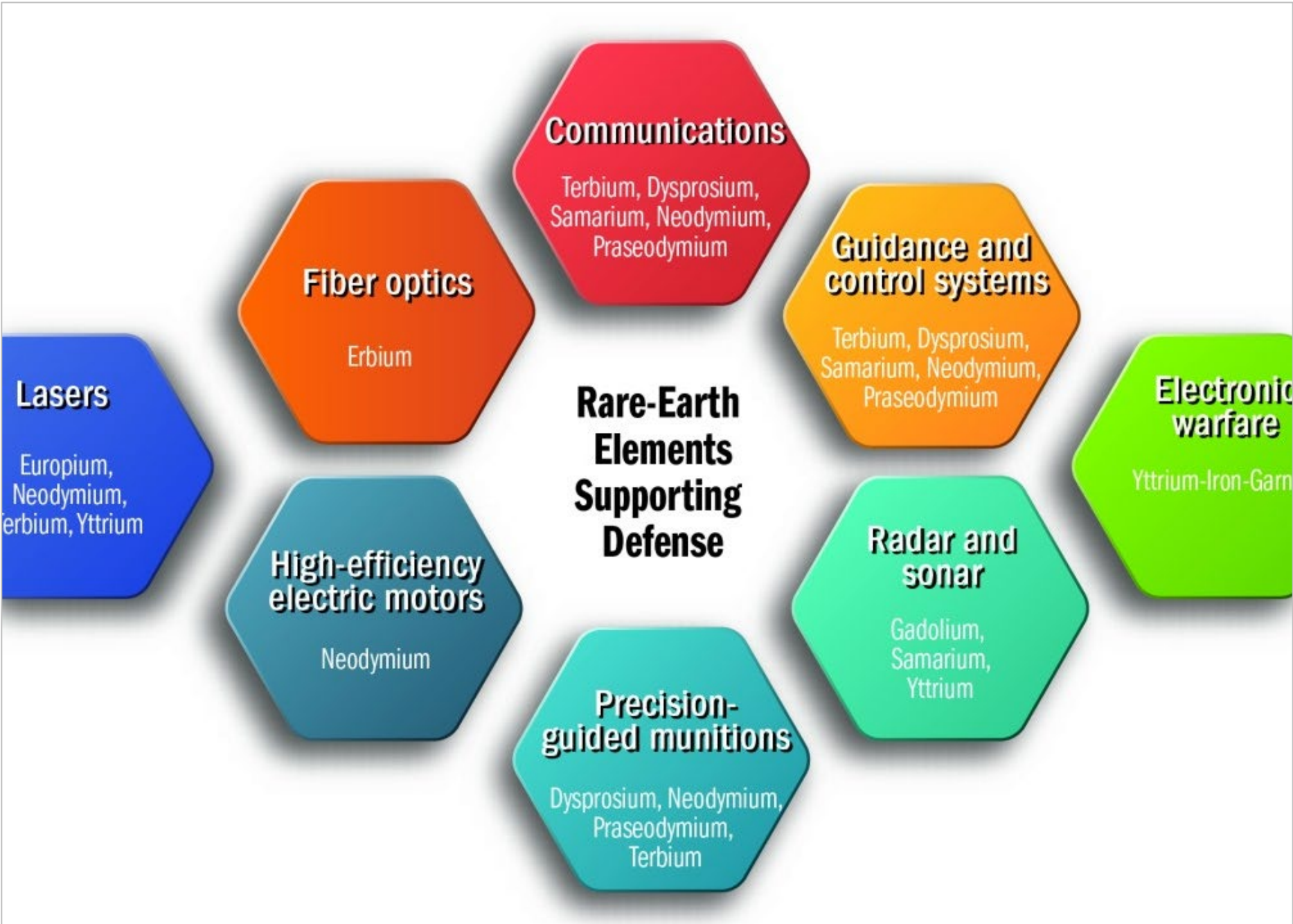


Abstract

- The purpose of the research is to investigate and analyze the cost-effectiveness of alternative sources of rare earth elements (REM) in preparation for and in the early stages of a conflict in East Asia. This paper explores the criticality of REM, their sources, and the factors that would inhibit their use during an East Asian conflict. This research is conducted by analyzing open-source scholarly, professional, and technical written research. Additionally, this topic is explored through analysis, policy, and law. This study employs cost-effectiveness analysis to explore the viability of three courses of action available to mitigate this shortage. After investigating these subjects at length, this research concludes that the current viability of supply chains that mine, transport, and process these materials would no longer be viable or reliable during conflict. This research concludes that full-scale domestic production at all stages is the most cost-effective investment for this scenario. Additionally, this paper reviews limitations and makes recommendations as well as suggests areas for future study.



Uses of REE in Defense Tech. source US Army
https://www.army.mil/article/227715/an_elemental_issue

Methods

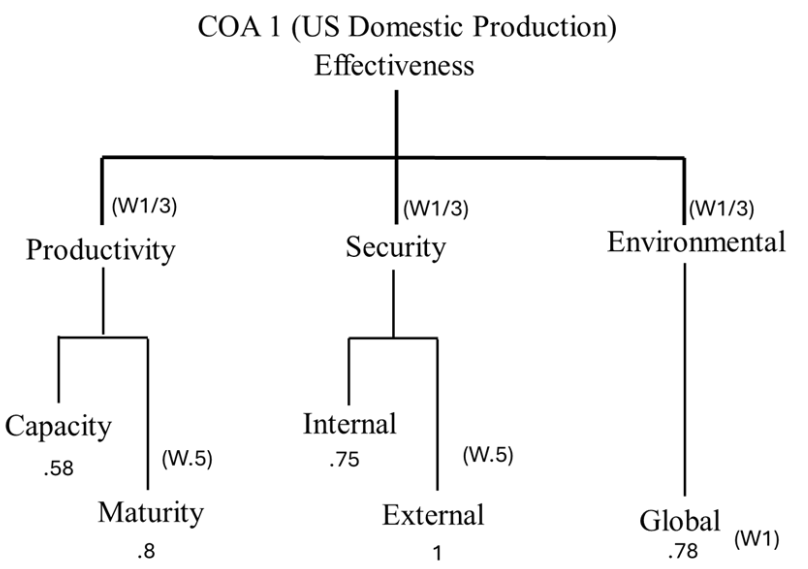
- This research is conducted as a cost-effectiveness analysis. Quantifiable performance and qualitative factors are normalized into score which can compare effectiveness.
- Measures of effectiveness include environmental impact, security, capacity, and industrial maturity.
- Measures of effectiveness are broken down into measures of performance which can be compared across courses of action.
- Effectiveness scores then feed a hierarchy that permits the cumulative performance of each course of action.
- Scores are then graphed in connection with their cost to evaluate which option is most cost-effective.

Results & Their Impact

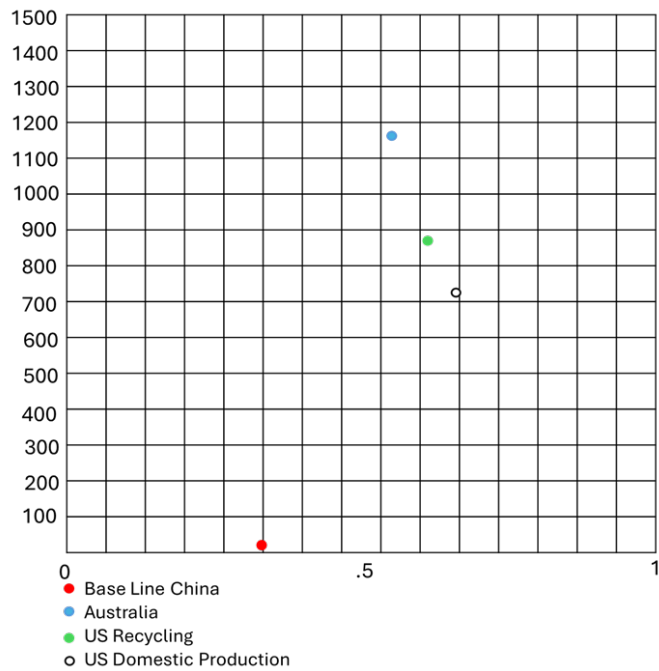
- The results of this study indicate that to replace China as the United States’ primary supplier of finished rare earth elements the US should focus investment into domestic production.
- While more than one option for acquiring rare earth minerals appears viable the security, capacity, and environmental impacts of US mining are superior to the alternatives explored in this research.
- Alternative investment strategies were explored by referencing recent historical precedence. This approach indicated that both US-based mining and recycling were cost-effective.
- This conclusion supports the possibility of US resource independence and stable access to critical defense components.

Hazard	CO2	Particulate Matter	Ecotoxicity	EPFW	EPM	AP	Rank Total	VF Score
Method								
China	98kg 4	0.4kg 3	0.5 PE 4	0.04kg 4	0.28kg 4	0.7kg 4	23	0.056
USA Mining	61kg 1	0.5kg 4	0.25 PE 1	0.02kg 2	0.02kg 1	0.2kg 1	10	0.78
AUS	72kg 2	0.3kg 2	0.3 PE 3	0.03kg 3	0.04kg 3	0.5kg 2	15	0.53
Recycling	81.34kg 3	0.2Kg 1	.295 PE 2	0.016 1	0.0252kg 2	0.56kg 3	12	0.67

Environmental Impact MOE



US-Based Mining
Performance Hierarchy



Cost-Effectiveness

