

CRITICAL MINERAL MINING IN CANADA

Alaz Munzur

Critical minerals mining can help drive clean technology development, accelerate Canada's clean energy transition and industrial transformation.

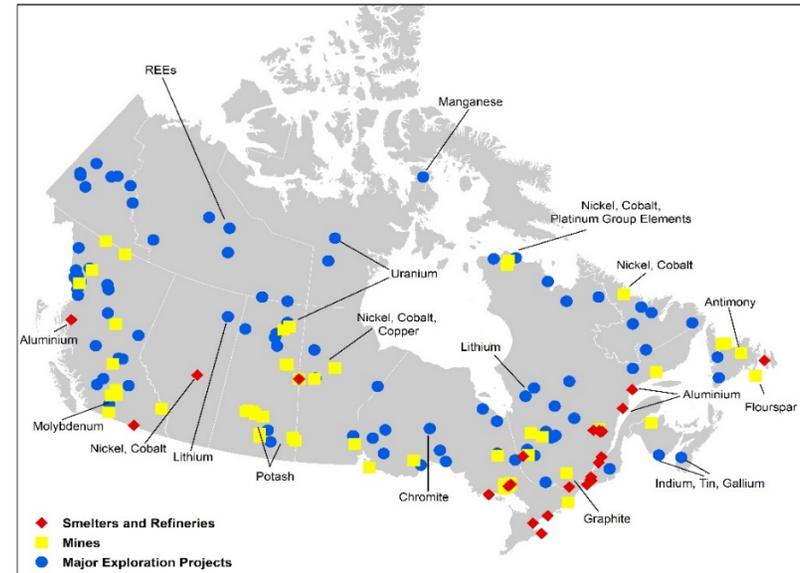
Critical minerals are commodities with few effective substitutes like nickel, uranium, copper and cobalt. Their “criticality” depends on factors like market volatility, supply risk, environmental impact and priorities regarding economic development and national security. It is an evolving term and a mineral commodity considered critical now may be less so in the future. These minerals are essential for a functioning economy since they are vital inputs in almost all industries from defence to telecommunications, manufacturing and healthcare, and in clean technologies like electric vehicle batteries and motors, solar panels and nuclear reactors. Historically, China has dominated the marketplace as the major supplier, distributor and processor of critical minerals. This over-reliance on a single supplier has placed countries importing critical minerals at a distinct disadvantage in terms of establishing secure access to a vital group of inputs. However, with the ever-rising global demand for reliable suppliers with high environmental, transparency and anti-corruption standards, Canada is well positioned to become a preferred source of critical minerals for its key trading partners.

To emphasize Canada's mineral priorities and guide the development of a pan-Canadian strategy, Natural Resources Canada, in consultation with provinces, territories and industry proponents, developed a list of 31 critical minerals for Canada (NRCan 2021a). Canada is already the world's leading producer of potash and among the global top five in several critical minerals on this list, including uranium, niobium, titanium, palladium, aluminum, platinum, nickel and graphite, and supplies 13 of the 35 minerals deemed critical by the US (Department of the Interior 2018). In 2020, Canada and the US signed the [Joint Action Plan](#) to advance collaboration on critical minerals and develop an integrated North American supply chain. Currently, Canada has number of advanced exploration projects (Figure 1).

Ensuring a reliable and secure supply chain of rare earth elements (REEs) has been a pressing issue in the past decade. REEs are a group of seventeen elements and are categorized as critical minerals. REEs can be either “light” or “heavy.” Light REEs (lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium and scandium) are produced in relative global abundance and are in surplus supply. Heavy REEs (terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium and yttrium) on the other hand, are highly valued due to very concentrated global supply. The most important use for heavy REEs is making magnets that can be found in nearly

all types of high-tech electronic device like cell phones, computers, wind turbines and electric vehicles.

Figure 1: Critical Minerals Mines, Major Exploration Projects, and Smelters and Refineries



Source: Map prepared by author using data from [NRCan \(2021b\)](#). For illustrative purposes only. Contains information licensed under Open Government Licence – Canada.

There are technical, economic and environmental challenges with further REE Development in Canada. Canada's hard rock mineral deposits are more difficult to process than the clay deposits found in China. Significant capital expenditure is necessary to develop technologies to separate, process and refine these REE deposits, and to explore and develop new deposits. Currently, research is limited on the potential environmental risks associated with the development of REE production in Canada (Yin et al. 2021). Canada with its high mining standards has the potential to be a major supplier of REEs but, as a member of the Global Battery Alliance, should also invest in opportunities to increase the recycling rate of end-of-life portable devices and reduce the environmental footprint of the REE supply chain.