

An aerial photograph of a river valley in British Columbia, showing a winding river, fields, and some buildings. A semi-transparent map of British Columbia is overlaid on the image, with the river valley area highlighted in a darker shade. The text is centered over the map.

A refined look at “critical minerals” in British Columbia

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Northern
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The purpose of this primer is to help fact-check and broaden the conversation around “critical minerals” given their link to the current climate crisis, geopolitical tensions and tariff threats. The focus is on British Columbia, although references refinery capacity and links in other parts of the country.

What are “critical minerals”?

The key characteristics of “critical minerals” are that they are:

- Considered essential to a country’s economic security, and
- Potentially face supply chain disruptions.

The “criticality” of a mineral will change over time, depending on society’s needs (demand) and supply shifts. The term was first used by the U.S. during World War I when tin, nickel, platinum, nitrates and potash were identified as being in scarce supply nationally. Since then, the U.S. has continued to list minerals as critical, strategic, or essential (although the differences between these are minimal). Many countries have recently developed “critical mineral” lists and strategies based on commitments to decarbonize and reduce

fossil fuel dependence, alongside the war in Ukraine and mounting geopolitical tensions (where other jurisdictions dominate mineral supply chains).

Not surprisingly, “criticality” varies between countries depending on mineral endowment, the relative importance of the minerals to their industrial and economic development needs, and a strategic assessment of supply risks and volatility. Many nations, including Canada, also include some minerals where we have a comparative advantage—for example, Canada is unlikely to face any supply-chain disruptions of copper, and yet has it on its priority list given our production for export.

“Critical minerals” are elements that are needed for the low-carbon transition (such as lithium for EV batteries), but also those in demand for military purposes (weapons and aerospace), telecommunications and medical devices—and for general industrial purposes and infrastructure.

Future demand will be heavily influenced by innovation (e.g. changing battery chemistry affecting demand for different metals or technology development that reduces demand); city planning and investments in public transportation; reduced consumption due to changing consumer demand and more durable or repairable products; and re-use and recycling. In other words, the expected demand for critical minerals can be changed in both content and magnitude by a number of policies and actions (not just from adding new mined material).

“In 1945...humanity still relied on only about 12 metals. If you fast forward to now, we use everything in the periodic table.”

– Christopher Pollon, author of *Pitfall: The Race to Mine the World’s Most Vulnerable Places*

vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61
niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71
tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2

What minerals do Canada and B.C. consider “critical”?

The federal government released its strategy in 2022 and now lists 34 “critical minerals” with a focus on six: lithium, graphite, nickel, cobalt, copper, and rare earth elements. British Columbia has echoed these—although of the 6 priority minerals and metals, B.C. only produces copper. B.C. has known deposits of 16 of the critical minerals—but mostly mines coal and gold, neither of which are considered a critical mineral in Canada.

The province is by far the biggest producer of copper in the country, more than twice Ontario’s production and accounting for nearly 60 percent of Canada’s production. And yet, Canada accounts for just 2.6 percent of total global copper production. There are 10 producing copper mines across B.C., including some of the largest on the continent (such as Highland Valley Copper, stretching more than 20 kms from end to end). Copper is needed

The federal government released its strategy in 2022 but didn’t define what makes a “critical mineral” until 2024... Canada now defines “critical” as a mineral that must be:

- essential to Canada’s economic security and its supply is threatened; or
- required for our national transition to a low-carbon economy; or,
- a sustainable source of highly strategic critical minerals for our partners and allies.

for electrical wires and cables, EVs, and wind turbines; however, it is not really facing any supply disruptions or constraints. Canada only has copper refineries in Quebec and Newfoundland, although the Gibraltar copper mine has an on-site plant that produces cathode copper. Most of B.C.’s copper goes to be refined in China and Japan.

Gold is NOT a critical mineral

Gold is not featured on Canada's critical minerals list but it is commonly mined in B.C. The vast majority of gold that's mined, about 92 percent, is not used for technological applications, and yet gold represents a majority of the exploration currently underway in B.C. and across Canada.

Gold is often found in conjunction with copper and other minerals, particularly in the kind of geological formations present in B.C.; in fact, in every operating B.C. gold mine, there's another metal being mined as well: copper, silver, lead, or zinc. Gold is never the primary metal by weight, although in some cases, like the Brucejack mine in northern B.C., it's the primary metal by value. Nicola Mining Inc.'s Merritt Mill is the only B.C. facility permitted to process third-party gold and silver concentrate from across the province. There are several companies that refine scrap gold (as well as silver, platinum and palladium) across the country, including Instant Gold in Vancouver.

What else does B.C. mine?

Between 20 and 30 million tonnes of metallurgical coal is mined every year in B.C., by far the most of any mineral except for sand and gravel, accounting for the greatest sales of any mined product—about \$10.6 billion in 2023. Canada is the seventh-largest coal exporter in the world.

While not considered a critical mineral in Canada, metallurgical coal is listed in some jurisdictions, including the European Union. Currently, around 70% of global steel production uses coal, resulting



in around 7% of total GHG emissions. However, technology is advancing that reduces or eliminates coal usage in steelmaking, causing some large global coal producers such as BHP to begin divesting their lower grade coal assets. Already, a specialty metallurgical coal product called PCI coal is beginning to be phased out in many steel refineries in favour of other fuels such as hydrogen.

In 2023, the province had seven open pit coal mines (four owned by Teck in the southeast which were recently sold to Glencore, and three in the northeast owned by Conuma Resources), and 11 producing metal mines (Bonanza Ledge (Au), Bruce Jack (Ag, Au), Copper Mountain (Ag, Au, Cu), Elk Gold Mine (Au, Cu), Gibraltar (Cu, Mo), Highland Valley Copper (Cu, Mo), Mt Milligan (Au, Cu), Mt Polley (Ag, Au, Cu), Myra Falls (Pb, Zn, Ag, Au, Cu), New Afton (Ag, Au, Cu), and Red Chris (Au, Cu, Ag)). By the end of that year, Myra Falls, B.C.'s only zinc producer, shut down (in part because of low zinc prices). Molybdenum is listed as a critical mineral and B.C. is Canada's only producer (mostly used in steel alloys). Silver is not on the list of Canada's critical minerals and is predominantly mined with other commodities (gold, copper and zinc). It is used in electronics and photovoltaics, however majority use of silver is for financial investment, coins and jewellery.

Nickel is not currently being mined in the province although Turnagain in the north is in advanced development and has funding from Mitsubishi. B.C. also has notable reserves of niobium, which is used in steel alloys and in superconductors, among other high-tech uses and is almost universally considered a critical mineral. There are no active niobium mines, although Taseko proposed one known as the Aley project over a decade ago. There are a number of proposed copper mines and copper mines with additional minerals (mostly molybdenum, zinc, and gold) in various stages of advanced exploration and environmental assessment and permitting in the province.

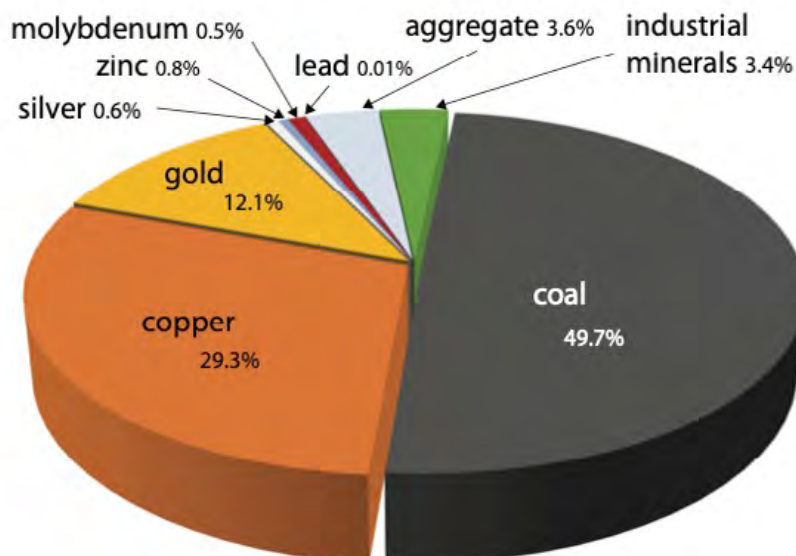
B.C. also has a number of licenced mines that are not operating, but are also not being closed and reclaimed. These mines live in a state of “care and maintenance” that is not defined in law or policy, and can go on indefinitely. Currently, some of the mines in care and maintenance include Endako, Huckleberry, Kemess and Quinsam Coal.

What about processing our mined materials?

It’s not just about where materials are mined. Refining capacity is also heavily concentrated (and it’s heavily toxic). China refines 90 percent of rare earth elements and 60–70 percent of the world’s cobalt and lithium. High-grade nickel, which is crucial for electric vehicle batteries, is predominantly sourced from regions like Russia and Indonesia (which currently refines the majority of the world’s nickel, under environmentally disastrous conditions). 70 percent of the world’s cobalt is mined in the Democratic Republic of Congo, under conditions that often disregard human rights and environmental sustainability.

Canada’s refining capacity is significant, but focused on aluminum, copper, and nickel. In Trail, British Columbia, Teck’s smelter processes mostly

2021 forecast value of British Columbia mineral production by commodity; total is \$12.6 billion



lead and zinc. Indium, germanium, and bismuth are also refined at the Trail smelter, but not yet mined here. Rio Tinto's Kitimat smelter imports bauxite ore from Australia, China, Brazil and Guinea to produce aluminum that is primarily shipped to Japan, South Korea and the U.S. The biggest producers of aluminum in Canada are Rio Tinto PLC, Pittsburgh-based Alcoa Corp. and privately held Quebec-based Aluminerie Alouette. Canada supplies more than half of the U.S.'s aluminum needs, mostly from Quebec producers.

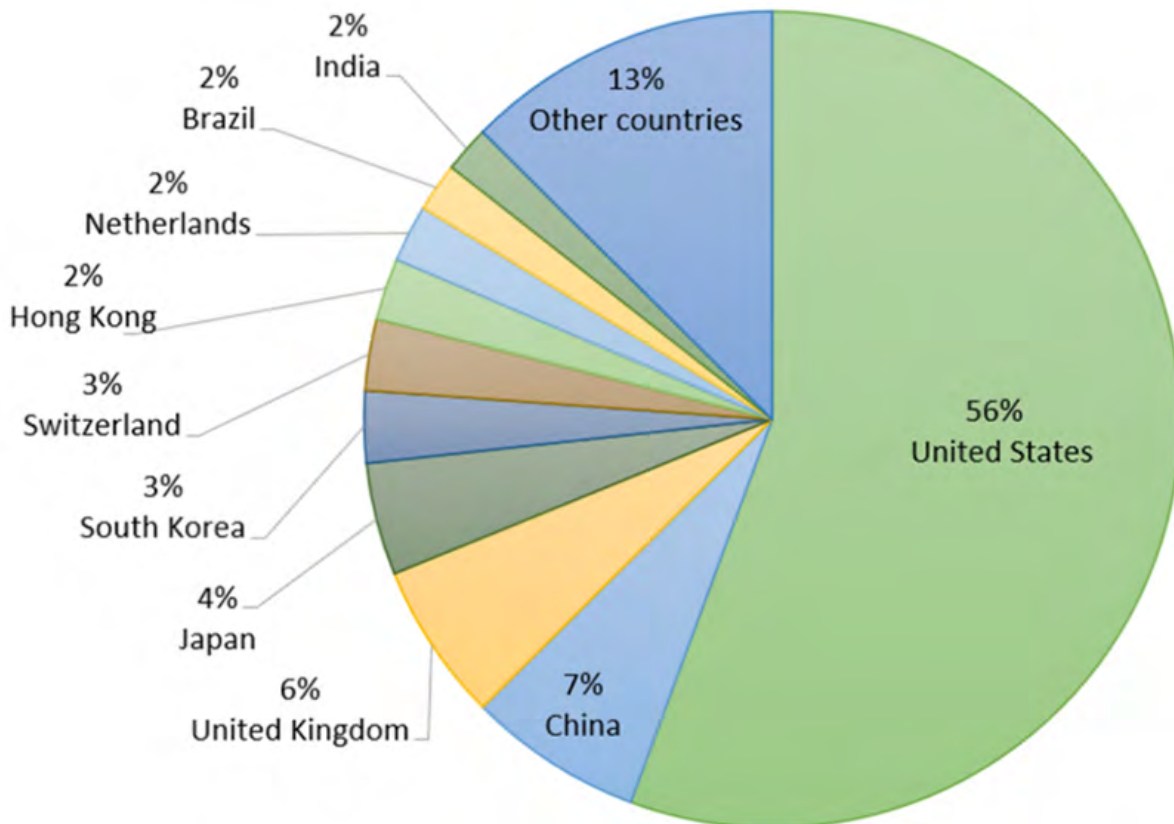
British Columbia's Metalex has a secondary lead smelter in Richmond where it collects and recycles lead from batteries.

Glencore operates the Horne Smelter, located in Rouyn-Noranda, and the CCR Refinery in Montréal-Est. While mostly processing copper, the facility also processes gold, silver, platinum

and palladium. They also operate the second largest zinc refinery in North America (taking over Canadian Electrolytic Zinc—CEZinc Refinery in Salaberry-de-Valleyfield, Quebec), and Glencore smelts lead in Lachine, Quebec. Copper is one of the few materials that retains its chemical and physical properties through repeated recycling, making it an ideal candidate for resource conservation and waste reduction. A substantial portion of copper recycling occurs at the Horne smelter and at refining facilities in Montréal.

Brazil-based Vale operates the Copper Cliff smelter and refinery in Sudbury, Ontario that predominantly processes nickel, as well as copper, cobalt, gold and silver. Vale also operates the Long Harbour Processing Plant in Newfoundland & Labrador, turning nickel concentrate into finished nickel and associated copper and cobalt products.

Canada's mineral exports by country, 2023



Sources: Natural Resources Canada, Statistics Canada

Glencore and Vale’s refineries largely export to the U.S. (which is true writ large – the U.S remains Canada’s top destination for critical minerals exports).

By contrast most B.C. coal is exported via coal ports near Vancouver and out of Prince Rupert, largely to steelmaking facilities in China, Japan, or South Korea. The rest is sent by rail to steel mills in eastern Canada. Some of the major steelmakers in Canada are Sault Ste. Marie, Ont.-based Algoma Steel; U.S. company Cleveland-Cliffs Inc., owner of Stelco; and Luxembourg-based ArcelorMittal, owner of Dofasco.

Can we trace the end use of B.C.’s mined materials?


Not really. If a mine in B.C. says that they are mining nickel to help build EV batteries, there is no way to trace and ensure that is the end use. It can be easier from refineries; for example, Vale signed a long-term contract with Tesla Inc. to supply 30–40% of its nickel from its Ontario and Newfoundland & Labrador operations directly for electric vehicle production in the U.S. But most of B.C.’s mined materials get shipped overseas for refining and aren’t very traceable as the materials can be sold anywhere for any use.

This also raises questions for when companies claim to be leaders in a sector, such as Hyundai for sustainability within the automotive industry. A recent report by Mighty Earth researched over 57,000 shipment records to map out the global steel supply of Hyundai, and virtually all of these operations had issues of environmental and human rights issues. Coal and iron ore mines as

well as their processing facilities were identified across the globe, and included coal sourced from Glencore’s Elk Valley Resources coal mining operation in southeast B.C. that has received some of the highest fines under the *Fisheries Act* for selenium pollution.

The province has no ability to hold proponents of “critical mineral” mines to account or to trace end use. West High Yield Resources’ Record Ridge has proposed a magnesium mine near the town of Rossland. While its website says that they are focused on “strategic critical minerals that play a pivotal role in the global societal transition towards green energy and a net zero carbon environment”, the company also highlights that it intends to initially sell its ore to U.S.-based Galaxy Magnesium if it enters production, who use magnesium for end products like helicopters and water piping. However, they also have a subsidiary, Galaxy Power, that uses magnesium in alloys to make lighter and faster oil pumps for deep wells in Kazakhstan. While magnesium is needed for green energy applications, there are no guarantees this mine, marketing itself within the green energy transition, will be used for that (and could in fact serve the opposite).

We aren’t able to track “British Columbia” copper beyond exports for processing. British Columbia processes few of the metals and minerals we mine, making it difficult to track its end use or final destination. Mining more copper here doesn’t directly translate to more security of supply for it in the province.



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What are rare earth elements?

Rare earth elements (REE) are a group of 17 elements, including the 15 elements of the lanthanide series on the periodic table of elements together with the transition metals scandium and yttrium. All REEs, except promethium, are actually quite abundant. The challenge is finding them in any concentration or economically minable deposits. They are most often extracted from other mined material (such as zinc), however, separating them requires a number of chemical compounds and produces a large amount of waste and toxins. Another concern is that some REEs are bound up in radioactive uranium and thorium which can lead to detrimental health effects (in particular increased risks of lung, pancreatic and other cancers).

Rare earth elements are key ingredients for glass (polishing, colours, camera lenses, tank windows, night-vision goggles), lights (fluorescents, LEDs, for scoreboards and TV screens), magnets (MRI machines, cellphones, wind turbines, jet engines), batteries (for hybrid vehicles), and have essentially allowed for improvements in efficiencies, durability and reduced sizes for the many electronic devices that we use in our daily lives.

China is by far the world's largest producer with an estimated 210,000 tonnes of mined REEs and 175,000 tonnes of refined REEs in 2022, accounting for 70% of global mined production and 87% of global refined production. In 2020, Saskatchewan invested to produce Canada's first REE processing facility with the Saskatchewan Research Council. BC's Geological Survey shows some claims with REE occurrences.

What about germanium?

Germanium is usually a byproduct of lead and zinc ore processing and is part of what is processed at Teck's smelter. The ore seems to come predominantly from Teck's Red Dog mine in Alaska. The main uses of germanium are for fiber optic cables, solar cells and military purposes, like night vision goggles and infrared lenses and windows. China banned exporting both germanium and gallium to the U.S. in 2023 for national security reasons and B.C. is now its main supplier. The US Department of Defence is also looking to source germanium by recycling old tank windows and rifle scopes. The global company Neo has a production facility to recover gallium from secondary sources in Peterborough, Ontario.



What is the impact of the electric vehicle revolution?

Batteries have been at the centre of much of the hype around critical minerals, with their production driving the demand for lithium, nickel, manganese, cobalt, and graphite. In terms of mined materials needed, an electric vehicle currently requires an average of six times more raw materials than a conventional car. While we need to prioritize getting off fossil fuels, we also need to make smart choices. EV Hummers weigh about three times that of the early EV models. In fact, an electric bus is approximately nine times more efficient in lithium and an e-bike is 240 times more efficient than the EV Hummer battery. We need policy direction to keep battery sizes small, which can significantly reduce demand for critical minerals and fossil fuel use.



British Columbia has set a mandate that all new vehicle sales in the province must be electric by 2035. From both a materials and sustainability

perspective, we do not have the resources globally to swap out every combustion fuel vehicle for an EV one. We need broader solutions in terms of transit, active transportation, and city planning, as well as sourcing through circular economy initiatives. Studies have also shown that we can reduce the demand for mining through recycling by as much as 25% for lithium, 35% for cobalt and nickel and 55% for copper for electric vehicle batteries. This is also one way for countries to reduce their dependence on imports of these critical minerals.

What is re-mining?

Historically, there was minimal regulation to ensure proper closure and decommissioning of B.C. mines. There are more than 1,100 closed mines in the province, a number of which are abandoned or orphaned that have been left unreclaimed, or are contaminating (or potentially contaminating) sites. British Columbia also has over 170 tailings facilities. Mine waste from orphaned and abandoned, and closed mine sites are on-going environmental legacies that negatively impact communities, land use and watersheds. One possible solution to sourcing critical minerals while also cleaning up some of these legacy sites, is to re-mine or reprocess the tailings, waste rock or other waste material to extract minerals (either that previously had limited value, such as some of the REEs, or can now be extracted with new technologies). With the right regulations in place, this could lead to better clean-up and closure of some of the mine sites throughout the province. Geoscience BC recently released a report pulling together data to scan potential for mining waste material.



Is “Critical Minerals” just greenwashing?

The term “critical minerals” evokes a sense of nationalism and urgency. While there are definitely strategic opportunities to identify priority minerals for the energy transition and that are key for our economy but facing trade disruptions, the term is being used to sell more mining and expedite permitting.

Critical minerals have been the subject of intensive lobbying by the mining industry. More than 500 lobbyists at the federal level count critical minerals as part of their portfolio, representing some of the largest mining companies and associations in the country. In B.C., the same pattern appears, with major players like Rio Tinto, the Business Council of Canada, and the Mining Association of B.C. lobbying the provincial government on critical minerals.

The Federal Government has earmarked \$1.5 billion to the Critical Minerals Infrastructure Fund where it has already contributed to Highway 37 improvements for access to the so-called “Golden

Triangle”, as well as direct subsidies for road building to the proposed Galore Creek Mine. British Columbia now has a Ministry of Mining and Critical Minerals, and recently announced fast-tracking four mining projects (one of which is a gold and silver mine—not critical minerals). Both B.C. and Canada offer mineral exploration tax credits and flow-through shares, with the federal government providing an additional 30% incentive through its Critical Mineral Exploration Tax Credits.

While claiming to be key actors in the energy transition, mineral exploration companies are also staking on melting glaciers and threatening some Indigenous Protected and Conserved Areas. British Columbia has biodiversity commitments to meet conservation targets (nearly doubling our protected areas) and to align laws, including our mineral staking regime, with the UN *Declaration on the Rights of Indigenous Peoples Act (DRIPA)*. There is a need to create additional no-go zones for mining in B.C. in order to prevent more conflicts and also create greater certainty for the mining sector as to where there is potential for development.

A lot of lofty economic and jobs promises are made by mining proponents and associations in the push for critical minerals, although we have seen in recent reports that these rarely come to fruition. The BC government does little to track these over time despite often making trade-offs and a choice to accept environmental harms for stated economic benefits. While mining jobs are often high paying and support many regional economies, the mining sector focuses on “innovation” that reduces labour needed.

Amidst threats of tariffs and climate change impacts, there is a need to cooperate across the country on strategies to transition off fossil fuels and become less reliant on certain trading partners. But the conversation around “critical

minerals” needs to broaden and be based in evidence – new mines are not the only pathway to the transition and greater security, especially when we’re dedicating so little to processing, adding value and setting up of domestic industries. There are policies and regulations that could reduce demand and access supply chains through other means, such as recycling and re-mining. British Columbia also needs to protect critical resources, like water and salmon, and respect Indigenous rights while addressing the current crises. In essence, we need a transition to a clean energy future where mining impacts are reduced instead of exacerbated, and solutions are broad to help minimize the need for new mines.



About the Northern Confluence Initiative

Northern Confluence is dedicated to conserving the salmon watersheds that sustain our communities, economies and shared futures. We are rooted in northwestern British Columbia and draw together perspectives from across the region. Together, we are working to improve land use decisions and stewardship that respect Indigenous laws and rights and further protect biodiversity. Northern Confluence is a project on MakeWay's shared platform. northernconfluence.ca

