

GREEN ENERGY MINERAL: KEY FACTS

Molybdenum

US CRITICAL MINERAL? **NO**

MAIN USES IN GREEN ENERGY TECHNOLOGY | **KEY DEVELOPMENT ISSUES IN MINING**

 Energy storage  Wind  Geothermal	 Environment  Governance  Leveraging minerals for economic growth (local/national)
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DEMAND PROJECTIONS

Molybdenum is a ferroalloy used in steel production because of its exceptionally high melting point. This makes it an important component for steels used in wind turbines and geothermal plants. In addition, a small layer of molybdenum is used as part of the emerging thin-film solar technology CIGS, thanks to its superior electrical and heat conductivity, and its ability to bond to glass. By 2050, around 33,000 tons of molybdenum are forecast to be used in renewables each year, which represents approximately 11% above 2018 production levels (Hund et al., 2020).

PRODUCTION/RESERVES



Molybdenum’s ore is called molybdenite which can occur in primary form (mainly in China) as well as in association with copper-bearing minerals (in the Americas especially). In 2020, China was the world’s largest producer with 120,000 tons, or 40% of global production. China was followed by Chile with 58,000 tons and the US with 49,000 tons. China has the world’s largest known reserves followed by Peru. The price per kilo has varied from \$14.40 in 2016 to \$27.04 in 2018, and back down to around \$20 in 2020. Molybdenum is tracked by the LME; the price was around \$20 at the time of writing.

MINING IN USAID-PRESENCE COUNTRIES

Among top producers, **Chile** (limited presence) is the second most important after China. Other major producers with USAID presence include **Peru, Mexico, Armenia, Mongolia,** and **Uzbekistan.** **Kazakhstan** is also a small producer.

MAJOR INDUSTRIAL COMPANIES | **ARTISANAL AND SMALL-SCALE MINING (ASM)**

Freeport-McMoRan is the largest producer thanks to its copper and molybdenum mines in the US and Chile. State-owned **Codelco** produces the bulk of Chile’s molybdenum, along with **Southern Copper Corporation.** **China Molybdenum Company** is China’s largest molybdenum miner. **Jinduicheng Molybdenum** operates the world’s largest molybdenum mine located in China.

None

ISSUES IN USAID-PRESENCE COUNTRIES

Because most molybdenum in USAID-presence countries is mined as a secondary product of copper mining, the same key issues highlighted for copper in South America apply, including governance for national and local economic development and environmental management.

Environmental issues, notably water contamination, have been highlighted in other smaller molybdenum producers including Mongolia's Erdenet copper-molybdenum mine (Battogtokh et al., 2014). Governance issues have also been highlighted in Armenia, mainly lack of transparency around Russia-linked politically exposed persons who are alleged beneficial owners of a privatized molybdenum mining company (Karapetyan, n.d.).

MINE DEVELOPMENT AND SUPPLY CHAIN DYNAMICS

Exploration budgets for molybdenum projects have decreased from highs in 2016 but significant spending is underway on projects in the US, Canada, and Australia. Because the majority of new projects are driven by copper, with molybdenum as a secondary product, copper supply chain dynamics are important in driving investment decisions.

There is considerable vertical integration in the molybdenum supply chain with mining companies generally also doing the smelting and manufacturing. For example, Freeport-McRohan subsidiary Climax Molybdenum is the processing and trading arm for its production from South America, even though the company began over a century ago with mining molybdenite in Colorado (Climax Molybdenum, n.d.). Similarly, the major Chinese producers mine, process, and market end products.

ORGANIZATIONS AND INDUSTRY GROUPS

The **International Molybdenum Association** (IMOA) is a trade association for the industry (International Molybdenum Association, n.d.). In China, the **China Nonferrous Metals Industry Association** (CNIA) with 726 members has a **Molybdenum Branch** (Asian Metal, n.d.).
