

GREEN ENERGY MINERAL: KEY FACTS

Manganese

US CRITICAL MINERAL? YES

MAIN USES IN GREEN ENERGY TECHNOLOGY



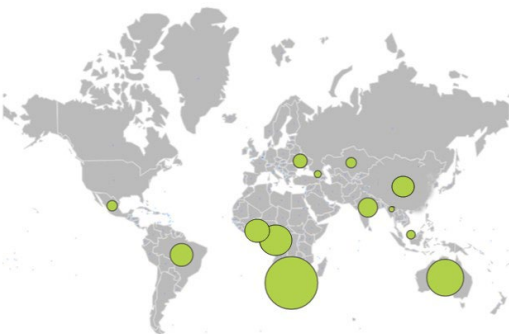
KEY DEVELOPMENT ISSUES IN MINING



DEMAND PROJECTIONS

Manganese is used in steel to decrease brittleness and increase strength, as well as serving as an alloying agent that removes oxygen and sulfur during iron ore smelting. In renewable technologies it is mainly used in batteries; by 2050, 6% of battery metals will be manganese. Manganese forms part of the cathode compound in certain types of lithium-ion batteries, namely, the nickel-manganese-cobalt oxide (NMC) design. Small amounts of manganese are also used as part of steel components of wind turbines and in geothermal plants. By 2050, annual manganese demand from renewables is projected to be 694,000 tons under a two-degree scenario, or 4% above 2018 production levels (Hund et al., 2020). This projection does not account for potential use of manganese as part of carbon capture and storage technologies.

PRODUCTION/RESERVES



Source: OECD

South Africa is the world's largest producer with 5.2 million tons in 2020, or nearly 30% of world production. In second place is **Australia** with 3.3 million tons followed by **Gabon** with 2.8 million tons. South Africa, **Brazil** and Australia have the largest known reserves. Land-based manganese resources are abundant but irregularly distributed. There are also undersea manganese deposits. In the last five years, the price per ton of manganese ore (44% grade) imported to the US from China varied from \$4.32 in 2016 to \$7.16 in 2018. Prices today are around \$4.50 per ton and are expected to remain relatively stable.

MINING IN USAID-PRESENCE COUNTRIES

South Africa and **Gabon** are in the top two producers. Other important producers include **Ghana, Brazil, India, Ukraine, Côte d'Ivoire, Burma, Mexico, Georgia, Vietnam,** and **Kazakhstan**. Smaller or emerging producers are **Bolivia** (limited presence), **Indonesia, Kenya, Namibia, Peru, Ukraine,** and **Zambia**.

MAJOR INDUSTRIAL COMPANIES

Like South Africa's chromium industry, its manganese industry has little public information. Of its estimated 22 mines, only four are owned by publicly listed companies (Creamer, 2020). The largest operator in terms of resources/reserves is **Assmang Manganese**, controlled by **Assore Limited** and **African Rainbow Resources**, both publicly listed South African holding companies. South African **Jupiter Mines** owns a 50% stake in South Africa's second largest mine, the Tshipi Borwa. France-based **Eramet** owns and operates Gabon's main mine.

ARTISANAL AND SMALL-SCALE MINING (ASM)

ASM manganese mining has been documented in West Timor, Indonesia, especially between 2009 and 2011 when an estimated 325,000 people were involved (Fisher et al., 2019). An academic study found that mining had few negative impacts when it was conducted in a way complementary to farming and other livelihoods (Fisher et al., 2019; Ling, 2018).

ISSUES IN USAID-PRESENCE COUNTRIES

Manganese mining has been the subject of less controversies compared to other minerals, but challenges with respect to governance, environmental management and community relations exist in both major and minor producers. For example, an NGO report from this year reviewed human rights issues, especially affected women, in South Africa's manganese sector (Somo, 2021). Community land tenure has been an issue in Kenya. For example, a community leased its land to a manganese company but complained it did not receive its agreed upon benefits (Muingi, 2020). Communities around Gabon's major mine, the third largest in the world, are also divided as to the extent to which they have benefitted from the mine which has been operating for decades (France24, 2021).

Governance challenges also feature in the literature. In Ghana, for example, the country's main mine is owned by a Jersey-headquartered Chinese holding company linked to a major manganese metal producer Ningxia Tianyuan Manganese Industry (The Chronicle, 2019). In 2019, the government of Ghana temporarily shut down the mine over accusations of hundreds of millions of dollars of tax evasion through transfer pricing and other maneuvers. Ghana has recently also capped annual exports in order to retain more value in country and stabilize extraction (Roskill, 2020). Dynamics around Indonesia's manganese mining have also highlighted governance challenges related to decentralization (Sahin et al., 2012).

Manganese mining has been linked to fewer environmental concerns, though at least one study from India pointed to potential water contamination (Goswami et al., 2009). Infrastructure governance challenges such as South Africa's electricity crisis is also negatively impacting its mining industry, including manganese mines. Indeed, the conversion of manganese ore to ferromanganese used in steel requires significant power (Creamer, 2020).

MINE DEVELOPMENT AND SUPPLY CHAIN DYNAMICS

South Africa's manganese producers generally process a portion of manganese ore into ferromanganese prior to export to steel manufacturers, mainly in China. Gabon exported unprocessed ore until opening a \$400-million smelter in 2015 (Mining Review Africa, 2015). Other countries like Ghana and Côte d'Ivoire export unprocessed ore.

China has been in the spotlight recently for actions to further consolidate control over the manganese supply chain (Yap, 2021). According to a Wall Street Journal article, China controls 90% of manganese products including its use in steel and batteries, illustrating how the location of midstream and downstream mineral processors is crucial to take into account. As with other minerals, Chinese manganese processors are also increasingly getting involved in sourcing, such as the Ghana project controlled by a major Chinese processor that has explicitly cited the Belt and Road Initiative as a motivation for its involvement in mining (Shanghai Nonferrous Metals Network, 2018).

ORGANIZATIONS AND INDUSTRY GROUPS

The **International Manganese Institute (IMnI)** represents over 80 industry players (The International Manganese Institute, n.d.). Manganese processors and manufacturers in China have recently created a state-backed **manganese innovation alliance**, described as a cartel, according to the aforementioned WSJ article.