

Analytical Framework: ETM Infrastructure vs. Armaments

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Overview

This document summarizes preliminary findings and outlines potential research approaches to analyzing competing uses between military and renewable energy applications for energy-transition materials (ETM). ETM supply and demand projections for the energy transition often omit military applications. Military demand is difficult to quantify due to declining transparency of defense reporting and the defense industries' own uncertainty about its supply chains. A robust analytical framework is needed to produce verifiable estimates of climate-hostile capture of ETM in a politically-charged and data-poor landscape.

Significance

Military consumption of ETM is likely much larger than disclosed or estimated and is likely to grow with increases in defense expenditures and armed conflicts. This will strain all ETM-dependent sectors of the civilian economy and undermine transition objectives. ETM circularity is vital to the energy transition but circularity cannot be achieved when ETM are destroyed in warfare.

High-level Findings And Implications

Poor Data Quality Landscape - Contrary to popular perception, secrecy is not the only, or even primary, reason for the lack of public data on military ETM use and trade. Other factors include:

1. *Normalization of ignorance*, as seen in the US Department of Defense (DOD) response to Executive Order on America's Supply Chain (February 2021), which reported that weapons manufacturers are unaware of their own supply chains.
2. *Intentional absolvemnt of responsibility* of lower-level supply chain practices through weak due diligence mechanisms to maintain plausible deniability and artificially cheap materials costs.
3. *Deliberate omission* for propagandistic reasons. For instance, claims that US weaponry is mostly supplied from China contrasts sharply with published supply chain data showing primary concentration in the US and Europe.
4. *Complicit participation* in an ETM "Kill Chain," which involves moving materials from one place to another while profiting from violence in all locations through security, defense, and weapons contracts. This is exemplified by legal compartmentalization of entities and logistics involved in sourcing materials from known conflict zones (e.g. DRC) while supplying equipment made with ETM to ongoing conflicts (e.g. Palestine).

Climate & Energy Reports and Media Coverage Omit Military Capture of ETM

- Military applications of ETM demand much higher intensities of available resources. For example, electrifying a tank with a 300-mile range would require 15x more ETM material than electrifying a school bus with a similar range.
- Military appropriations exceed public investments in renewable energy infrastructure by at least a factor of 10. For example the publicly disclosed DOD budget request for FY2025 is \$849.8 billion compared to the potential \$900 billion total of direct and indirect allocations to climate initiatives under the Inflation Reduction Act over a ten year period.
- Comparatively modest investments in the green economy would yield a much greater public good, illustrated by the unfunded requests for \$100 billion to update the entire Amtrak US Northeast Corridor train track to high-speed compatibility or \$89 billion to electrify the entire US public transportation fleet.

High Prevalence for Propaganda - The absence of verifiable data enables the spread of unchecked narratives, including:

1. *Rhetoric of National Defense* often invokes ETM scarcity and foreign dependency to increase ETM allocation to climate-hostile and military applications. The claim that increased military expenditure and ETM allocation is purely for defense is invalidated by evidence of profiting from military offensives, such as:
 - a. A GBU-39 Small Diameter Bomb (SDB) made with ETM in the U.S. was found in an airstrike that killed at least 45 Palestinians. From one defense contract alone, in which Boeing made \$2+ billion, >40,000 SDBs were made with >15,000 sold/promised to at least 15 other countries.
2. *Bait & Switch Tactics* obscure the link between militarism & extractivism. Mining operations, which are long-term and capital-intensive to initiate, often insist on the existential importance of their operation to the energy transition in order to reduce public opposition while securing military contracts that provide immediate start-up investment.
3. *Greenwashing Militarism* uses ETM supply criticality to provide cover for the continued practice of military invasions and human rights abuses to secure favorable resource and energy extraction conditions for multinational firms.

Potential Research Approaches

As an underexplored research area, there are numerous potential approaches to quantifying and contextualizing ETM capture in the military sector. Each methodology presents its own set of benefits and challenges depending on research scope, policy objectives, and intended audience.

- **Country-Specific Military Supply Chains:** integrates national ETM data through direct or indirect supply chains, but requires extensive collection of often restricted defense industry information with varying levels of transparency.
- **Mineral/Metal/Material-Focused Analysis:** highlights market dynamics of specific ETM through global supply chains, may not capture the full utilization of any single ETM as compositions of alloys vary by application.
- **Company-Centric Approach:** focuses on key manufacturing stakeholders, contractors, and their buyer/seller networks, but many firms and sub-contractors are diversified, using ETM for both military and civilian applications
- **Weapon/Equipment-Specific Analysis:** quantifies ETM volume in either low-ETM content/high usage or high-ETM content/low usage armaments, but variations in the composition of armament subtypes elude precise quantification
- **Component/Subcomponent Tracking:** provides comprehensive ETM consumption of discrete components, but compositions may differ based on application or usage area resulting in data gaps or awkward integrations.

Comments Requested

As a new research line currently under development for larger research and policy objectives, your thoughts and suggestions are highly valued. Please get in touch, particularly if you are interested in pursuing similar research questions.

