Choke Points: Critical Minerals and Irregular Warfare in the Gray Zone

Description

Introduction

In the situation rooms of Washington and the chancelleries of Europe, the future of warfare is often visualized as a contest of high-velocity hardware: the silent glide of a hypersonic vehicle, the swarm logic of autonomous drones, or the cryptographic shield of quantum computing. Yet, this fixation on the end-product of kinetic warfare obscures a primitive, decisive vulnerability in the gray zone. We are obsessing over the tip of the spear while our adversaries have quietly seized control of the shaft.

For the last decade, the West has slowly awakened to the reality of resource insecurity. We read breathless headlines about the â??scramble for Africaâ?• and the rush to stake claims on lithium deposits in the Nevada desert. But this awakening has birthed a dangerous strategic errorâ??what I term â??The Mining Fallacy.â?•

This is the mistaken belief that â??resource securityâ?• is synonymous with â??access to mines.â?• It posits that if we simply dig more holes in the ground, we secure our supply chains. This is a fatal oversimplification. As the U.S. Geological Survey (2024) confirms, the United States and its allies possess sufficient geological reserves of rare earth elements, cobalt and copper.

The true center of gravity in modern economic warfare is not the mine. Itâ??s the refinery. While the West has focused on the extraction of raw ore, the Peopleâ??s Republic of China (PRC) has systematically monopolized the complex, toxic and capital-intensive midstreamâ??the processing capacity required to turn dirt into defense-grade materials. By controlling between 85% and 90% of the worldâ??s processing capacity for rare earths, Beijing has constructed a â??kill switchâ?• for Western industrial and defense supply chains.

This is not a story of resource scarcity. It is a story of engineered dependency. We are witnessing a masterclass in the weaponization of interdependence, where environmental regulations, export licenses, and state subsidies are used not as tools of governance, but as instruments of gray zone warfare.

The Alchemy of Influence: How Processing is the Real Prize

To understand the leverage, one must understand the metallurgy. The term â??Rare Earth Elementsâ?• is a misnomer. Elements like neodymiumâ??first utilized in permanent magnets by Sagawa et al. (1984)â??are relatively abundant in the earthâ??s crust. However, they are geologically â??promiscuous.â?• They rarely appear in concentrated veins. Rather, they are found mixed together in complex mineralogical cocktails, often bonded with radioactive elements like thorium and uranium. And theyâ??re a great challenge to isolate in pure form.

Extracting the ore is the easy partâ??it is merely earthmoving. The strategic bottleneck is the separation. Turning raw bastnÃ¤site ore into the high-purity metal alloys required for an F-35 Lightning II or a Virginia-class fast-attack submarine is a feat of chemical engineering. As detailed by Xie et al. (2014), this requires hundreds of sequential solvent extraction stages to separate elements with nearly identical electron shells. It is difficult, expensive and, historically, exceptionally dirty.

In the 1980s and 1990s, the United States was the worldâ??s leading producer of these elements. But as environmental regulations tightened, the West offshored the dirty work. Hurst (2010) warned over a decade ago that China was using state subsidies and â??environmental arbitrageâ?• to capture this industry, but the warning was ignored.

The result is a vertical monopoly. The Department of Energy (2022) estimates China controls 87% of global magnet production. Even if a mine opens in the U.S. or Australia, the raw concentrate must often be shipped to China for processing before it can be used. We have built a supply chain where the raw ingredients of our national defense must take a round-trip ticket through the territory of our primary strategic competitor. And adversary.

The Administrative Embargo: Lawfare by Other Means

If midstream dominance provides the capability for coercion, â??lawfareâ?• provides the delivery mechanism. The modern tool of economic warfare is no longer the clumsy naval blockade. It is the precise, bureaucratically defensible export control.

For years, the PRC utilized predatory pricing to destroy Western competition. The collapse of Molycorp in 2015 remains the definitive case study of how market manipulation can decapitate Western capacity. However, Beijing has since shifted to a more sophisticated form of legal warfare: the weaponization of national security.

The warning shot was fired in 2010. Following a collision between a Chinese fishing trawler and the Japanese Coast Guard, China unofficially halted rare earth exports to Japan. Prices skyrocketed. But Chinaâ??s 2023 restrictions on Gallium and Germanium (to any country) represent the evolution of this

tactic.

In July 2023, Chinaâ??s Ministry of Commerce imposed licensing requirements on these metals, essential for radar and semiconductors. This was not a ban that would have triggered an outcry, but an administrative choke point. The impact was devastating. As documented by the U.S. International Trade Commission, gallium exports from China crashed from 6,876 kg in July 2023 to just 227 kg by October. Beijing proved it could legally choke off the inputs for Americaâ??s defense industrial base while claiming adherence to international norms.

The Hollow Forge: Decapitating the Defense Industrial Base

The implications for the Pentagon are severe. Consider the operational reality of a conflict in the Indo-Pacific. Precision-guided munitions rely on rare earth magnets. A Commerce Department investigation (2023) found that reliance on imported sintered magnets constitutes a national security threat. If Beijing were to initiate a blockade of Taiwan, they would almost certainly stop approving export licenses for these materials.

This fragility extends beyond magnets to the very skeleton of the war machine: magnesium. This metal is essential for aircraft-grade aluminum alloys, missile castings, and solid rocket fuel. Yet, as Matisek et al. (2025) highlight in *Barronâ??s*, the United States has zero domestic primary production following the bankruptcy of U.S. Magnesium, leaving the Pentagon dependent on China for 95% of global supply. The timeline for attrition is terrifyingly short. Pentagon sources estimate that if China cuts off magnesium exports, the U.S. would have â??six months to decide to go to war. After that, we wouldnâ??t be able to wage war at all.â?•

The result would be a rapid attrition of capacity. We might have the factories to assemble the missiles, but we would lack the processed oxides and alloys to make the components. This creates a â??deterrence gap.â?• A war over Taiwan could be decided in weeks, yet it takes 15 years to build a new processing facility. We are trying to solve a clear and present tactical emergency with a decadal infrastructure plan.

The Policy Response: Executive Action on American Mineral Production

The Trump Administrationâ??s response to this vulnerability came on March 20, 2025, with the Executive Order â??Immediate Measures to Increase American Mineral Production.â?• The order explicitly acknowledges the strategic imperative outlined above, declaring that â??our national and economic security are now acutely threatened by our reliance upon hostile foreign powersâ?? mineral production.â?•

Critically, the order addresses not just mining but the entire midstream bottleneck. The definition of â??mineral productionâ?• explicitly encompasses â??mining, processing, refining, and smelting of minerals, and the production of processed critical minerals and other derivative productsâ?• â??including permanent magnets, motors, and the defense systems that depend upon them. It further defines â??processed mineralsâ?• as those that have undergone conversion â??into a metal, metal powder, or a master alloy,â?• recognizing that the strategic value lies in the chemistry, not the ore.

The order invokes the Defense Production Act to accelerate domestic capacity, delegating Section 303 authority to the Secretary of Defense (War) for â??domestic production and facilitation of strategic resources.â?• It directs the creation of a dedicated mineral and mineral production investment fund through the U.S. International Development Finance Corporation (DFC), backed by Defense Production Act funds and the Office of Strategic Capital. Moreover, the Export-Import Bank is instructed to deploy financing tools under the Supply Chain Resiliency Initiative to â??secure United Statesâ?? offtake of global raw mineral feedstock for domestic minerals processing.â?•

Furthermore, the Executive Order mandates the identification of federal lands suitable for â??leasing or development . . . for the construction and operation of private commercial mineral production enterprises,â?• with the Secretaries of Defense, Interior, Agriculture, and Energy directed to prioritize sites where â??mineral production projects could be fully permitted and operational as soon as possible.â?•

Perhaps most significantly, the directive mandates that mineral production be designated as â??a priority industrial capability development area for the Industrial Base Analysis and Sustainment Programâ?•â??formally embedding critical mineral processing into the DIB planning architecture. This represents a doctrinal shift: the recognition that the refinery, not the mine, is the true center of gravity.

Whether these measures can close a 15-year infrastructure gap in time to deter conflict remains the central question. Executive action is necessary but not sufficient. The order provides the policy architecture; implementation will determine whether it becomes a turning point or a footnote.

From Extraction to Emancipation: A Doctrine of Industrial Deterrence

To secure the gray zone, we must implement a strategy of â??Industrial Deterrence.â?• I suggest five pillars:

The Strategic Processing Reserve: The Department of War must stockpile intermediate and finished products, not raw ore. Ore is useless in a crisis without refineries. We need stockpiles of separated oxides and magnet blocks that can be injected directly into the DIB.

Contracts for Difference: To counter Chinese predatory pricing, the U.S. government must utilize Contracts for Difference. This guarantees a â??strike priceâ?• for domestic producers. If the global market price falls below this level due to foreign manipulation, the government pays the difference. This mechanism de-risks the massive capital investment required for refineries.

The National Critical Mineral Consortium: Government action alone is insufficient. The private sector must mobilize its own industrial base. We need a consortium of the largest end-users of rare earthsâ??defense primes like Lockheed Martin, Anduril and RTX, alongside tech giants like Apple and Teslaâ??to jointly fund and operate a domestic chemical processing hub running twenty-four hours a day, seven days a week.

Modeled after the Sematech initiative that saved the U.S. semiconductor industry in the 1980s, this consortium would pool capital to build the massive, high-risk separation facilities that no single company can justify alone. This infrastructure would function as more than a commercial supply chain. It would become a national treasureâ??a sovereign, hardened asset ensuring that the chemistry of American power is made in America and remains on American soil.

Innovation and Urban Mining: We cannot just dig our way out. We must innovate. Research by Tang et al. (2022) into manganese-bismuth magnets offers a rare-earth-free alternative. Simultaneously, we must exploit â??Urban Mining.â?• The United Nations Global E-Waste Monitor reports that 62 million metric tons of e-waste are generated annually, containing billions in recoverable metals. As Akcil et al. (2021) and Yang et al. (2017) note, hydrometallurgical recycling could meet a significant portion of future demand if we scale the technology.

Closing the â??Carbon Loophole:â?• Finally, we must turn the adversaryâ??s lack of environmental standards into a liability. Implementing a Carbon Border Adjustment Mechanism specifically for critical minerals would tax the â??dirtyâ?• processing of adversaries. As Gergoric et al. (2017) demonstrated, cleaner solvent extraction is possible but expensive. A Carbon Border Adjustment Mechanism levels the playing field, forcing the market to price in the externalities the PRC has ignored. We must weaponize environmental compliance by transforming our adversaryâ??s disregard for ecological standards from a competitive advantage into a balance-sheet liability.

Conclusion

The era of resource innocence is over. As the liberal rules-based order fractures into a reality of intense state competition, the West must abandon the delusion that markets are neutral and geology is destiny. Neither is true. We have spent trillions perfecting the tip of the spearâ??the optics, the stealth, the ballisticsâ??while allowing our adversary to seize the shaft, the forge, and the very chemistry that

makes modern power possible.

The Mining Fallacy is not merely an intellectual error; it is a strategic suicide pact. Digging mines without building refineries is simply acting as a resource colony for the Peopleâ??s Republic of China. To secure the 21st century, we must stop admiring the ore and start mastering the oxide. The choice is binary and existential: we either domesticate the dirty, complex, and vital midstream, or we accept that our sovereignty exists only at the pleasure of Beijing. The forge is open. It is time to step inside.

Dino Garner is a former Research Biophysicist, U.S. Army Airborne Ranger (1st Ranger Battalion), Overseas Security Operator, and Defense Researcher/Analyst, specializing in critical infrastructure vulnerabilities and gray zone competition. Some of his articles and position papers can be found on LinkedIn. He is the author of the Pulitzer Prize-nominated books, Silent Scars, Bold Remedies: Cutting-Edge Care and Healing from Post-Traumatic Stress Injuries and AEROMASTERS: Celebrating a Century of the American Fighter Pilot, Vol. I.

Image Credit: Generated by DALL-E, OpenAI (December 2025).

The views expressed are those of the author and do not reflect the official position of the Irregular Warfare Initiative, Princeton Universityâ??s Empirical Studies of Conflict Project, the Modern War Institute at West Point, or the United States Government.

If you value reading the Irregular Warfare Initiative, please consider supporting our work. And for the best gear, check out the IWI store for mugs, coasters, apparel, and other items.

Date Created
2026/01/05