Capstone Project for Ziemba Insights

Canadian Critical Minerals Outlook

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Introduction

Value of Critical Minerals & Canada's Role in the Energy Transition

Critical minerals are essential components in a variety of clean energy technologies, from wind turbines and electricity networks to electric vehicles. The International Energy Agency (IEA) expects global demand to more than double by 2030. If the world is to achieve net zero emissions by 2050, demand will grow three and a half times by 2030. Limited production capacity, project delays, cost overruns and technology shortfalls constrain supply.

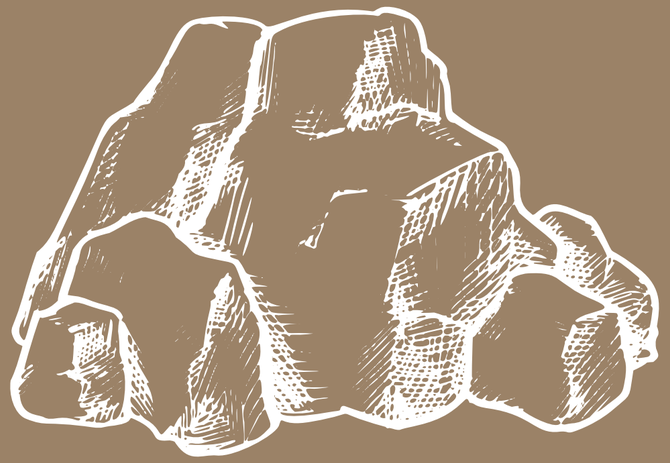
Supply is highly concentrated in their supply chains in a small number of countries, such as the Democratic Republic of Congo (DRC) produced 70.3% of the world's cobalt, while China produced 65.6% of graphite,

China occupies a dominant position in the global critical minerals supply chain, accounting for 85% of the processing capacity and 78% of the manufacturing capacity for EV batteries worldwide. To mitigate the risks associated with supply chain concentration, Western countries have taken active steps to build up their own capacity to extract, process, and manufacture critical minerals. But doing so is easier pledged than done given costs and long lead times.

Canada is endowed with an abundance of reserves for many critical minerals essential for the energy transition. The country's proximity to major markets in North America and Asia, transparent legal system, stable political environment, high ESG standards, and variety of critical minerals deposits make it an attractive destination for investments in the critical mineral supply chain. The Canadian government introduced the Canadian Critical Minerals Strategy in 2022 to increase the supply of responsibly sourced critical minerals and grow Canada's capability at every point along the critical minerals value chain. Many Provinces also announced their own strategies

The **Canadian Critical Minerals Outlook** surveys the state of Canada's critical minerals sector for five minerals - graphite, lithium, nickel, cobalt, and copper, exploring involvement in Canada, various investment dynamics, the federal and provincial policy framework, and US-Canadian collaborations. The report presents key takeaways for the five critical minerals in Canada, sharing insights into each mineral's level of activity, trends, and investment in the near and long term.

2. Canadian Critical Mineral Activity



Canada hosts mines and advanced projects for graphite, lithium, copper, nickel, and cobalt and processing facilities (e.g., smelters and refineries) for the last three minerals. This provides an overview of Canadian activity and infrastructure for these five critical minerals based on NRCan's dataset. Projects that are not producing or only produce a negligible amount of the relevant mineral were excluded from the data set. We include the following types:

Operating mines (Mines): currently active mining operations in Canada, specifically focusing on mineral extraction.

Processing facilities: currently operational processing facilities in Canada that extract valuable minerals from ore producing a concentrated and marketable product.

Advanced projects (Projects): mines or processing facilities under development. Their potential viability is supported by a preliminary economic assessment or a pre-feasibility/feasibility study.

2. Canadian Critical Mineral Activity

Table 1 Overview of Canadian Five Critical Mineral Activity

	Number of			Advanced Projects		By Province		
	Mines	Processing Facilities	Projects	Active	On hold/Suspended	Mines	Processing Facilities	Projects
Graphite	1	n/a	9	5	4	QC(1)	n/a	QC (6)
Lithium	1	n/a	12	12	n/a	MB (1)	n/a	QC (6)
Nickel	13	5	21	16	5	ON (9)	ON (2)	ON (11)
Cobalt	12	4	14	11	3	ON (8)	ON (2)	ON (6)
Copper	25	6	63	48	15	ON (11)	ON (2) & QC (2)	BC(18)

Source: NRCan Dataset

Table 1: Provides a general overview of our analysis, listing the province with the highest participation rate in Canada for each critical mineral activity. Copper stands out as the most active mineral sector in Canada, encompassing mining, processing facilities, and advanced projects. However, the activity in lithium and graphite sectors is relatively subdued. Ontario, Quebec, and British Columbia emerge as the provinces with the highest activity rates across the five mineral activities in Canada.

2. Canadian Critical Mineral Activity

Graphite

As the 6th global graphite producer, Canada accounts for around 1% of global natural graphite. There is currently only one operational graphite mine in Canada, Lac-des-Îles, owned by a Canadian company Northern Graphite Corporation. There are currently no active graphite processing facilities. However, the country hosts 9 advanced graphite projects, with 5 active and 4 on hold or suspended. Quebec hosts 6 of these projects, while Ontario holds 3. These ventures are owned by 7 Canadian companies and 1 Australian company.

Figure 1 Map of Canadian Graphite Mines and Advanced Projects

Source: NRCan Dataset, 2024

2. Canadian Critical Mineral Activity

Figure 2 Map of Canadian Lithium Mines and Advanced Projects

Source: NRCan Dataset, 2024

Lithium

Canada ranks as the 8th largest global producer of lithium and accounts for 0.4% of global production. Canada currently has 1 operational lithium mine, located in Manitoba and owned by the Chinese company Sinomine Resource Group Co. Ltd. As of now, there are no active lithium processing facilities within the country. Across four provinces, there are 12 advanced lithium projects in various development stages -- Quebec leads with 7 projects, followed by 4 in Ontario, and 1 each in Saskatchewan and Alberta. These projects are owned by companies from three different countries, Canada (10), Argentina (1), and the UK (1).

2. Canadian Critical Mineral Activity

Nickel

Figure 3 Map of Canadian Nickel Mines, Processing Facilities and Advanced Projects

Source: NRCan Dataset, 2024

In Canada, there are a total of 13 operating mines producing nickel across four provinces in Canada, including Ontario (9), followed by Quebec (2), Manitoba (1), and Newfoundland and Labrador (1). Ownership of these mines is divided among four companies: Vale Canada Limited (7), Glencore Canada Corporation (4), Canadian Royalties Inc. (1), and KGHM Polska Miedź S.A (1). There are 5 operating nickel processing facilities, with two in Ontario, one in Quebec, one in Newfoundland and Labrador, and one in Alberta. These facilities are operated by 4 companies, with 4 engaged in refining, 2 in smelting, and 2 in plant operations, all owned by 4 Canadian companies and 1 Brazilian Company.

There are 21 advanced nickel projects, 5 of which are currently on hold or suspended. Among the 10 provinces in Canada, 7 currently host advanced nickel projects: Ontario (11), Manitoba (4), British Columbia (2), Quebec (2), Nunavut (1), and Yukon (1). These projects are owned by 19 companies including one Chinese company, one Australian company, and 17 Canadian companies.

2. Canadian Critical Mineral Activity

Cobalt

Across Canada, there are 12 operating cobalt mines in Canada. Of these, 8 are located in Ontario, 2 in Quebec, 1 in Manitoba, and 1 in Newfoundland and Labrador. Among these mines, the Brazilian company Vale owns seven, while Canadian companies own the rest. 3 refineries and 1 smelter and plant are owned by 2 Canadian companies and 1 Brazilian company. 2 of these facilities are located in Ontario, 1 is in Newfoundland and Labrador, and 1 is in Alberta.

14 advanced cobalt projects are distributed across eight provinces, including Ontario (6), Quebec (2), and 1 each in Alberta, Yukon, Nunavut, Northwest Territories, Manitoba, and British Columbia. Among these advanced projects, 3 are on hold or suspended, while 11 are active. Regarding ownership, 9 projects are owned by Canadian entities, 2 by the U.K., 1 by China, and 1 by Australia.

Figure 4 Map of Canadian Cobalt Mines, Processing Facilities and Advanced Projects

Source: NRCan Dataset, 2024

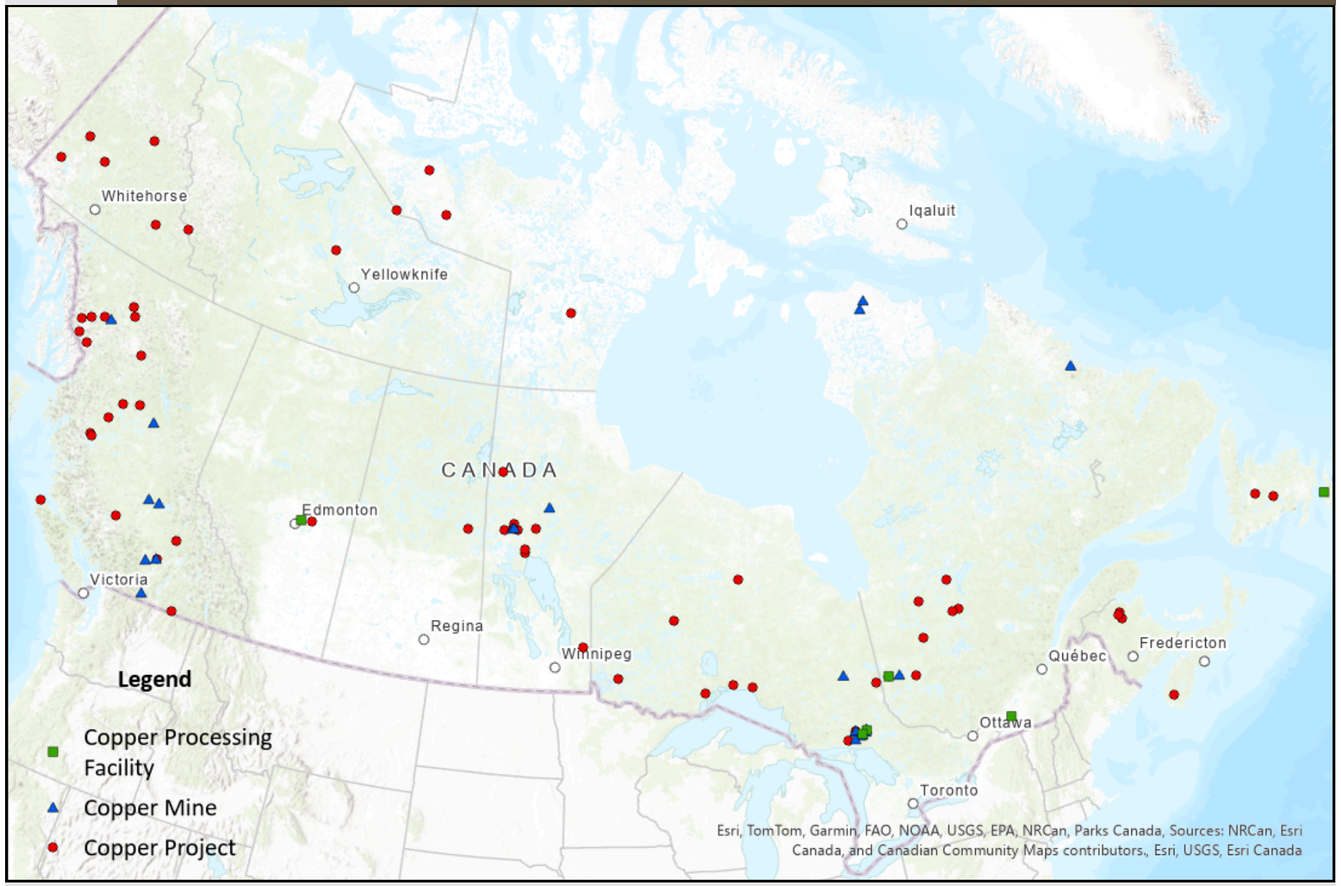
2. Canadian Critical Mineral Activity

Copper

Canada has 25 operational copper-producing mines mostly in Ontario (11) and BC (7), with some in Quebec (3), Manitoba (3) and Newfoundland and Labrador (1). Most mine ownership is dominated by Vale (8) and Glencore (5), as well as some presence by Hudbay Minerals (2) and smaller actors including Agnico Eagles Mines and Centerra Gold. There is one mine owned by Polish company KGHM Polska Miedź S.A. and Australian company Newcrest Mining Ltd. There are 6 copper processing facilities in Ontario (2), Quebec (2), Alberta (1) and Newfoundland and Labrador (1), notably by Vale and Glencore.

63 advanced copper projects produce gold, silver, zinc or nickel. British Columbia has the highest number of projects (18), followed by Ontario (9), Manitoba (8), Quebec (7) Yukon (6), Nunavut (4), New Brunswick (3), Newfoundland and Labrador (3), Northwest Territories (2), and 1 each in Alberta, Saskatchewan, and Nova Scotia. 14 projects were on hold or suspended. Most copper projects in Canada are owned by junior Canadian companies, with some foreign ownership by Australia, UK, Poland and Netherlands.

Figure 5 Map of Canadian Copper Mines, Processing Facilities and Advanced Projects



Source: NRCan Dataset, 2024

The Canadian mining sector has emerged as a focal point for investors. This section will outline the dynamics that have shaped the market in the past couple of years including the size, planned vertical integration, and the levels of government support to various projects. Investment in Canadian mining faces challenges of price volatility and exposure to shocks.

3. Investment Dynamics

- Firm size
- Development stage
- Vertical integration
- Price volatility
- Government support
- Roles of global markets

3. Investment Dynamics: Lithium

We exclude lithium from the investment dynamics section given the relative lack of promise currently in Canada . There was little Canadian production from 2014 to 2020, and lithium produced is shipped internationally for processing. Further, Australia dominates the global lithium supply as the country independently produces 52% of the world's lithium. As such, Canada has shown difficulty leveraging the advantages, including ESG that Australia also boasts.

While Australian lithium mines are already well-established, the development of new mines in Canada entails significant fixed capital investment and time-consuming permitting and construction processes that further diminish Canada's appeal as an investment hub for lithium. Although two years ago there was a great buzz around lithium regarding its role in EVs, it is no longer being prioritized by investors.

Former BHP Minerals geologist, Paul Cowley, is quoted stating in an article from February 2024 that "Everything was there. There was investor interest in our project, we were able to raise money and advance the project up to a certain point. Two years on, however, the wind just died down." Further, Canada's only major lithium producer stated in late January 2024 that lithium is proving to be a challenging market environment.

Overall, there seems to be a lack of concrete opportunity. Investors are looking elsewhere and there are more investable concrete opportunities in other countries such as Australia or Chile.

3.1 Investment Dynamics: Graphite

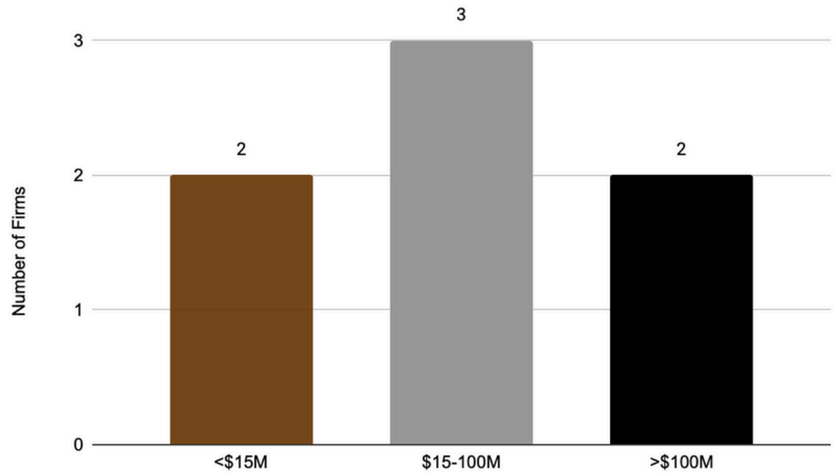
Firm size

Financial data provide substantial insights into the landscape of companies within the Canadian graphite market. Two major players stand out -- firstly the Northern Graphite Corporation (NGC), owner of the Bissett Creek project in Ontario, the operating Lac-des-Îles mine in Quebec, as well as another graphite mine in Namibia. The firm commands the second biggest value of assets among the dataset's projects, amounting to US $75M, and is also the only company with a positive balance sheet. Secondly, Nouveau Monde Graphite (NMG) boasts the largest total amount of assets, valued at $111M.

Other companies within the market managing medium-sized assets include Zentek, Focus Graphite, and Metals Australia, with respective asset values of $24.4M, $28.83M, and $26.59M. Lomiko Metals, Canada Carbon, and Ontario Graphite Ltd. are among the smaller entities, with Ontario Graphite Ltd. encountering significant hurdles over the past eight years, including insolvency. The company's current financial status remains opaque, indicating ongoing complexities in its operations; however, it appears to still be protected under the Companies Creditors Arrangement Act, owing to an outstanding $15M debt to its creditor.

The graphite market in Canada thus presents a diverse array of companies across varying sizes. A majority of these entities are junior mining companies, grappling with financial constraints due to limited capital and challenges in securing funding. These difficulties are further compounded by the prevailing market conditions affecting the graphite, as outlined later in this section.

Figure 6 **Total Assets of Owners - Graphite**



Source: NRCan Dataset

3.1 Investment Dynamics: Graphite

Three of the eight companies analyzed have initiated vertical integration initiatives, predominantly geared towards the EV battery sector. NMG, owning two projects within the market, is in the process of constructing a major battery plant in Bécancour, Quebec. This strategic move has garnered substantial interest from global investors, evidenced by partnerships forged with automotive industry giants such as Panasonic and General Motors. Notably, NMG also secured investment from Mitsui in 2022, further solidifying its position in the market. NGC, in the possession of one major project and a producing mine, is also venturing into vertical integration through the development of a battery anode factory in Northern Quebec, however no formal endorsement or announcements in the past year.

Vertical integration

Vertical integration thus appears to be a notable trend among the two largest entities in the market, such initiatives necessitate substantial investments that may prove challenging for smaller companies. Therefore, while vertical integration presents opportunities for market consolidation, its widespread adoption is likely to remain limited due to financial constraints faced by industry players as well as by the government.

Government support

Despite the significant potential of the graphite mining sector in Canada, government support for advanced projects has been relatively limited. The focus of federal and provincial support has predominantly centred on battery plant projects. Federal incentives primarily target the riskier exploration stage, while provincial tax incentives have shown minimal effectiveness in attracting investment for advanced projects. Additionally, the administrative burdens associated with fulfilling criteria for funding may disproportionately affect younger and smaller companies operating in the graphite sector, thereby hindering government support.

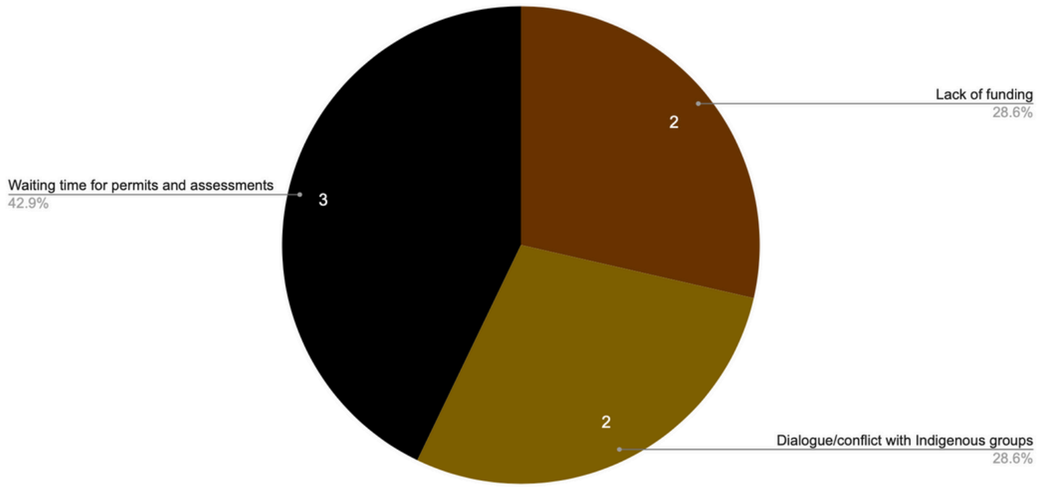
However, incentives encouraging the acquisition of equipment for smelting and refining, cruelly lacking in Canada for graphite, may have influenced recent announcements regarding the establishment of three manufacturing plants in Quebec, located in St-Basile-le-Grand, Bécancour, and Granby. While important tax credit proposals have been made for the upcoming budget, notably the Clean Technology Manufacturing Tax Credit, their relevance to the current graphite mining landscape remains questionable. Excluding NMG, none of the listed projects appear to incorporate clean mining technology, raising concerns about the adaptability of these incentives.

3.1 Investment Dynamics: Graphite

Development stage

Advanced graphite projects appear to still be subject to the same traditional risks encountered by mining ventures in Canada, as outlined by the similar concerns raised in the 2021 Fraser Institute survey and the 2024 KPMG survey, as well as discussions in the 2024 PDAC conference.

Figure 7 **Reasons for On Hold or Suspended Projects - Graphite**



Source: NRCan Dataset

The prevalent perception that Canada holds the potential to emerge as a global leader in critical mineral production persists. However, the consensus among the private sector is that the government's efforts to assist mining companies in managing associated risks have fallen short, leading to difficulties getting projects through the pre-production phase. Many advanced graphite projects are still awaiting various permits and authorizations, such as Kearney, Lack Knife, and Lac Rainy. Other projects are at high risk of cancellation due to negative assessments, particularly in the environmental and social domains, such as Canada Carbon's Miller project. Moreover, difficulty in reaching agreements with Indigenous groups poses a significant obstacle, as demonstrated by Zentek's progression updates regarding the Albany project.

Thus, despite the increased attention surrounding advanced graphite mining projects, the sector continues to grapple with regulatory hurdles, permitting delays, and challenges in Indigenous engagement. These factors contribute to investor apprehensions and difficulties in securing financing, particularly for companies in earlier stages of pre-production.

3.1 Investment Dynamics: Graphite

Price Volatility and the Role of Global Markets

Price volatility poses a significant challenge for mining companies operating within the graphite sector, impacting investment decisions and project development due to uncertainties in revenue streams and project viability. The sector has witnessed several projects temporarily suspending their activities in response to fluctuating graphite prices. Discussions at the PDAC conference underscore the challenges faced by “cash-strapped” junior mining companies in securing investment amidst low-price prospects. The Zentek project serves as a pertinent example of the impact of price volatility on investor decisions. Investors in the project opted to retrieve their initial investment following the announcement that the project was put on hold due to market conditions.

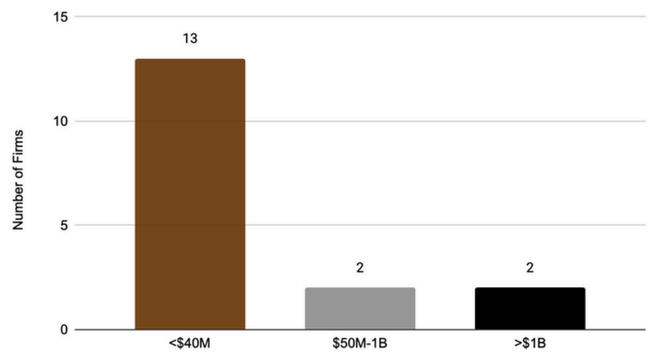
Price fluctuations for graphite are largely due to supply shocks from outside of the country. China holds considerable influence in the market, primarily due to its significant supply (80% of the total amount produced globally). Sudden shortages originating from major mines in Africa have a similar impact, as Mozambique and Madagascar are the second and third biggest producers, respectively.

This negative impact on investment in the Canadian market is partly mitigated by the interest in Canadian graphite elicited by China and African countries’ unpredictability. Importing regions such as East Asia and the European Union have shown increased interest in Canadian graphite processing and manufacturing – for instance, the South Korean Volta Energy Solutions, the Swedish Northvolt, and the Japanese Panasonic and Mitsui. Despite this newfound interest in Canadian graphite, the surge in demand has yet to guarantee rapid production growth or fully offset the impact of supply shocks originating from major producing countries.

3.2 Investment Dynamics: Nickel & Cobalt

Firm size

Figure 8 Total Assets of Owners - Nickel & Cobalt



Source: NRCan Dataset

Ownership of the operating nickel and cobalt mines in Canada is concentrated in two companies–Vale and Glencore. Among advanced projects, ownership is highly scattered, with Jilin Jien Nickel Industry Co., Ltd owning three projects and 20 other companies (17 of which are Canadian) each owning one.

Vertical integration

Three advanced nickel projects have announced plans for vertical integration. In September 2023, FPX Nickel Corp. signed a memorandum of understanding (MOU) with Prime Planet Energy & Solutions (PPES), joint venture between Toyota and Panasonic, to explore opportunities for vertically integrating nickel production in FPX's Decar/Baptiste Nickel Project in British Columbia and the production of nickel sulphate and cathode active materials for the PPES supply chain. Any potential binding agreements arising from the MOU are expected to provide FPX with additional funding to advance the Decar Project.

Corazon Mining Ltd., the owner of the Lynn Lake project, also signed an MOU with Blackstone Minerals Ltd in March 2022 to collaborate on the production of upstream and downstream nickel and cobalt concentrates to meet demand from the EV battery industry.

In February 2024, **Canada Nickel Company** announced a plan to build what could be the largest nickel processing facility in North America in the Timmins Nickel District in Ontario, which contains the Crawford project with the world's second-largest nickel reserve.

These activities showcase rising interest in vertically integrating the nickel and cobalt supply chain to meet demand from the EV industry from both domestic and international buyers. At the same time, this trend has been limited to the largest projects, suggesting that scale is a key factor for whether a project is selected for vertical integration.

3.2 Investment Dynamics: Nickel & Cobalt

Government support

Six advanced nickel projects have announced they have received or are eligible for government tax credits and funding.

- The **Crawford project** owned by Canada Nickel Company announced that government tax credits alone can knock US$200M off the project, and the federal Strategic Innovation Fund and the Critical Minerals Infrastructure Fund can enable them to secure US$400M of capital in total from the Canadian government. In addition to the whopping sum received by Crawford, there are several smaller sums of funding.
- FPX announced that its **Decar project** received CA$0.7M from NRCan through the Critical Minerals Research, Development and Demonstration program.
- The **Dumont Nickel project** owned by Magnet Investments LP announced that it received CA$4.5M in 2023 from NRCan.
- The **Shakespeare project** owned by Magnet Mining Inc. announced that it is eligible for government funding worth 30% of capital cost.
- The **Nickel Shaw project** will benefit from a 30% tax credit if the Clean Technology Manufacturing Tax Credit proposal is passed.
- **Electra Battery Materials Corporation** received CA$5M funding from the federal government towards the construction of North America’s first cobalt sulfate refinery.

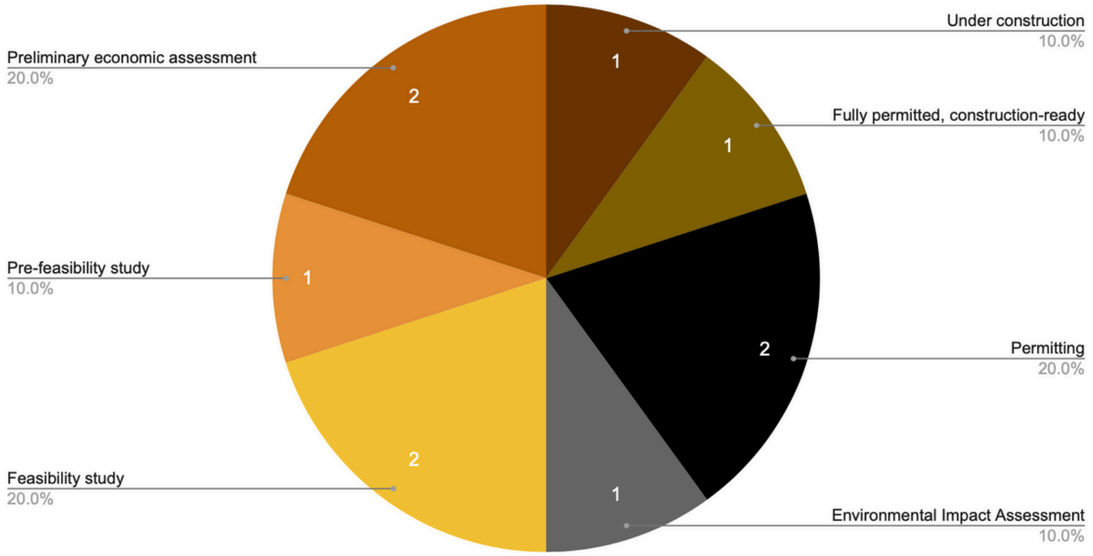
Overall, our research shows that there are multiple streams of government tax credits and funding for critical minerals projects, and companies seem eager to take advantage of these incentives. However, the amount of funding received by each project varies by size and stage of development.

3.2 Investment Dynamics: Nickel & Cobalt

Development stage

76% of the advanced nickel projects are active. Five projects are on hold or suspended, with two due to facility maintenance issues, one due to financial difficulties caused by the low price of nickel, and two with no public information available on the reason for suspension. Based on the NRCan dataset, there are no notable factors that are causing widespread project delays. Nevertheless, it is worth noting that two projects are awaiting permits and one is undergoing an Environmental Impact Assessment. Additionally, Wyloo Metals, the owner of the Eagle's Nest project situated in a region inhabited by nine First Nations communities, is actively working to establish partnerships with local First Nations while simultaneously conducting its feasibility study. In turn, *Figure 9* demonstrates active projects at different stages of development.

Figure 9 **Development Stage - Nickel & Cobalt**



Source: NRCan Dataset

3.2 Investment Dynamics: Nickel & Cobalt

Nickel: Price Volatility and the Role of Global Markets

In March 2022, the price of nickel on the LME surged dramatically over three trading days, skyrocketing by more than 270%, from US$27,080 per metric ton to US$101,365 per metric ton from March 7 to March 9, 2022, before settling around US$80,000 per metric ton. This unprecedented price movement prompted the LME to suspend the market following the surge on March 8, 2022. These events were driven by a short squeeze, instability within the LME, and Russia's military actions in Ukraine. However, this surge was short-lived, and nickel prices experienced continued volatility over the following years. By 2023, the price of nickel had fallen by over 40% from the previous year amid a global nickel glut and softer demand growth from the electric vehicle sector. Prices remained near their lowest levels since 2021, trading around $16,000 per ton. Despite efforts to stabilize the market, including output cuts and adjustments to supply chains, nickel prices continued to face downward pressure. By 2024, analysts predicted further declines, with Citigroup Inc. forecasting nickel to fall to $15,500 per ton. The market remained in surplus, driven by increased primary nickel output from Indonesia and China, despite potential supply cuts from mines outside Indonesia.

Against this backdrop, three critical factors are likely to affect future nickel activities in Canada:

Nickel Oversupply from Asia: Indonesia's export ban on nickel ore in 2020 aimed to boost domestic processing, attracting Chinese investment for smelters. This flood of cheap nickel, controlled by China, saturated the market, causing global price declines and mine closures.

Uncertain Nickel Demand: Vale predicts a 44% rise in global nickel demand by 2030 driven by the energy transition. However, emerging technologies like LMFP batteries, that do not contain nickel or cobalt, pose a challenge to traditional nickel-dependent EVs, potentially reducing future demand.

Canada's Nickel Production Advantage: Canada's sulfide-rich ores offer high-purity Class 1 nickel, contrasting with Indonesia's laterite ores requiring environmentally damaging processing. This positions Canada favorably in the global nickel market due to its environmentally friendly approach and higher-purity nickel output.

3.2 Investment Dynamics: Nickel & Cobalt

Cobalt: Price Volatility and the Role of Global Markets

The price of cobalt has experienced significant volatilities in recent years and is currently at its lowest point in three and a half years. In 2023, the global cobalt market was estimated to have closed in a surplus of 12.5kt, nearly double from the 6.3kt seen in 2022. Surging supplies of cobalt from Indonesia and DRC are forecast to continue to outpace rising demand from the EV industry in the near term, generating large surpluses that will keep prices of the metal under pressure. Over the longer term, the Cobalt Institute (2022) estimates that global demand for cobalt will double by 2030, despite the potential for alternative battery technologies to partially replace NMC batteries as discussed earlier. Supply deficits are expected to emerge in 2027 due to the sustained cobalt demand growth from EVs.

DRC and Indonesia are expected to be the two major suppliers of cobalt by 2030. However, mining operations in both countries face criticisms for insufficient environmental standards, while mines in DRC also face criticisms for child labour and human rights violations. In addition, cobalt production in both countries is heavily dominated by Chinese companies, which import most of the produce for processing in China. Canada’s high ESG standards and proximity to major markets in North America and Asia put it in a competitive position to capture the rising demand for cobalt from those regions.

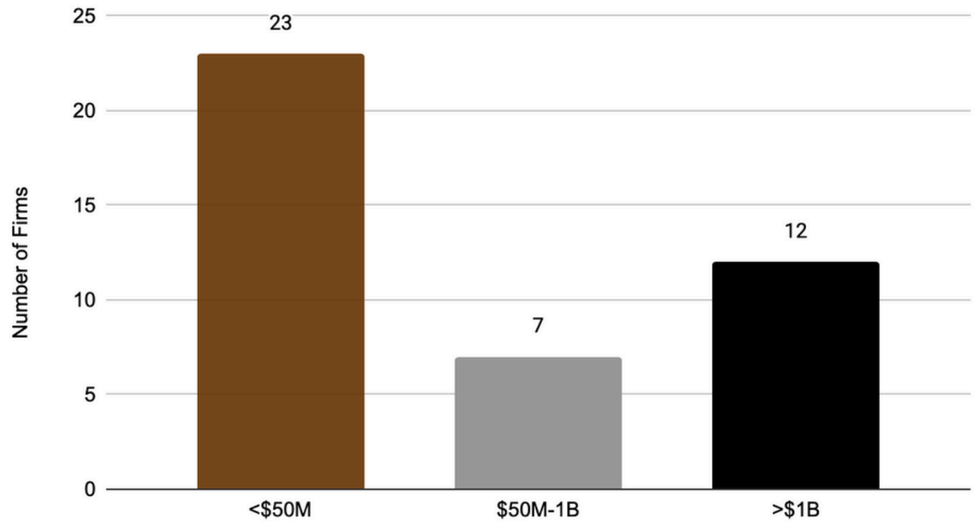
3.3 Investment Dynamics: Copper

Firm size

In copper mining activities in Canada, the predominant actors that comprise the majority of production are Vale, Teck, Glencore, Taseko Mines, Centerra Gold and Newcrest Mining. Mines and processing facilities are owned by these larger actors, while advanced projects have increased involvement for junior mining companies. There is some foreign ownership by Australia, the UK, Poland, and the Netherlands, however it represents a minimal share of copper production in Canada.

When examining the size distribution across copper-producing firms, demonstrated in *Figure 10*, junior mining companies with total assets below US$50M comprise the majority of activity. The predominant involvement of smaller Canadian companies further demonstrates the exploration and development phases of projects. There is also the involvement of larger companies, with total assets over US$1B, that hold significant copper production in Canada and remain dominant in copper mines and processing facilities.

Figure 10 **Total Assets of Owners - Copper**



Source: NRCan Dataset

3.3 Investment Dynamics: Copper

Vertical integration

Attempts for vertical integration have begun, however, remain very slow in the Canadian copper scene. One of the key and sole examples of vertical integration remains in Fortune Minerals Limited's NICO copper-gold-bismuth-cobalt project, which seeks to build a refinery in Alberta to process concentrates from the NICO planned open pit and underground mine and concentrator in the Northwest Territories. Vale also remains vertically integrated, as it also derives its hydro energy for production activities. Nevertheless, vertical integration remains minimal in copper production in Canada.

Government support

Government funding and support are somewhat prevalent in advanced copper projects, especially in more ambitious activities that may also be deemed more necessary. Nevertheless, most mining companies emphasize the difficulty of obtaining such funding due to extensive and complex processes for application. Fortune Minerals Limited's NICO project, which is planned to be 100% vertically integrated, received up to CA$887,170 from the federal and Alberta governments to build their operations. The High Lake project by MMG Mining in Nunavut also received CA$21.5M from the Canadian National Trade Corridors Fund, in addition to the CA$7.25M committed by the Inuit Representative Group.

Finally, the federal government also announced it would support First Quantum following its mine closure in Panama, since the closed copper mine accounted for around 40% of their revenue, however, no numbers have been assigned yet. Overall, government funding is somewhat present, however, most notably for larger actors and more ambitious projects, lacking support for the remaining copper activities across Canada with significant junior company participation.

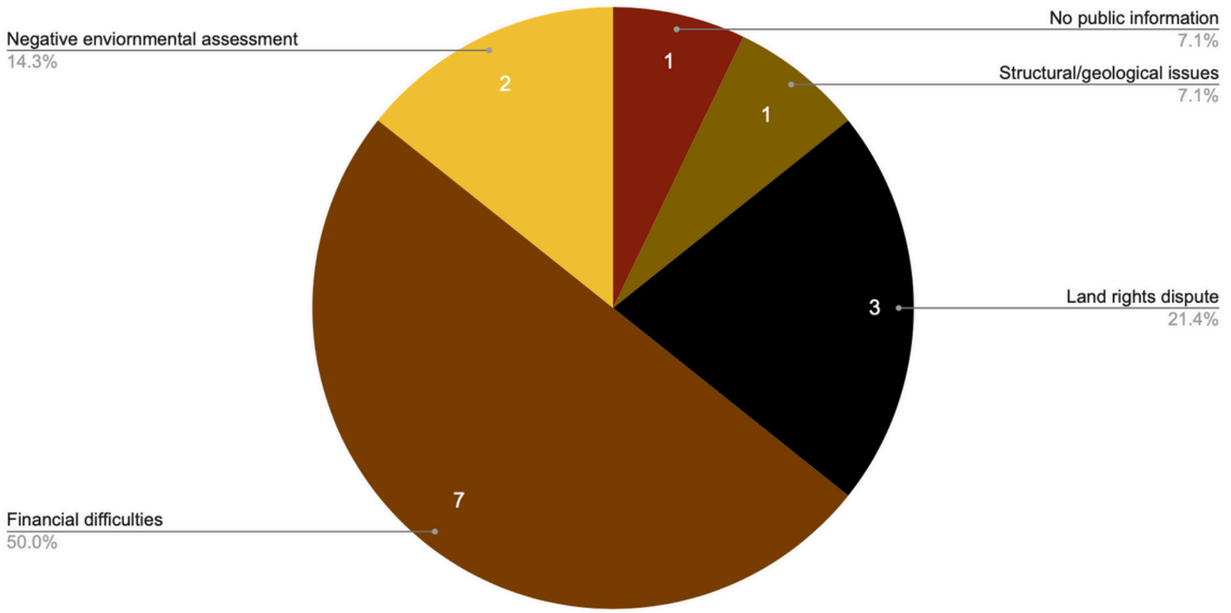
3.3 Investment Dynamics: Copper

Development stage

Around 75% of projects that produce or process copper in Canada are active, which is often produced alongside gold, silver, zinc, and sometimes nickel. A total of 14 projects are on hold or suspended as measured in the NRCan dataset. *Figure 11* demonstrates that financial difficulties, including lack of economic profit and receivership, comprise the largest reason for operations going on hold or becoming suspended (7 out of 14). In addition, traditional reasonings across Canada remain present for pausing copper mining activities, including land rights disputes (3), negative environmental assessments (2), and structural/geological issues (1). In the example of the Morrison project owned by Pacific Booker Minerals, their negative environmental assessment due to sensitive salmon habitat in northwest B.C. is the second negative assessment, first rejected by the province in 2012 due to concerns over impacts on fish, water and local communities.

Ultimately, financial difficulties in the post-exploration phase often present the most susceptible factor for operations being suspended or on hold, especially for junior mining companies that operate without government funding or support.

Figure 11 Reasons for On Hold or Suspended Projects - Copper



Source: NRCan Dataset

3.3 Investment Dynamics: Copper

Price Volatility and the Role of Global Markets

The copper market remains quite volatile, following similar trends to other commodities. Prices hit a low in 2020 due to fears over a worldwide recession, then doubled and peaked in 2022 as there was a rebound in economic growth. They continued to decrease due to China's reduced demand in the construction sector, which accounts for a large share of copper demand. Presently, prices are somewhat averaging out, especially as China's construction sector ramps up its copper demand and largely determines copper's financial future. Prices are expected to surge due to further increasing demand and a global supply deficit, most notably due to First Quantum's mine closure in Panama and Anglo-America's decreased production due to financial constraints, that continue to determine copper activity in Canada.

Nevertheless, as copper is often mined alongside gold, nickel, silver, zinc or cobalt, its production remains abundant across Canada. It also remains an integral component of any electrification efforts across the globe due to its conductivity. Recognizing copper's role and significance, various copper companies across Canada have demonstrated their ESG standards in ensuring sustainable copper production. For example, the McIlvenna Bay project by Foran Mining Corporation is the first carbon-neutral copper development project in the world. Through various initiatives such as sourcing electricity from hydropower and integrating a fleet of EVs for their operations, the project reports 10 years' worth of carbon emissions from exploration activities now offset. Glencore's Onaping Depth Nickel-Copper project, which is an underground mine extension being developed at Craig Mine, also presents its ambitions to be one of the first mines to be operated fully with battery EVs in the world. Ultimately, the ESG advantage of Canadian copper companies largely may serve in presenting attractive sustainability credentials, especially as countries pass such requirements into law, driving investments and increasing Canadian copper production.

3.4 Investment Dynamics: Key Takeaways

The analysis of investment dynamics for graphite, nickel, cobalt, and copper sheds insights into the Canadian critical mineral sector as a whole. The research reveals common trends regarding how investment in critical minerals relates to mining companies' size, vertical integration plans, the level of government support, how fast the projects develop, and each mineral's price volatility and exposure to international shocks.

Size of owners. The Canadian mining landscape reflects diverse ownership compositions, with junior companies playing a significant role in all minerals. This diversity underscores the prevalence of funding concerns and the importance of addressing potential financing challenges.

Vertical integration. Vertical integration initiatives primarily target projects with substantial production capacity and larger firms. The role of scale in attracting investment for such initiative thus emerges as a notable trend.

Government support. While government support initiatives exist, data limitations hinder comprehensive analysis of their effectiveness. An overview of surveys in the last five years indicates significant demand for government funding; however, the current tax incentive structure is continuously perceived as overly stringent and complex. Additionally, our analysis raises concerns regarding future tax policy plans such as the Clean Technology Manufacturing Investment Tax Credit and their suitability for the critical minerals market as it currently is, especially for the graphite sector.

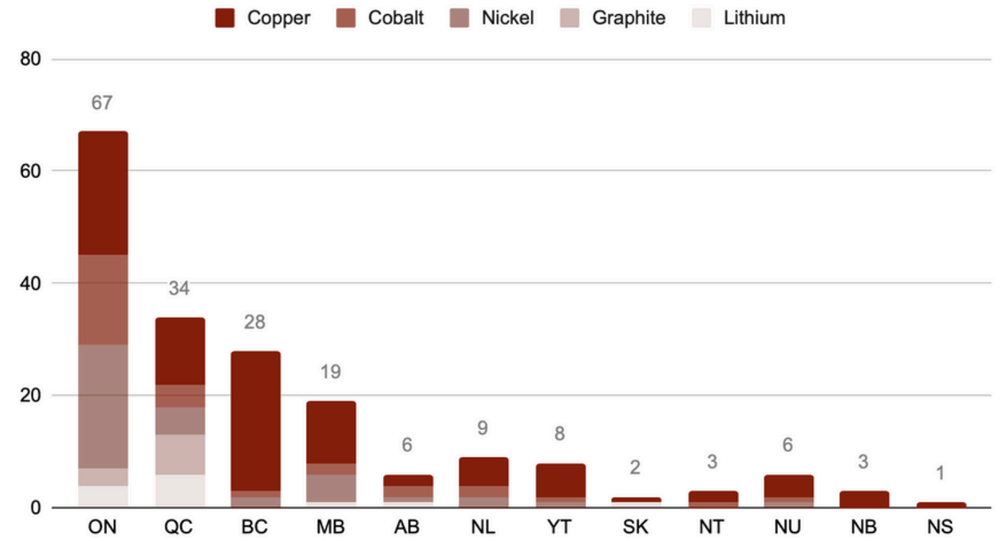
Development stage. All critical minerals studied face common challenges in project development, including regulatory assessments, negotiations with Indigenous groups, and financial difficulties. Further analysis of mining companies' surveys over the last ten years also repeatedly highlights these hurdles, emphasizing the need for streamlined processes and increased funding support, especially for more junior companies.

Price volatility and global markets. Commodity prices generally play a crucial role across all minerals. Low prices currently prevail across the board, driven by external shocks in major supplying countries, and significantly deter investment in Canadian critical mineral producers. This highlights the importance of designing structures and policies to support junior mining companies that are facing low prices for their commodities. However, predictions for a future robust overall demand suggest a potential for price recovery in the future.

4. Policy Landscape

This section of the report narrows the scope to consider the provinces and/or territories with the greatest number of mines. As such, we will be looking at Quebec, Ontario, and British Columbia, with their production demonstrated in *Figure 12*.

Figure 12 **No. of Mines, Processing facilities, and Projects by Province**

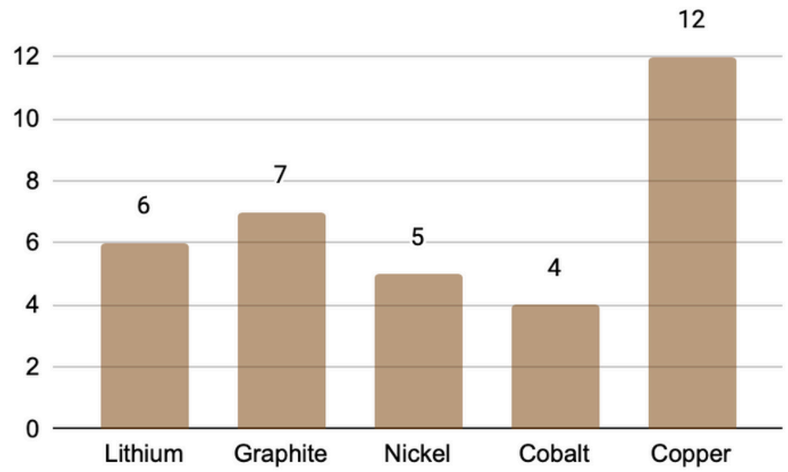


Source: **NRCan Dataset**

The analysis will begin with a background on operating mines within the provinces, then will move into a policy analysis to address whether the provincial policies and regulations are hindering or encouraging production. Next, the provinces will be ranked from best to worst in terms of encouraging production. The section will then move into a macro-overview looking at the federal scope of the Canadian Critical Minerals Strategy. The overarching questions of *"do businesses need more hedging strategies, are the incentives sufficient? Do the Government or end users need to do more?"* will be analyzed within the context of the information detailed in this section.

4.1.1 Provincial Overview: Quebec

Figure 13 No. of Mines, Processing facilities, and Projects in Quebec



Source: NRCan Dataset

Quebec is a large province, covering an area of 1.7M square kilometers. As of May 31, 2023, the province has 319,976 active mining claims thus accounting for one fifth of Canada's mineral production. Quebec has been praised for being an encouraging province due to project funding and encouraging tax acts.

Quebec Plan for the Development of Critical and Strategic Minerals 2020-2025 (QPDCSM)

In 2020, Quebec adopted the QPDCSM:

1. Increase knowledge and expertise on CSMs.
2. Deploy oroptimize integrated sectors in partnership with regional and Indigenous communities.
3. Contribute to the transition toward a sustainable economy.
4. Raise awareness, guide, and promote.

The purpose of this plan was to encourage investment in Quebec and increase Canadian production globally. This plan is in synergy with other government actions including the Stratégie québécoise de développement de la filière batterie (Québec strategy for the development of the battery industry), 2030 Sustainable Mobility Policy, and the 2030 Plan for a Green Economy.

Quebec has several corporations, tax acts, and alliances to encourage mining activities within the province, most notably including la **Société du Plan Nord15 (SPN), The Mining Tax Act, Taxation Act,** and **La Grande Alliance.** Firstly, the **Société du Plan Nord15 (SPN)** is a government corporation that has an overarching goal to contribute to the development of Northern Quebec. The SPN is in coordination with the Indigenous Nations concerned as well as the private sector and representatives of the regions. The purpose of the SPN is to encourage mining activities in Northern Quebec where there are vast opportunities to foster economic benefits.

4.1.1 Provincial Overview: Quebec

The mining industry is subject to the Mining Act to promote mineral research, exploration, and development from a sustainable development perspective. Under the Mining Act, Quebec's tax regime has various methods to support mining companies and is self-proclaimed as "one of the best business climates for mining investment" as per the Government investment report. The **Mining Tax Act** includes:

- A refundable duties credit for losses, where under certain conditions, it provides a refund of 8% or 16% of the amount of eligible work (exploration-related development and pre-production deposit appraisal respectively);
- An allowance for community consultations and environmental studies allowances;
- An exploration allowance (in Northern Quebec), which adds an extra 25% to exploration expenses incurred in Northern Québec that did not entitle companies to the refundable tax credit for resource-based projects;
- An additional allowance for a mine situated in Northern Quebec to offset the high costs associated with bringing it into production;
- The mining tax regime also facilitates the processing and transformation of extracted mineral commodities. For example, companies are entitled to a processing allowance, to acquire assets used in ore processing. The allowance is a percentage of the cost of the items and is determined based on the nature of the processing activity. This percentage is one of the most attractive in Canada.

4.1.1 Provincial Overview: Quebec

Quebec also has the **Taxation Act** – which is aimed at corporate tax regimes. For mining specifically, an investment and innovation tax credit is available for “the acquisition of manufacturing and processing equipment used for smelting, refining and hydrometallurgy of ores other than gold and silver, with a temporary improvement of the rates regarding the costs incurred, or for acquisition of goods after March 25, 2021, but before January 1, 2024”. The purpose of the corporate and personal tax regimes is to incentive mineral exploration. As such there are incentives available such as:

- The Refundable Tax Credit: relating to mineral or other resources, which entitles taxpayers to a refund of up to 38.75% of eligible exploration expenses incurred in Québec by an eligible corporation;
- The Flow-Through Share System: individuals can deduct up to 120% of the cost of their investment.

Québec

LA GRANDE ALLIANCE

Beyond various Government incentives, the province of Quebec has also exemplified a focus on relations with Indigenous Communities. In February 2020, the Government and the Cree Nation signed **La Grande Alliance,** an important agreement for collaboration and consolidation of socioeconomic ties between the Cree Nation and the Government du Québec to connect, develop and protect the territory. This agreement will allow the planning and execution of a 30-year infrastructure program that aims to facilitate transportation of people and goods and increase the value of natural resources.

4.1.1 Provincial Overview: Quebec

Investment in Quebec - Key Takeaways

In regards to investment, in 2022 the province's total investment expenditures in the mining sector were up **10.9%** to $4.8B. Overall, the province has implemented many more action plans to ensure sustainable growth and unlock Quebec's mining potential. An article by Mining.com in June 2023 stated, "Quebec is becoming known for mining project funding that hands out $700M dollars a year and promotes the province as a battery metals hotspot".

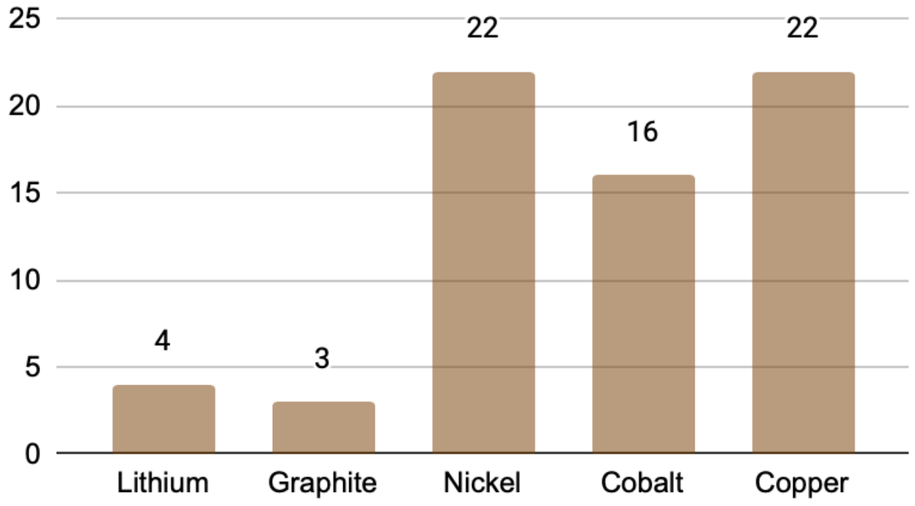
As such, the question can be raised – *is Quebec hindering or encouraging production in the province?* The province has immense mining potential, and it seems as though the Government is investing in this potential. As of 2021, Quebec was noted as the **second highest** mineral-producing province by value at **$11.9B**.

Unfortunately, recent news was released on March 21, 2024, that Quebec's Coalition Avenir Québec (CAQ) government plans to end the Roulez Vert EV rebate program by 2027. The government's decision to phase out its purchase rebate for EV's could be a negative sign towards the strength of the EV transition. On the flipside, it could be as the Government believes that the province is ready to take off on its own. Regardless, removing a rebate will likely decrease demand for the near future, which could be negative for the province's investments.

Overall, it seems Quebec is encouraging production as of now, but if more news is released throughout the year this conclusion is subject to change.

4.1.2 Provincial Overview: Ontario

Figure 14 No. of Mines, Processing facilities, and Projects in Ontario



Source: NRCan Dataset

Ontario is also a very large province, covering more than 1M square kilometers. In 2020, Ontario produced approximately $3.5B in critical minerals. According to the Ontario Critical Minerals Strategy 2022-2027, there is also the frequently discussed ‘Ring of Fire’ that is titled as a transformative opportunity located northeast of Thunder bay containing critical mineral deposits including nickel, and copper.

The Government of Ontario reports incentives for critical minerals exploration and development including:

- A competitive corporate tax rate;
- A mining tax rate that is on par with other Canadian jurisdictions and has a lower remote rate;
- The Ontario Focused Flow-Through Share (OFFTS) tax credit, which helps junior exploration companies access much needed project capital.

Ontario has several agencies, tax acts, and alliances to encourage mining activities within the province. They are broken down and bolded below as cited from the Government reports:

- **Ontario Focused Flow-Through Share (OFFTS) tax credit;**
- **Ontario Junior Exploration Program (OJEP) support program;**
- **Northern Industrial Electricity Rate (NIER) Program;**
- **Northern Ontario Heritage Fund Corporation (NOHFC).**

4.1.2 Provincial Overview: Ontario

Ontario Focused Flow-Through Share (OFFTS) tax credit: this credit provides eligible individual shareholders with a a refundable tax credit of 5% of eligible Ontario exploration expenses, harmonizing with the federal government's 100% bonus deduction and 15% investment tax credit. When combined with the federal tax credit, the OFFTS is estimated to reduce the after-tax cost of a $1,000 investment in exploration by $625 to $375 for Ontario investors. Since 2011, 60% of mines that opened in Ontario were explored by junior exploration companies using OFFTS, leading to $4.3B in mine construction capital costs.

Ontario Junior Exploration Program (OJEP) support program: an initiative of the Ontario government that will help attract investment in early exploration, expand the pipeline of mineral development projects, including critical minerals, and lead to more mines and jobs in Ontario.

Northern Industrial Electricity Rate (NIER) Program: to help Northern Ontario's largest industrial electricity consumers offset their electricity costs, sustain jobs, and maintain competitiveness. The NIER Program provides electricity rebates to qualifying participants as they achieve greater electricity efficiency by committing to the development and implementation of a comprehensive Energy Management Plan. On January 1, 2021, the province removed certain costs from industrial electricity bills, resulting in average savings of 14 per cent for qualifying metal ore mining employers.

Northern Ontario Heritage Fund Corporation (NOHFC): an agency of the Ontario government with funding programs to support new business startups, business expansions and businesses looking to locate new operations in Northern Ontario from outside the province. From research NOHFC seems to prioritize Indigenous communities through workforce programs, and other programs and agreements including

- **Resource Revenue Sharing (RRS)** agreements: Ontario shares the economic benefits from resource development with Indigenous communities;
- **Aboriginal Participation Fund (APF)**: a $4.7-million annual fund that supports the capacity of communities to participate in Aboriginal consultation, as well as education and relationship-building activities related to mineral exploration and development.

4.1.2 Provincial Overview: Ontario

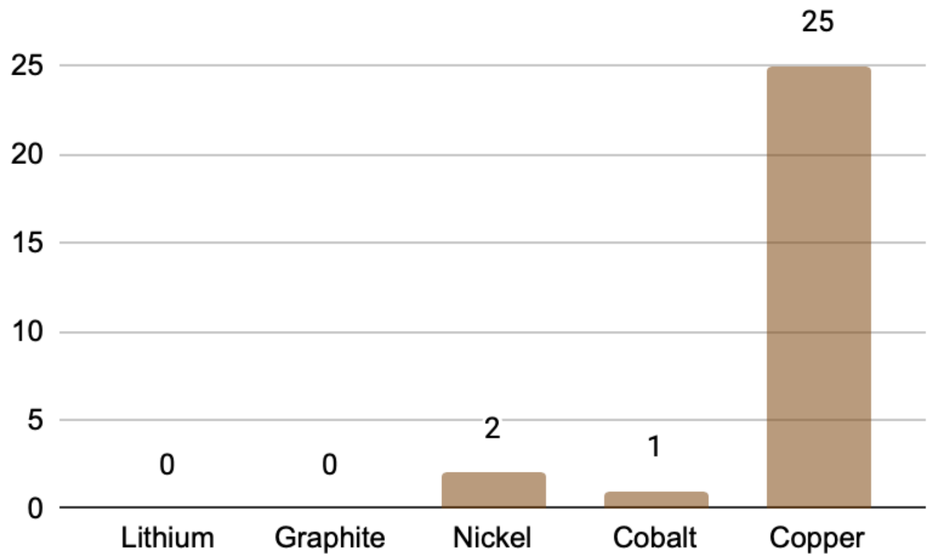
Investment in Ontario - Key Takeaways

As of March 26, 2024, “Ontario’s new budget expands the critical minerals innovation fund by $15M as the province prepares to enact streamlined mining permit approvals next week”.

As such, the question can now be raised for Ontario – is the province hindering or encouraging production? Looking at all the programs, it would seem intuitive to say yes, the province is encouraging production, but government incentives seem to be more challenging to pin down, and it seems as though the province is actually hindering production. Furthermore, Ontario is the **third** mineral-producing province by value at **$11.1B.**

4.1.3 Provincial Overview: British Columbia

Figure x No. of Mines, Processing facilities, and Projects in British Columbia



Source: NRCan Dataset

British Columbia covers an area of 944,735 square kilometers. The province has approximately 30 industrial mining operations and over 1,000 aggregate mine operations active. British Columbia has a government that is supportive of reducing carbon emissions whilst still encouraging mining production. The main pieces of legislation that govern major mines in BC are the Environmental Assessment Act, the Mines Act, and the Environmental Management Act.

The B.C. Critical Minerals Strategy is focused on accelerating growth whilst building strong partnerships with Indigenous Communities. The province also has released a clear roadmap with actionable targets towards reducing emissions. Some government incentives, policies, and taxes include:

- **BC Carbon Tax - 2024 Output-Based Pricing System (OBPS);**
- **The CleanBC Industrial Incentive Program (CIIP);**
- **BC Mining Exploration Tax Credit;**
- **Innovative Clean Energy Fund (ICE).**

4.1.3 Provincial Overview: British Columbia

Government Incentives, Policies, and Taxes include:

BC Carbon Tax - 2024 Output-Based Pricing System (OBPS): this will come into force on April 1, 2024. The OBPS in BC is a performance-based, cap-and-trade mechanism that sets emission pricing and standards, incentivizing reductions and offering rebates for cleaner industrial operations below sector benchmarks. The OBPS is combination of annual performance-based evaluation and cap-and-trade system to price emissions and incentivize reduction.

The CleanBC Industrial Incentive Program (CIIP): encourages cleaner industrial operations by reducing carbon tax costs for facilities that can demonstrate their operations are among the lowest emitting for their sector compared to world-leading greenhouse gas emissions benchmarks.

BC Mining Exploration Tax Credit: the credit is calculated as 20% of qualified mining exploration expenses less the amount of any assistance received or receivable. Assistance includes reimbursements you have received or are entitled to receive, as well as grants, subsidies, rebates, and forgivable loans.

Innovative Clean Energy Fund (ICE): a Special Account, funded through a levy on certain energy sales, designed to support the province’s energy, economic, environmental and greenhouse gas reduction priorities, and to advance B.C.'s clean energy sector.

4.1.3 Provincial Overview: British Columbia

Investment in British Columbia - Key Takeaways

British Columbia has focused their policy incentives heavily on environmental incentives within the industry. The province's critical mineral strategy states that it is a "World Leader in ESG".

Further, the strategy states that there are approximately $1B in provincial government revenue to support services.

It is time to raise the question for the final time – is B.C. hindering or encouraging production in the province? B.C. seems to be encouraging production through an environmental lens, which is a long-term strategy. It should be noted that British Columbia is the **highest** mineral-producing province by value at **$12.9B**.

4.1 Provincial Overview: Rankings

Rankings in terms of Valuations and Encouragement (highest to lowest):

1. **British Columbia**

2. Quebec

3. Ontario

Using the information outlined above, it is evident that the provinces can be ranked from most encouraging to least – and these rankings are in alignment with the valuations of production per province. British Columbia seems to be the most encouraging province and also has the highest valuation. Second is Quebec, followed thirdly by Ontario. It is interesting to highlight that these provinces' policies are aligned with their valuations.

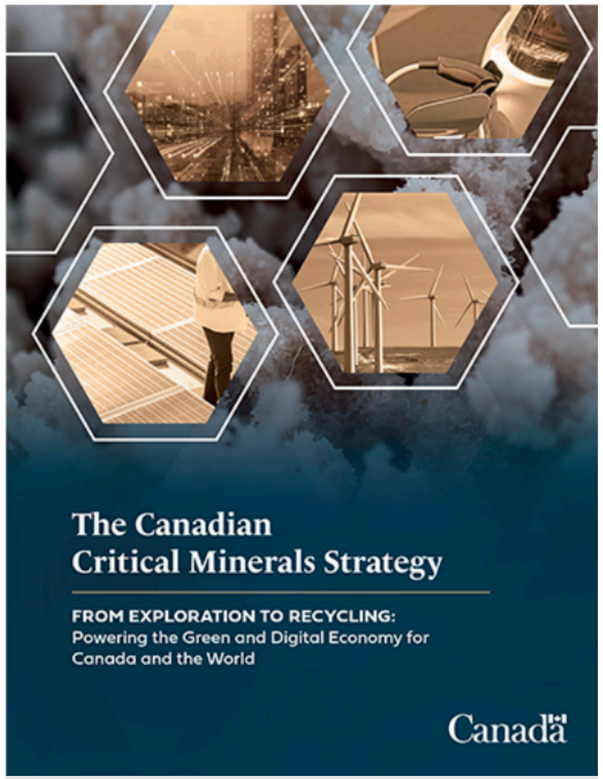
4.2 Federal Overview: CCMS

Canada is a large country with enormous quantities of natural resources spread across the provinces. The Canadian government states they are committed to encouraging critical mineral production and providing various incentives. The following section will outline the Canadian Critical Mineral Strategy, serving as the federal cornerstone for critical mineral activity, as well as various programs and incentives available for production in the country.

The Canadian Critical Mineral Strategy is all encompassing but focused on **five key objectives**:

1. Supporting economic growth, competitiveness, and job creation.
2. Promoting climate action and environmental protection.
3. Advancing reconciliation with Indigenous peoples.
4. Fostering diverse and inclusive workforces and communities.
5. Enhancing global security and partnerships with allies.

Of the 31 minerals outlined in Canada's report, six are prioritized for their distinct potential to spur Canadian economic growth and their necessity as inputs for priority supply chains. The five minerals included in this report lithium, graphite, nickel, cobalt, copper were highlighted along with rare earth elements.



Source: Government of Canada

4.21 Federal Overview: CCMS

The Canadian government has made budget commitments from 2021 and 2022 to cover different aspects of the value chain, from exploration to processing and refining :

- **$79.2M** for public geoscience and exploration to better identify and assess mineral deposits.
- **30%** Critical Mineral Exploration Tax Credit for targeted critical minerals.
- **$47.7M** for targeted upstream critical mineral R&D through Canada's research labs.
- **$144.4M** for critical mineral research and development, and the deployment of technologies and materials to support critical mineral development for upstream and midstream segments of the value chain.
- **$1.5B** for the SID to support critical minerals to projects with prioritization given to advanced manufacturing, processing, and recycling applications.
- **$40M** to support northern regulatory processes in reviewing and permitting critical minerals projects.

4.21 Federal Overview: CCMS

The Government of Canada has put forth various programs and funding for critical minerals projects. A comprehensive list can be found below and continued on the following page:

Critical Minerals Exploration Tax Credit (30% tax credit based the amount invested) (CMETC): to enable the exploration of critical minerals, a new 30 percent Critical Mineral Exploration Tax Credit is being introduced (as of April 2022 and on or before March 31, 2027) that would be available to investors under certain flow-through shares agreements to support specified exploration expenditures incurred in Canada. This tax credit is applicable to specific critical minerals including nickel, lithium, cobalt, graphite, copper, among others.

Strategic Innovation Fund Net Zero Accelerator: Innovation Science and Economic Development Canada (SIF): as part of the Canadian Critical Minerals Strategy, SIF is mandated to support critical minerals projects, mainly in the areas of mineral processing, manufacturing, and recycling. A minimum of $10M is available per project to fund projects that meet eligible cost requirements. SIF contribution amounts are repayable by default. While portions may be non-repayable, such amounts would only be considered on a case-by-case basis where significant benefits for Canadians are confirmed. This will be one of the most significant direct funding mechanisms in Canada’s toolkit.

Critical Minerals Centre of Excellence (CMCE): $21.5M to support the Critical Minerals Centre of Excellence (CMCE) to develop federal policies and programs on critical minerals and to assist project developers in navigating regulatory processes and federal support measures.

Critical Minerals Research, Development and Demonstration Program (CMRDD): provides funding for pilot plants and demonstration projects. The program will help develop essential mineral value chains that will contribute to Canada's goal of being a net-zero carbon emitter by 2050.

4.21 Federal Overview: CCMS

The Government of Canada programs and funding for critical minerals projects (Continued):

Critical Minerals Geoscience and Data (CMGD) Initiative: this provides funding to advance the availability of valuable data and insights on the location, quality, and economic feasibility of critical minerals resources. By harnessing the power of geoscience and data, we will pave the way for the responsible growth of industries reliant on these minerals, from technology and energy to defence and infrastructure.

Indigenous Natural Resource Partnerships Program (INRP): this aims to increase the economic participation of Indigenous communities and organizations in the development of natural resource projects that support the transition to a clean energy future. The 2022 budget allocates $103.4M to advance economic reconciliation through enhanced readiness to meaningfully participate in the natural resource sector, including at least $25M to support Indigenous participation and early engagement in the Critical Minerals Strategy.

Canadian Critical Minerals Infrastructure Fund (CMIF): The CMIF will provide up to $1.5B in federal funding over seven years for clean energy and transportation infrastructure projects necessary to enable the sustainable development and expansion of critical minerals in Canada. Up to $300M in contribution funding is also available with the following limits applicable to projects in two streams:

- up to $50M per project for nongovernmental applicants.
- up to $100M per project for provincial and territorial governments.

4.21 Federal Overview: CCMS

Beyond these programs mentioned above, there are additional funding, incentives, and supported offered by the Government of Canada such as:

- **Regional Development Programs**
- **Canada Growth Fund**
- **The Business Development Bank of Canada (BDC)**
- **Export Development Canada (EDC)**
- **Sustainable development Technology Canada (SDTC)**
- **Scientific Research and Experimental Development (SR&ED) tax incentives**

Finally, there is the **Canada Infrastructure Bank (CIB).** The CIB acts as a complementary financing source to accelerate the development of Canada's critical mineral resources and supply chains by enabling infrastructure projects. This includes but is not limited to access roads, clean power generation, and transmission along with wastewater management facilities. As well, the CIB will target investments of at least $100M, except those projects owned by Indigenous communities.

As of March 7, 2024, the Energy and Natural Resources Minister Jonathan Wilkinson "announced federal investments of more than $15M in projects to increase Indigenous participation and support the development of Canada's critical minerals sector. Thus, exemplifying Canada's commitment to financing critical minerals.

4.3 The Overarching Questions

This section will conclude with revisiting the overarching question of *“do businesses need more hedging strategies, are the incentives sufficient? Do the Government or end users need to do more?”* With the information detailed above, this question will be answered from a provincial, federal, and end user perspective.

Provincially, it seems that British Columbia is doing a good job incentivizing not just business, but sustainable initiatives, which is a beneficial long term strategy. Quebec has also done a good job incentivizing business but with the news that the provincial government will phase out its purchase rebate for EV’s, their incentives could change. Finally, Ontario seems to be lagging the furthest behind in regards to business incentives, so there is room for improvement within this province.

Federally, although the Government of Canada has made significant investments to support the development of critical mineral projects, the Government needs to do more to actually initiate the start of projects. For industry research, an informational interview was conducted with an individual working for a heavy equipment manufacturing company, who is looking to electrify mine-fleets. This individual detailed his perspective of what’s happening is that the industry is waiting for someone to take that first leap so there needs to be more Government incentive to do so. Although there are incentives and tax breaks available, there are high overhead and startup costs in mining. As such, the Government needs to be incentivizing companies to take that leap.

Finally, looking at the **end users**, they also need to be applying more pressure on Governments. In order for Government’s to push forward with action whether it be climate related, or to incentivize investment, end users have to collectively push the policies forward.

4.4 US-CANADA: Critical Minerals Relations

The United States lacks significant domestic critical mineral production and security. Over 80% of their critical minerals supply comes from foreign sources, with China accounting as the primary import source for various minerals. In an attempt to diversify sources of critical minerals, US-Canadian critical minerals relations have been increasing in priority over the past few years, demonstrated by legislation and funding including the IRA, Canada-US Joint Action Plan on Critical Minerals Cooperation, and the Defense Production Act.

While political will is present, some projects especially in the graphite sector have benefitted from government funding and collaborations, however most projects await decisions and experience slow funding. There have also been a few collaborative projects in nickel and cobalt, and minimal collaborations in copper due to existing US copper production.

The United States and Canada enjoy various collaborative ambitions to enhance critical mineral cooperation. The Inflation Reduction Act (IRA) places a large role and opportunity for Canadian mining producers, treating Canada as a “domestic” source as it seeks to replace foreign dependence on critical minerals. The Canada-US Joint Action Plan was released in 2020, which improves critical minerals security, ensures competitiveness in national industries, and guides cooperation to encourage job growth, investment and security. The US and Canada have also updated the Joint Action Plan on Critical Minerals Cooperation, where the Departments of State, Commerce, Defense, and Energy and the U.S. Geological Survey work with Canadian counterparts to allow increased data sharing, efforts to engage the private sector, and research and development. The US also announced US$250M in Defense Production Act (DPA) funding for US and Canadian companies to mine and process critical minerals for electric vehicles and stationary storage batteries. Canadian officials have provided the US with a list of at least 70 projects that could warrant US funding, which is open until July 2024. A few projects have received funding, such as Graphite One’s Alaska project, while others await a decision.

4.4 US-CANADA: Critical Minerals Relations

Graphite

US-Canadian graphite collaboration remains active due to a complete lack of US domestic production since 1990. Graphite One received subsidies from the IRA & DPA of US$37.5M for a mining project in Alaska, which seeks to fast-track a feasibility study and the company to put up the rest, totalling US$75M total. Nouveau Monde Graphite (NMG) is also in agreement with General Motors (GM) including a US$150M investment to produce an active anode material in Quebec as part of the EV supply chain.

Nickel

US-Canadian collaboration in the nickel sector remains quite low. One of the only notable collaborations features Canada Nickel Company Inc., which has entered into a Subscription Agreement with Anglo American today to make an approximately $24M investment in Canada Nickel (Anglo American to own 9.9% of Canada Nickel).

Cobalt

The United States has a few cobalt mines in development, serving as the world's 12th largest producer but contains very minimal production. Nevertheless, there remains a lack of US-Canadian cobalt collaboration, with First Cobalt's Iron Creek copper-cobalt project in Idaho as one of the only public cobalt collaborations.

Copper

Copper was only added to the US critical minerals list in mid-2023, and domestic US production of copper is present with the country owning around 20 operational copper mines, with many in development and serves as the world's 5th largest copper producer. In turn, there is a lack of numerous US-Canadian collaborations in copper activities. One example of collaboration includes Aston Bay and American West Metals exploration for the Storm Copper project in Nunavut, which is conducted and funded by American West.

5. KEY TAKEAWAYS: Critical Minerals Outlook

Our analysis of Canadian investment dynamics highlights that the potential for Canada to become a major player for any of the minerals featured in this report is highly dependent on the government's capacity to support mining companies through the mine development process.

- **Financing** is the most important obstacle to achieving growth in raw mineral output and ultimately at later stages of the supply chain, due to the prevalence of junior mining companies and low commodity prices for the minerals at the moment.
- It is also essential that both the **federal and provincial governmen**t effectively address permitting issues and facilitate consultation processes with local stakeholders, to allow CM projects to make it to the finish line and raise Canada's mineral production capacity, to respond to increased demand.

6. KEY TAKEAWAYS: Critical Minerals Outlook

In terms of policy, our comparative analysis of the three major Canadian mining provinces reveals that both Quebec and British Columbia are effectively using policy to attract investment in mining projects. On the other hand, Ontario needs to implement more incentives and encourage mining production to successfully increase the province's mineral output. On the federal level, although Ottawa has made significant investments to support the development of critical mineral projects, the Government needs to provide additional support at earlier stages of pre-production to further stimulate the creation of new projects. End users also need to apply more pressure on federal and provincial governments to incentivize a more sustainable approach to mining and to increase production output.

Finally, policies such as the IRA, the DPA, and the Canada-US Joint Action Plan on Critical Minerals Cooperation demonstrate the increasing emphasis on US-Canadian critical minerals relations. A limited number of mining projects, notably in graphite, have benefitted from US-Canada collaboration on critical minerals; however, most projects await regulatory approvals and experience slow funding. While the IRA has shown potential benefits for Canada's critical mineral mining market, the policy has intensified competition at more value-adding stages of the supply chain, especially processing and battery manufacturing.

6. KEY TAKEAWAYS: Critical Minerals Outlook

Caveats and important questions further research should address :

- Our conclusions are based on the expectation that demand for critical minerals will be driven by an increase in EV production. However, the safety of that assumption is still uncertain, especially after the sector underperformed in the past year, contrary to expectations.
- The lack of available data on tax incentives take-up makes the analysis of federal and provincial tax policies' effectiveness arduous. A granular study of mining companies' take-up of federal and provincial tax incentives is needed to better understand how these can be improved. This may require more in-depth research and interviews with Canadian critical mineral companies.
- Similar issues regarding data availability on project timeline led to similar difficulties in making prediction about future Canadian production capacity for each mineral, due to the inherent uncertainties in project timelines for Canadian projects.
- As we have seen, the concerns regarding investment and federal and provincial policies are, for the most part, not new to the mining sector. How to make the government more responsive to the private sector's needs?

The next couple of years will determine whether Canada can position itself as a major player in the critical mineral supply chain. The question is whether the public sector will be able to effectively support the growth of the Canadian market. The federal government's recent restrictions on investments by foreign state-owned enterprises in the critical mineral sector highlight the challenge of balancing national security concerns with Canadian mining companies' need for funding. It remains to be seen whether the Canadian government can effectively leverage available tools to support the growth of the Canadian critical mineral sector while navigating an increasingly complex world order.

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