What Are "Critical Minerals" and How Are They Used?

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“Critical Minerals” is a political, rather than a scientific term.

Increasingly a topic of interest in policy and supply chain conversations

What Makes Minerals “Critical”

Various governments, industries, NGOs have their own definitions of critical minerals.

Lithium, Cobalt, Nickel, Graphite, Tin, and tantalum for example, are all used in a variety of batteries, and other technological applications that make them valuable to industries and governments.

A wide variety of rare earth minerals, metals, and other materials like silica have also been designated as critical by various governments and NGOs.

A combination of usefulness and supply constraints leads to “critical” designations

Usefulness:

-Technological applications and economic growth
-National security applications (use in weaponry, AI etc)
-Sustainability applications: reducing pollution often requires replacement technology that relies on critical minerals

Supply Constraints:

-difficulty obtaining useful inputs leads to classification as “critical”
-production in politically sensitive regions
-rarity of the materials in question
-demand outpacing supply

The Race to Obtain Critical Minerals

Critical minerals are often acquired from jurisdictional “grey areas.”

Examples: disputed territories, areas facing civil war or other conflict, marine environments that may be less regulated than land or subject to uncertain jurisdiction.

Tribal land and waterways in the United States have faced impacts from a wide variety of mining and extractive industries.

Critical Mineral Uses

Commercial and Security Applications: Batteries, computers, electronics, medicine, and military applications can all lead to “critical designations” by governments seeking to secure access to inputs for economic development, and the defense industry.

Sustainability Applications: because pollution from fossil fuel-powered transportation, electricity, and heating are major contributors to climate change, replacement with technology that reduce or eliminate greenhouse gas emissions is “critical” to fighting climate change. These technologies rely heavily on critical mineral inputs.

Political Uses?

Discussion of permitting reform (and the reduction of environmental protections) often uses the need for critical minerals as justification for reduced regulation.

U.S. and allies already have significant access to critical minerals, the more urgent constraints are actually in processing and “value added” industries needed to turn minerals into useful applications.

A constraint on adopting clean energy and reducing other forms of pollution is the availability of effectively processed minerals and material inputs.