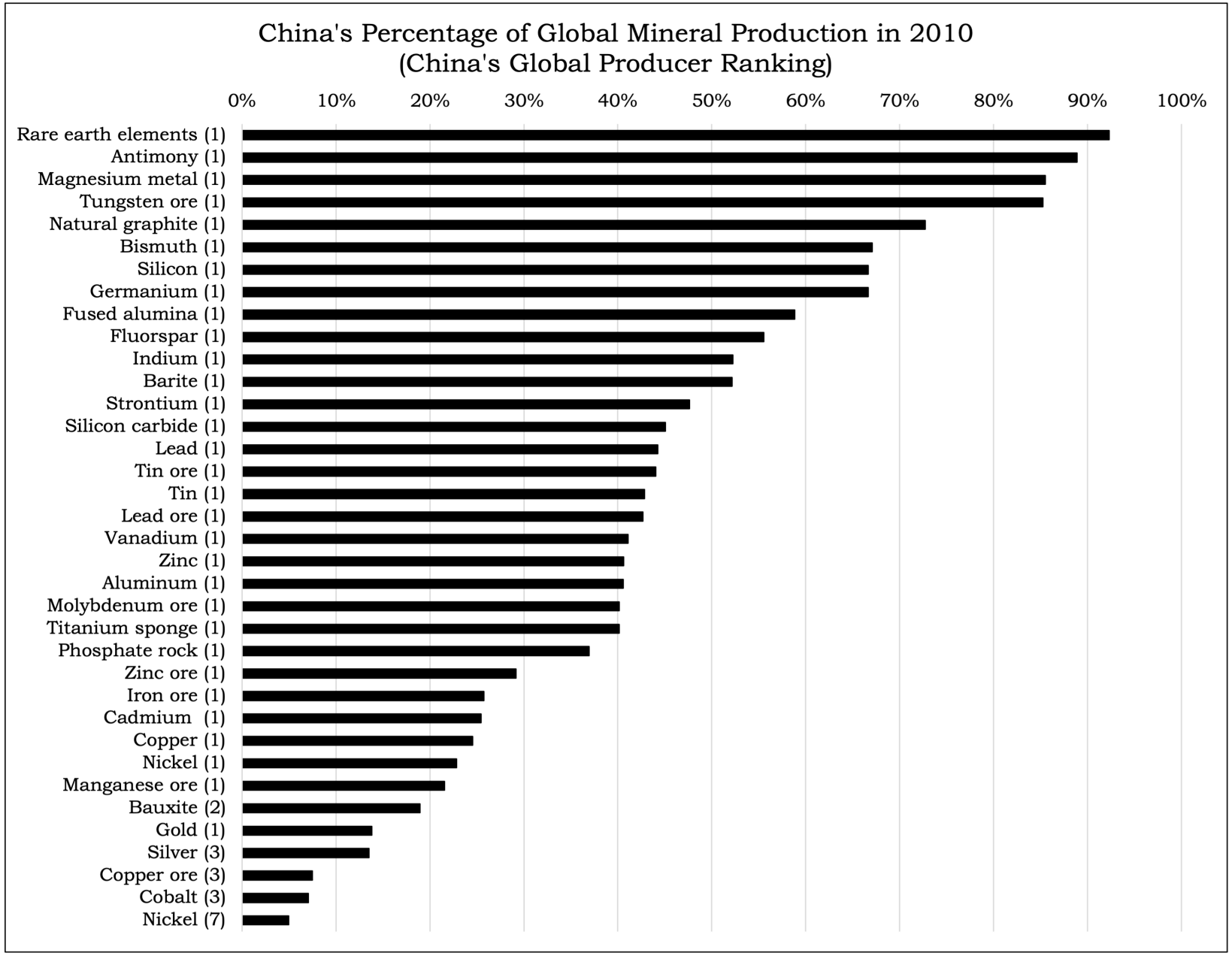
- USGS: Most notable change in global mineral production 1990–2018 was China
- 2022: Top producer of 30/50 minerals on US Critical Mineral List
- World's largest mineral stockpile—and is increasing
  - 2 million metric tons of copper; US stockpiles 0
- Significant overseas control of minerals
  - DRC: 40–50% of cobalt production
  - Indonesia: 84% of nickel output suitable for batteries
- Aligned imports
  - Myanmar: 40% of its heavy REEs



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- China's policies: subsidies for domestic production and backing for overseas investment
  - State-owned dev banks: China Dev Bank, Exim Bank
  - Stat-owned ommercial banks: ICBC, Bank of China

Results

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- The US was a rising great power and had great mineral power in the early 20th century
- China is a rising great power and has great mineral power in the early 21st century
- Both nations required access to ample secure mineral supplies to sustain their heightened defense production and sizable military forces.
- **A state's mineral power helps enable its military power.**

Figure 2.—2023 U.S. Net Import Reliance[1]

Commodity	Net import reliance as a percentage of apparent consumption in 2023	Leading import sources (2019–22)[2]
ARSENIC, all forms	100	China,[3] Morocco, Malaysia, Belgium
ASBESTOS	100	Brazil, Russia
CESIUM	100	Germany
FLUORSPAR	100	Mexico, Vietnam, China, South Africa
GALLIUM	100	Japan, China, Germany, Canada
GRAPHITE (NATURAL)	100	China,[3] Mexico, Canada, Madagascar
INDIUM	100	Republic of Korea, Canada, Belgium
MANGANESE	100	Gabon, South Africa, Australia, Georgia
MICA (NATURAL), sheet	100	China, Brazil, India, Belgium
NIOBIUM (COLUMBIUM)	100	Brazil, Canada
RUBIDIUM	100	China, Germany, Russia
SCANDIUM	100	Japan, China, Germany, Philippines
STRONTIUM	100	Mexico, Germany, China
TANTALUM	100	China,[3] Germany, Australia, Indonesia
YTTRIUM	100	China,[3] Germany, France, Republic of Korea
GEMSTONES	99	India, Israel, Belgium, South Africa
ABRASIVES, fused aluminum oxide	>95	China,[3] Canada, Brazil, Austria
NEPHELINE SYENITE	>95	Canada
RARE EARTHS,[4] compounds and metals	>95	China,[3] Malaysia, Japan, Estonia
TITANIUM, sponge metal	>95	Japan, Kazakhstan, Saudi Arabia, Ukraine
BISMUTH	94	China,[3] Republic of Korea, Belgium, Mexico
POTASH	91	Canada, Russia, Belarus
STONE (DIMENSION)	87	Brazil, China,[3] Italy, Turkey
DIAMOND (INDUSTRIAL), stones	84	India, South Africa, Russia, Congo (Kinshasa)
PLATINUM	83	South Africa, Switzerland, Germany, Belgium
ANTIMONY, metal and oxide	82	China,[3] Belgium, India, Bolivia
ZINC, refined	77	Canada, Mexico, Peru, Republic of Korea
BARITE	>75	India, China,[3] Morocco, Mexico
BAUXITE	>75	Jamaica, Turkey, Guyana, Australia
IRON OXIDE PIGMENTS, natural and synthetic	75	China,[3] Germany, Brazil, Canada
TITANIUM MINERAL CONCENTRATES	75	South Africa, Madagascar, Australia, Canada
CHROMIUM, all forms	74	South Africa, Kazakhstan, Russia, Canada
PEAT	74	Canada
TIN, refined	74	Peru, Bolivia, Indonesia, Malaysia
ABRASIVES, silicon carbide	73	China,[3] Brazil, Canada, Netherlands
SILVER	69	Mexico, Canada, Poland, Switzerland
COBALT	67	Norway, Canada, Finland, Japan
GARNET (INDUSTRIAL)	67	South Africa, Australia, China,[3] India
RHENIUM	60	Chile, Canada, Germany, Kazakhstan
ALUMINA	59	Brazil, Australia, Jamaica, Canada
VANADIUM	58	Canada, Brazil, Austria, Russia
NICKEL	57	Canada, Norway, Finland, Russia
DIAMOND (INDUSTRIAL), bort, grit, and dust and powder	56	China,[3] Republic of Korea, Ireland, Russia
MAGNESIUM COMPOUNDS	52	China,[3] Israel, Canada, Brazil
GERMANIUM	>50	Belgium, China, Canada
IODINE	>50	Chile, Japan
MAGNESIUM METAL	>50	Canada, China,[3] Israel, Taiwan
SELENIUM	>50	Philippines, Mexico, Germany, Canada
TUNGSTEN	>50	China,[3] Germany, Bolivia, Vietnam
SILICON, metal and ferrosilicon	<50	Brazil, Russia, Canada, Norway
COPPER, refined	46	Chile, Canada, Mexico
ALUMINUM	44	Canada, United Arab Emirates, Bahrain, Russia
PALLADIUM	37	Russia, South Africa, Italy, Canada
LEAD, refined	35	Canada, Mexico, Republic of Korea, Australia
MICA (NATURAL), scrap and flake	28	China, Canada, India, Finland
PERLITE	26	Greece, China, Mexico
LITHIUM	>25	Argentina, Chile, China, Russia
TELLURIUM	>25	Canada, Germany, Philippines, Japan
SALT	25	Canada, Chile, Mexico, Egypt
BROMINE	<25	Israel, Jordan, China[3]
ZIRCONIUM, ores and concentrates	<25	South Africa, Australia, Senegal, Russia
CEMENT	22	Turkey, Canada, Greece, Mexico
VERMICULITE	20	South Africa, Brazil, Zimbabwe

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US Mineral Power Today

- Low domestic production
- NDS at record lows: As of March 2023, the value of stockpile inventories was 1.2% of the stockpile's 1962 value
- Reliant on imports from China

Policy Options

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- Fund domestic **exploration**, mining, processing, and recycling
- Procurement of domestically produced minerals
  - During the Korean War, the USG guaranteed the purchase of tungsten for its stockpile at a predetermined price from domestic producers for 5 yrs
- Tariffs to protect domestic mining industry from cheap mineral imports
  - E. W. Pehrson toward the end of World War II, “[A] large measure of [mineral] self-sufficiency has been maintained for many years with moderate tariff protection.”

Policy Options

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- Bolster its mineral stockpiles, focusing on minerals heavily utilized by the military, like copper and aluminum
  - In the 1960s, the US government stockpiled nearly 920,000 short tons of aluminum and over one million short tons of copper. Today, none.
- Provide capital to US companies to acquire ownership stakes in foreign mineral production
  - DFC has invested $105 million in TechMet, a Dublin-based private investment vehicle, to support a nickel-cobalt mine in Brazil and a rare earths project in South Africa.
- Finance offtake agreements between US companies and overseas mineral producers in friendly countries, like Australia

Conclusion

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- In previous major US wars—WWI, WWII, and the Korean War—the US was the superior mineral power.
- Today, the US confronts a superior mineral power in China
- If war occurs, America's relative mineral weakness could prove damaging or decisive, especially if mineral shortages occurs—as happened to some degree in all major US wars.
- **April 1938: C.K. Leith noted how the Central Powers' mineral shortages in World War I contributed to their defeat: "[T]he acute shortage of essential minerals which they experienced was a very considerable factor in their ultimate defeat."**