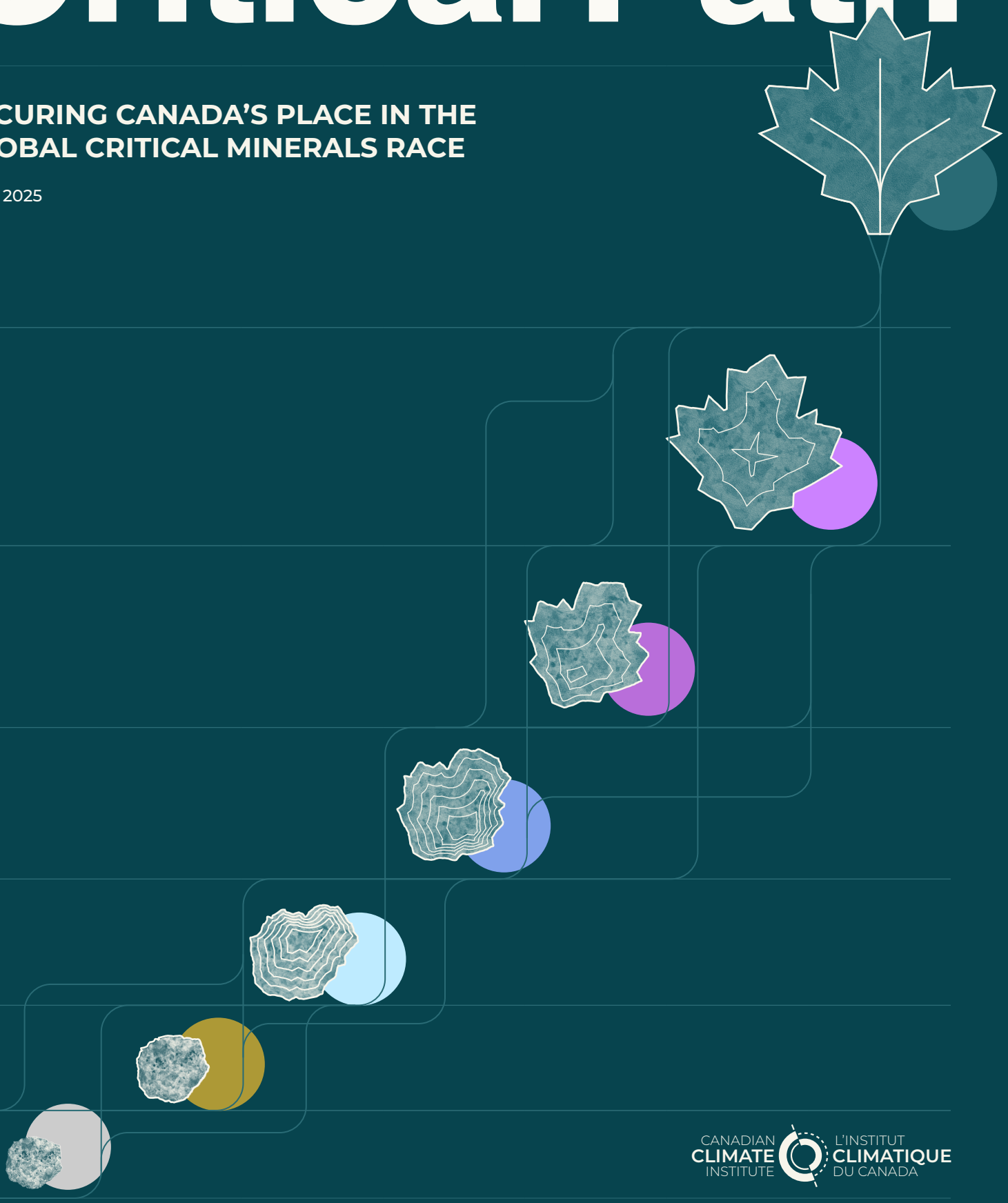
Critical Path

SECURING CANADA'S PLACE IN THE GLOBAL CRITICAL MINERALS RACE

June 2025



CANADIAN CLIMATE INSTITUTE
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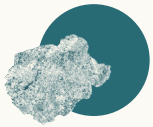
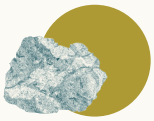
Executive Summary

Increasing Canadian production of critical minerals presents a huge economic opportunity for new growth and prosperity. Seizing that opportunity, however, requires new policy to help attract investment and speed up project development while navigating an increasingly volatile and competitive trade environment. Smart policies can reduce risk for investors to deliver net economic benefits for Canada and for local communities. This report provides a map for doing so.

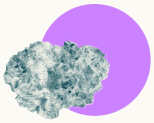


The world needs more critical minerals

Long-term global investment trends toward cleaner energy systems are clear and accelerating (IEA 2024b). And while recent actions in the United States may slow the pace of adoption in that jurisdiction, the broader transition to clean energy is expected to continue worldwide.

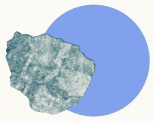


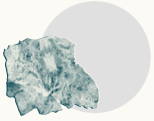
Producing clean energy technologies at the scale and pace necessary to meet the rising global demand will require a substantial new supply of minerals and metals, even after accounting for the fact that clean energy systems will require fewer material inputs overall than those based on fossil fuels.



Even in ambitious recycling scenarios, this surge in clean energy investment will require more extraction of six minerals in particular[1]: cobalt, copper, lithium, nickel, graphite, and rare earth elements. Industry worldwide will need these six critical minerals to manufacture solar photovoltaic (PV) modules, wind turbines, electric vehicles and charging stations, and batteries of all shapes and sizes.

By 2050, demand for critical minerals could increase by three to 90 times depending on the mineral and scenario. For example, demand for lithium is expected to grow between 11 and 17 times between 2023 and 2050[2] (IEA 2024b). By another estimate, the global mining sector will need an additional USD$480 billion to $750 billion in capital investment if it is to produce and process critical minerals in the quantities that decarbonization demands





1. This report focuses on six clean growth critical minerals out of the 34 listed in the federal Canadian Critical Mineral Strategy (NRCan 2022b). These six priority minerals are: cobalt, copper, graphite, lithium, nickel, and rare earth elements. Each of these minerals will be central to the global energy transition, with multiple clean growth applications. Canada has significant deposits of these six minerals, particularly cobalt, graphite, lithium, and nickel.

2. Range includes three IEA scenarios: stated policies, announced pledges, and net zero.

(Energy Transitions Commission 2023). The economic upside is enormous. In a scenario where the world meets its climate pledges, we expect that annual demand for critical minerals, including the six critical minerals, will reach a value of $770 billion by 2040[3] (Trottier-Chi 2024).

This report aims to better understand the opportunities and risks linked to a ramp-up of critical mineral mining in Canada, and what governments should do to enable development of these resources in ways that uphold Indigenous rights and maximize benefits for Canada's prosperity and energy security—without compromising environmental protections. Our analysis draws on multiple sources of data, including expert interviews, quantitative market analysis, an online survey, and extensive review of primary and secondary documents (See **Box 4**).

The opportunity for Canada is real—and large

Canada has ample reserves of these minerals, and their extraction and processing are a potential driver of significant economic growth. Canadian minerals could meet domestic demand and help others, including European Union (EU) member states and the U.S., secure their supply chains and become less reliant on minerals from a few dominant suppliers, including China, today the world's most powerful producer by far.

The continued threat of punitive tariffs from the current U.S. administration emphasizes the strategic value of bringing Canadian critical minerals to global markets—and quickly.[4] Yet despite the significant shift in policy, many of the key fundamentals have not changed for the U.S.: the nation has insufficient domestic supply of key critical minerals (e.g., cobalt and rare earth elements) and wants to diversify away from Chinese suppliers. Critical minerals exports could help Canada find a productive path through increasingly turbulent trade dynamics—but only if resource extraction is feasible within a reasonable timeframe.

Canada's domestic demand—expected to be valued at over $16 billion per year by 2040 (Trottier-Chi 2024)—largely comes from an emerging battery production industry, which has recently attracted billions of dollars in private and public investments.

Expanding Canada's critical mineral mining activities could capitalize on some of the economy's inherent strengths, including a well-regulated financial sector with extensive mining expertise, relatively higher environmental,

3. Based on the International Energy Agency (IEA) Announced Pledges Scenario.
4. Demand for critical minerals for defense-related applications is also rising.

social (including labour), and governance standards, proximity to buyers, and a low-carbon power grid with relatively competitive electricity rates.

Yet current investment in Canada's upstream mining of critical minerals is not keeping pace with both domestic and global demand growth (Bourassa and Arnold 2024). We estimate that Canada requires new investment between about $30 billion and $65 billion in upstream mining projects between now and 2040 to tap into its production potential (Trottier-Chi 2024). Based on average production capacities, this would mean that Canada must open more than 30 new mines over the same time period.

A package of policies can help unlock capital flows in Canada's mining sector to realize those opportunities.

Our findings and recommendations are grouped into four categories.

Providing investors certainty on commodity prices can directly de-risk mining projects

Despite strong demand projections, investors face significant financial risks. The economic viability of Canadian critical mineral mining projects will hinge on future market prices—some of which are extremely volatile. High price volatility makes it more difficult to secure financing while also delaying project development and interrupting operations (Collard et al. 2024; Jamasmie 2024).

Markets for some critical minerals (e.g., lithium and rare earth elements) are still immature and opaque. As a result, prices for these minerals are extremely volatile and at the whim of interference by a few powerful players (IEA 2023).

These findings were also a top concern identified by our interviewees and survey participants.

Recommendation 1

The federal government should give an arms-length financial institution the mandate to develop or expand financial risk-sharing agreements, such as equity investments, contracts for difference, and offtake agreements, to temporarily share the risk related to the high price volatility for some critical minerals with investors.

There is a role for governments to significantly reduce these risks and help overcome a central hurdle to investment in critical minerals in Canada.

Financial risk-sharing agreements between governments and mining companies can take various forms.

The most direct way for a public investor to share the financial risks of a mine is to take equity shares in the project. As equity holders, governments can provide patient capital that private markets won't, sharing both the downside risks and the upside potential of projects in the face of long payback periods.

Contracts-for-difference are contracts designed to protect producers from price volatility by establishing a fixed reference price or reference price range. When market prices fall below the defined threshold, a government pays the difference to the producer. When prices rise above it, the producer pays the surplus back to the government. Designed well, these risk-sharing

contracts are more fiscally conservative than direct subsidies because government support merely serves as a backstop mechanism, while also making it easier for projects to secure private capital. The reference price or price range determines the allocation of risks and revenues between the parties. These contracts should be temporary in nature while markets mature and become more predictable. Only projects that are close to economic competitiveness and a final investment decision should be eligible for support to increase the likelihood that the project will be profitable in the long run and therefore able to attract private capital.

Offtake agreements can significantly reduce demand- and price-risks for mines and help projects secure financing. An offtake agreement is a contract between a producer, such as a mining company, and a government, in which the government agrees to purchase all or a portion of the producer's output at a predetermined price or term. However, this level of public support should be reserved for mines that have particular strategic importance for Canada, especially when it comes to energy security, or in cases when Canadian governments decide to strategically stockpile certain minerals. However, the physical storage of stockpiled minerals may pose practical challenges.

Respecting Indigenous self-determination de-risks projects and enables partnerships

Canada's critical mineral mining sector will only thrive if Indigenous communities impacted by new mining projects have meaningful opportunities to participate. The principles of free, prior, and informed consent, and Indigenous self-determination, are essential to the decision-making process for mineral projects. They ensure Indigenous communities are able to participate in the economic opportunities and manage the related risks in line with their worldviews, cultures, and values.

Some Indigenous communities embrace the economic opportunities that come with new mining projects, entering partnerships with mining companies or acquiring equity stakes in mines. Active participation in decision-making over the entire lifecycle of a mining project—from exploration to reclamation—enables Indigenous communities to limit risks to their territories and rights, and realize opportunities.

In some cases, Indigenous communities may still decide the risks outweigh the opportunities. Mining can compromise Indigenous communities' ability to fully exercise their rights and practices that support their traditional lifestyles, even with early, meaningful engagement. Historically, both governments and the mining industry in Canada have overlooked the rights and

well-being of Indigenous Peoples, causing harm to communities, and this practice persists in some mining companies and some government decisions even today.

In interviews with Indigenous participants, we consistently heard that strengthening Indigenous self-determination and participation in mining projects can also reduce risks for investors by providing greater clarity early on about aspects of the project that Indigenous communities may oppose, thus enabling smoother, quicker regulatory assessment processes. In the long run, Indigenous partnerships can also prevent lengthy litigation.

Investing in mutual partnerships with willing Indigenous communities is therefore a necessary condition for building successful projects that help realize economic opportunities for Indigenous communities, investors, and Canada as a whole.

In contrast, going ahead with projects despite opposition from affected Indigenous communities poses significant risks—to Indigenous rights, investors, and ultimately to realizing Canada's critical mineral potential.

Recommendation 2

Canadian governments should support the ability of Indigenous communities to exercise their right to self-determination and economic participation in critical mineral mining projects by scaling up resources for capacity building and enhancing their access to capital for equity ownership in projects.

Indigenous participants also shared that many Indigenous communities do not have sufficient capacity or resources to fully engage with project opportunities in the mining sector. They lack access to the capital required to become mining project owners themselves or invest in purchasing an equity share within a project.

To enhance Indigenous communities' ability to actively participate in critical mineral projects, the federal government should provide flexible funding for capacity-building. This would ensure that Indigenous communities can give input and direction on mining projects that affect them throughout the mining lifecycle. We heard this in interviews with a wide range of Indigenous participants. Government funding could include funding for community positions, Indigenous-led programs to increase capacity for consultation and project participation, and Indigenous-led environmental assessments.

Provincial governments should create Indigenous loan-guarantee programs that can help Indigenous communities build economic partnership and equity ownership in critical mineral projects. In cases where loan-guarantee programs already exist, a dedicated stream for minerals should be created to address the unique capital expenditure and risk tolerance required for critical minerals, if one is not already available. The Alberta Indigenous Opportunities Corporation and the Saskatchewan Indigenous Investment Finance Corporation both include mineral streams.

Improving environmental protections de-risks projects for local communities and investors

Environmental risks of new mining projects equal high risks for investors—for multiple reasons.

First, it will be impossible to build new mines at the scale and pace required against local opposition (Davis and Franks 2014; Schlote 2023). Ramping up Canadian mining requires building and maintaining support from local communities and the Canadian public. In particular, inadequate storage of mining tailings and abandoned mines expose local communities (including Indigenous communities) to increased health and safety risks while also leaving the Canadian public to shoulder high clean-up costs. Recent mining disasters in Canada, such as the 2014 Mount Polley tailings dam failure in B.C. or the 2024 heap leach failure at the Eagle Gold Mine in the Yukon, illustrate how high-profile events can impact trust in the industry and confidence in the regulatory systems established to protect communities (Hunter 2014; CBC 2024).

In addition, international buyers want to diversify their critical mineral supply chains because they are primarily interested in one thing: reliability of supply. High environmental risks and incidents compromise reliability, both actual and perceived.

Recommendation 3

Provincial governments should strengthen mining regulations to reduce environmental risks and liabilities for Canadian communities and ensure reliable supply.

Canadian regulations of mining operations, including tailings management and mine closure, are not always aligned with leading international standards, and their enforcement is often lacking (Pollan and Al-Aini 2025).

Provincial governments should enhance existing tailings-management regulations to meet leading international standards such as Towards Sustainable Mining (TSM) or the Global Industry Standards for Tailings Management (GISTM). These standards cover the whole lifecycle of a tailings facility, from early design to planning for disaster response.

Many mining companies are already voluntarily moving towards compliance with TSM or GISTM—often in response to pressure from institutional investors—but all provinces should update regulations to make these standards mandatory.

To improve the regulation of mine closures, provincial governments should also strengthen existing financial assurance mechanisms for end-of-mine-life liabilities to ensure that clean-up costs are not shouldered by the public. These mechanisms require mining companies to set aside funding upfront to cover closure and post-closure activities. Governments should require these funds to be liquid, independently reviewed, and sufficient to cover actual costs. These measures will also incentivize mining companies to proactively mitigate post-closure risks by better managing environmental impacts throughout the mine's life.

These additional compliance measures will add costs to some producers in the short run but governments can help reduce this burden on companies by phasing in changes over time. Ultimately, these changes will help instill confidence in local communities and can lead to cost savings by preventing opposition from local communities (Indigenous or non-Indigenous), conflicts and litigation, which all contribute to long project development times.

Reducing delays in regulatory reviews is an urgent priority—for critical mineral mining projects and beyond

Respondents to an online survey[5] conducted for this study indicated that long, sometimes unpredictable review and permitting processes for mining projects are the most important barrier to investment in the sector (Bourassa and Arnold 2024).

There are no quick fixes—this is a complex, longstanding policy issue that affects projects beyond the critical mineral mining sector and requires careful analysis and smart reform (Cleland and Gattinger 2025). Developing specific policy recommendations is beyond the scope of this report, yet our analysis provides some useful insights for governments addressing this challenge.

Recommendation 4

Canadian governments should avoid cutting back environmental safeguards and Indigenous consultations to shorten regulatory approval processes for critical mineral mining projects (and other major clean growth projects), as doing so is likely to backfire.

This analysis finds that projects built on strong Indigenous partnerships and effective management of environmental risks have a higher likelihood of being profitable and contributing to the successful growth of Canada's critical mineral mining sector. Well-designed regulatory regimes for project reviews and permitting can play a central role in identifying these "winning" projects.

Given the geopolitical tensions around critical minerals, Canadian governments are facing pressure to get these resources to market as quickly as possible. However, while fast-tracking or expediting projects by scaling back environmental regulations and/or requirements for Indigenous consultations may seem like quick ways to shorten project review times, they often lead to longer development timelines overall—primarily by inviting opposition from local communities (Indigenous and non-Indigenous), which often results in lengthy and costly court proceedings.

5. We conducted an online survey (n=174), in partnership with TMX Group, investigating barriers and potential solutions to building out Canada's critical minerals value chain. The majority of the respondents (115) came from industry, representing companies active in exploration, extraction, refining, manufacturing. See **Appendix A** for more information.

Nevertheless, there are opportunities for cutting review times without compromising environmental safeguards and Indigenous rights.

Recent studies identify ways in which governments can enhance process efficiency of regulatory reviews (see, for example, Cleland and Gattinger 2025).

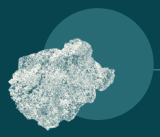
Also, considering new mining development at a regional level—i.e., in parallel with conservation planning—can help protect ecosystems and biodiversity while also giving investors more clarity early on about where and under what conditions new projects are possible—or not. Indigenous leadership in land-use planning and in identifying conservation areas that are off limits for new mines can safeguard Indigenous rights and speed up reviews for individual projects while also building broader support.

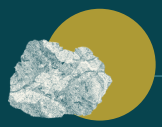
Finally, our findings also show that regulatory delays are not the only driver of long development timelines—and sometimes not even the most important one (Collard et al. 2024). Economic factors such as price volatility also frequently hold up progress, as do limited capacity and resources in Indigenous communities to engage with project opportunities. The recommendations in this report address these drivers of delays.

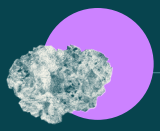
SECTION 1

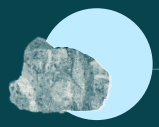
Introduction

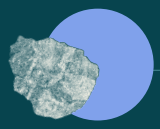
The critical mineral opportunity for Canada is real—and large

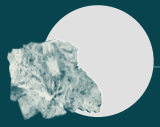












1.1 Surging global demand for critical minerals

The buzz about critical minerals has risen to a fever pitch in recent years—and for good reason. These raw materials are "critical" because they are essential inputs to several strategic growth sectors, including clean energy but also defence, space, and digitalization.

"Six materials in particular—cobalt, copper, lithium, nickel, graphite, and rare earth elements—are essential for producing the energy technologies that will fuel the world's low-carbon economy."

Six materials in particular—cobalt, copper, lithium, nickel, graphite, and rare earth elements—are essential for producing the energy technologies that will fuel the world's low-carbon economy, which is the focus of this report. Industry around the globe will need more of these six critical minerals to manufacture solar PV modules, wind turbines, electric vehicles, charging stations, and batteries of all shapes and sizes.[6]

Bloomberg New Energy Finance (BNEF) estimates that demand for critical minerals could balloon by as much as 2,100 per cent between 2022 and 2050, depending on the mineral and degree of decarbonization ambition pursued (Huo et al. 2024). The world needs more critical minerals, even in ambitious recycling scenarios (see **Box 1**).

But global investment in supply is not holding up. Rising geopolitical tensions as well as increasing environmental and social challenges create risks for the global mining industry. The sector will need an additional USD$480 billion to $750 billion in capital investment if it is to produce and process critical minerals in the quantities that decarbonization demands (Energy Transitions Commission 2023). Without a rapid ramp-up of investment, some analysts fear key critical minerals such as lithium, cobalt, graphite, and nickel could be in short supply by 2028 (Goldman et al. 2024).

Given the critical value of these materials for global energy systems, it is not surprising that governments of the world's most advanced economies—including the United States, the European Union (EU), and Australia—are jockeying for position to compete on critical minerals. These governments are looking to either establish themselves as leading suppliers or to secure access to reliable and affordable supply.

6. Unlike fossil fuels, which are primarily combusted when used and require indefinite production, the materials underpinning energy transition technologies are highly recyclable and require less extraction of raw natural resources. According to the Energy Transitions Commission, for example, the total cumulative material required for the global energy transition is equivalent to less than one year of current coal consumption (by mass) (Energy Transitions Commission 2023). Even under optimistic assumptions about re-use, recycling rates, and technology efficiencies, however, the energy transition still requires a massive build-out of critical mineral extraction and mining (Walter et al. 2024).

For countries without adequate critical mineral reserves, establishing resilient, diversified supply chains is a matter of both energy and national security. A few large producers of upstream critical mineral products, including China and Brazil, dominate the global market, which makes it risky for buyers to become dependent on any one producing jurisdiction. That is one reason the United States and European governments have been eager to diversify their supply chains and build resilient networks.

For countries like Canada and Australia that have domestic reserves, the surging demand means a potentially enormous economic opportunity. In a scenario where the world meets its climate pledges, we expect annual demand for critical minerals, including the six critical minerals, will reach a value of $770 billion by 2040 (Trottier-Chi 2024).

Box 1

RECYCLING IS CRUCIAL BUT WILL NOT BE ENOUGH TO MEET INCREASING DEMAND FOR CRITICAL MINERALS—AT LEAST IN THE SHORT RUN

The availability and costs of recycling options will influence demand for extracting new critical minerals. Circularity in the critical mineral supply chain involves collecting, processing, and repurposing minerals and metals from waste or end-of-life products, then reintegrating them back into the supply chain. For example, EV batteries have components that can be recovered at rates as high as 95 per cent (Hyundai Canada 2024). The International Energy Agency (IEA) estimates that recycling could reduce the demand for new mining by 25 to 40 per cent by 2050 (IEA 2024b).

Recycling of critical minerals offers important environmental and energy security benefits for Canada. Recycling minerals already in circulation minimizes the environmental impacts, including water usage, land disturbances, and greenhouse gas emissions, tied to the extraction and processing of minerals from raw ores (Breiter et. al 2023). It also reduces Canada's dependency on imported minerals and bypasses the lengthy process required to build new mines. Adopting recycling along the critical mineral supply chain is vital to making it more resilient (Domonoske 2024).

Most major modelling exercises conclude that the rate of critical mineral recycling will not keep pace with overall demand for those minerals, necessitating more extraction. In the short to medium term, circularity will be less about reducing reliance on extracted minerals and more about designing products for recycling once they reach their end of life (McCarney 2021). The situation changes around 2040, however. By that point, models suggest there will be enough recycled feedstock and product efficiency improvements to slow or even eliminate demand for raw critical minerals (Browning 2024).

While the federal government has provided support for research and early stage projects, Canada is lagging behind other countries in establishing critical mineral recycling targets. The European Critical Raw Materials Act has set a voluntary benchmark to achieve at least 25 per cent of the EU's annual consumption from recycling (IEA 2024a).

1.2 Canada's opportunity

At least in theory, Canada is well positioned to become a globally significant supplier of these resources and the clean technologies that depend on them (see **Box 2**). The country is richly endowed with deposits of the six critical minerals that the world will need in the global race to net zero. They can be found underfoot in almost every province and territory.

European trading partners see Canada as a trustworthy ally and Canada's critical minerals can play a strategic role in re-defining trade relationships with the U.S.

Box 2

CANADA HAS SEVERAL ADVANTAGES IN CRITICAL MINERALS

- Abundant and as-yet-largely-untapped reserves (See **Figure 1**).
- Already a producer of copper and nickel.
- A well-regulated financial sector with extensive mining-sector experience; as of 2016, the Toronto Stock Exchange and TSX Venture Exchange had hosted more than half of all global mining financings (TSX Venture Exchange 2016).
- Comparatively higher environmental, social, and governance (ESG) standards to attract ESG-focused institutional investors.
- A low-carbon power grid and relatively competitive electricity rates.
- Proximity to growing markets.

Canadian governments have signalled the importance of developing critical minerals, and the ongoing trade tensions with the United States have only strengthened that imperative. In late 2022, the federal government introduced Canada's Critical Minerals Strategy and allocated close to $4 billion for implementation (NRCan 2022a). Since then, many provinces and territories have also released strategies, and some have started to roll out policies intended to access the emerging global market for these resources (see **Box 3** for an overview).

Figure 1

CANADIAN RESERVES AND PRODUCTION VOLUMES OF FIVE CRITICAL MINERALS

Box 3

THE CANADIAN POLICY LANDSCAPE FOR CRITICAL MINERALS

Canada's Critical Minerals Strategy focuses on six main areas: driving research, innovation, and exploration; accelerating project development; building sustainable infrastructure; advancing reconciliation with Indigenous Peoples; growing a diverse workforce and prosperous communities; and strengthening global leadership and security. Its launch in 2022 was backed by a budget of $3.8 billion, to be managed largely by the Strategic Innovation Fund and the Critical Minerals Infrastructure Fund to support projects (NRCan 2022a).

Multiple tax credits provide investment incentives—although they typically cannot be used together. The federal Critical Minerals Exploration Tax Credit offers a 30 per cent tax credit to investors in companies exploring for one of a list of 15 critical minerals. This credit is separate from the 15 per cent Mineral Exploration Tax Credit. Meanwhile, the Investment Tax Credit for Clean Technology Manufacturing provides a refundable tax credit for up to 30 per cent of capital investment into clean technology projects. These include mineral extraction, processing, or recycling projects where critical minerals make up 90 per cent or more of the production (PDAC 2022; Canada Revenue Agency 2024).

Other federal initiatives include the Critical Minerals Centre of Excellence, the Indigenous Centre of Excellence for Mineral Development, and the Ministerial Working Group on Regulatory Efficiency for Clean Growth Projects, all of which are working to streamline project development. The Canadian Innovation Corporation aims to encourage innovation in the sector. Canada is also looking to drive Indigenous participation in critical minerals through the Indigenous Natural Resource Partnership Program and other policy guidance for generating direct benefits to Indigenous communities (Young et al. 2024).

Subnational governments are adopting strategies with policy packages as well. For example, the British Columbia Critical Minerals Strategy sets three goals of First Nations reconciliation, attracting investment, and establishing partnerships in the critical minerals space. Its policies include digital certificates for ESG credentials, a dedicated Critical Minerals Project Advancement Office, and forming of partnerships to build regional infrastructure projects (Government of British Columbia 2024c). The governments of Alberta, Manitoba, Newfoundland and Labrador, Northwest Territories, Nova Scotia, Ontario, Quebec, and Saskatchewan have also adopted critical mineral strategies.

1.3 Unlocking capital flows

Investment in Canada's upstream mining of critical minerals is not keeping pace with both domestic and global demand growth (Bourassa and Arnold 2024). If Canada is to grasp the economic opportunities of establishing its critical minerals value chain, capital must begin flowing to mining projects now.

What is holding back investments and what should governments do to unlock capital flows? This report seeks to answer these questions, drawing on a variety of data sources and analytical methods (see **Box 4**).

Our analysis shows Canada has significant opportunities in the global market for critical mineral products (see **Section 2**). But there are three interconnected types of risk that deter investment in the critical mineral mining sector: direct financial risks, environmental risks, and risks to Indigenous rights. Fortunately, targeted policies can turn these risks into opportunities.

First, financial risks related to project costs, demand uncertainty, and volatile markets make these projects less attractive to investors. **Section 3** of this report examines these risks and policy options for addressing them.

Second, experience shows that successful natural resource development projects require consensus and partnerships with local Indigenous communities over the entire project lifecycle. Mining can pose risks for Indigenous communities' ability to fully exercise their rights that support their traditional lifestyles. While some Indigenous communities embrace the economic opportunities that come with new mining projects, for others, the risks outweigh the opportunities. Risks to Indigenous rights and policy options to reduce them and to support Indigenous communities as project partners, owners, and leaders in critical mineral mining are discussed in **Section 4**.

Environmental risks associated with mining add uncertainty for investors by increasing the likelihood of project delays, disruption in operations, and litigation. **Section 5** discusses these issues and potential policy solutions.

Box 4

RESEARCH METHODOLOGY

Given the complexity of critical minerals mining, we deployed a mixed-methods approach combining quantitative and qualitative methods to inform our analysis:

1. **Review of academic and non-academic literature** on Canada's critical minerals mining sector, including industry opportunities, risks, mining technologies, markets, and relevant policies. The literature review included works by both Indigenous and non-Indigenous authors.

2. **Primary quantitative analysis** using asset-level data from S&P Capital IQ, which provided cost and market data, and Skarn, which provided greenhouse gas emissions data.

3. **Engagement** with 92 stakeholders and rightsholders took place through informal online virtual calls from January to May 2024. Participants were selected from our network, conference connections, and snowball sampling, with a few contacted via cold email. All were experts in critical minerals from mining, finance, government, environmental non-governmental organizations, or Indigenous communities and organizations.

4. **An online survey**, in partnership with TMX, was conducted from April to August 2024, investigating barriers and potential solutions to building out Canada's critical minerals value chain. The survey received 174 responses mostly from the mining industry (e.g., companies in exploration, extraction, refining, and manufacturing).

5. **Semi-structured interviews** were conducted from July to December 2024 with 33 experts with various perspectives on critical mineral mining, including both Indigenous and non-Indigenous participants. The semi-structured interviews provided detailed insights on the main barriers and related policy tools for financing and building new critical minerals mines. The questions were tailored to the expertise of participants, focusing on critical minerals, including financing, Indigenous participation and partnerships, and environmental risk mitigation.

Please see **Appendix A** for further details on the methodology and the analytical framework that we use to arrive at our policy recommendations.

Section 6 highlights three policy priorities for Canadian governments to encourage investment in critical mineral mining projects that are cross-sectoral in scope. These issues lead to slower investment in numerous sectors beyond the mining industry. Policies to address them are complex and may take time to fully implement. While providing specific policy recommendations for these cross-sectoral policy priorities is outside the scope of this paper, we draw some general lessons from this analysis.

Section 7 concludes with a set of recommendations for Canadian governments on how to build a policy package to realize Canada's critical mineral opportunities—for project investors, Indigenous communities, and Canada's prosperity.

A note on the scope of this analysis: while we recognize the importance of investing in Canada's entire critical mineral value chain and the economic profitability of processing and manufacturing,[7] this report exclusively focuses on upstream investment in extraction of the six critical minerals that are most essential to the energy transition. Others have examined Canada's challenges and opportunities for investment in steps that are further downstream (Allan et al. 2022; Clean Energy Canada 2022).

Similarly, a detailed discussion of the potential of critical mineral recycling and circularity for meeting domestic and international demand is also beyond the scope of this analysis. We address this important topic briefly in **Box 1**, where we also reference literature that provides a deeper dive.

Finally, we recognize that there are other significant risks and opportunities associated with new investment in Canada's critical mineral mining sector. This is especially true when it comes to labour and employment, as well as other social impacts on mining communities. Again, we point to others' work on these important issues, which are beyond the scope of this analysis (Mining Industry Human Resources Council 2023; Mining Association of Canada 2023).

7. A report by BCG (2022), for example, estimates that mineral extraction represents 10 per cent of the total profit pool of the lithium-ion battery value chain.

Box 5

ADDITIONAL RESEARCH THAT COMPLEMENTS THIS REPORT

To complement this report, the Institute commissioned four scoping papers to investigate specific challenges related to building competitive critical minerals projects:

1. **Climate Change, Critical Minerals, and Indigenous Engagement with Regulatory Processes** (Authors: JP Gladu, Ken Coates, and Katarina Savic). This paper presents Indigenous perspectives on recent and relevant regulations and legislation. It includes case studies of electricity and mining projects that were developed in partnership with Indigenous Peoples, and offers recommendations for governments and industry.

2. **Managing environmental risks of mining critical minerals in Canada** (Authors: Christopher Pollon and Eyab Al-Aini). This paper explores the major environmental risks associated with building, operating, and closing mining projects in Canada, and how best practices might mitigate those risks.

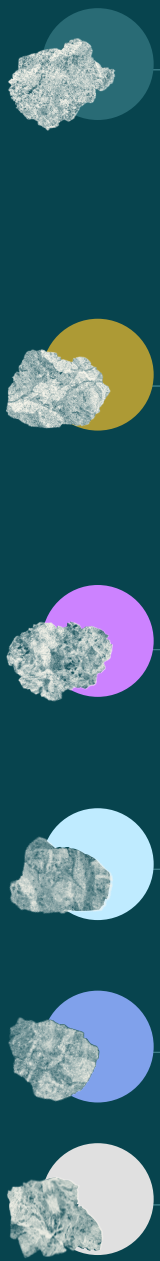
3. **Mining decarbonization: Enhancing Canada's low-carbon advantage in the global critical minerals race** (Author: Eyab Al-Aini). This paper identifies the different barriers to decarbonization of mining in Canada, the dynamics between these barriers, and the range of possible solutions. The paper includes projections for emissions trajectories from Canada's mining sector and Canada's low-carbon competitive advantage when it comes to mining, as well as a discussion of how Canadian governments should nurture this advantage. It also sheds light on the costs and benefits of decarbonization in the short and long terms.

4. **Forthcoming: Empowering Indigenous Nations in the energy transition: Why strengthening local capacity is the first—and necessary—step to Canada's future in critical minerals** (Authors: Jordan Peterson and Dakota Norris, Affinity North). Through community-level research and interviews, the authors explore the conditions, actions, and processes that have led to positive outcomes for Indigenous nations. The paper includes recommendations on how governments can best support Indigenous nations when advancing projects.

SECTION 2

The challenge

Investment in critical minerals is not keeping pace with demand



2.1 Meeting domestic demand

In this section, we outline the scale of investment in critical mineral mining that is required to meet Canada's domestic demand and that of international buyers.

Canada's clean energy transition is an important source of demand for critical minerals over the next decades, as investment in the downstream end of the critical mineral value chain is taking off.

The transport sector will be a central driver of domestic demand for critical minerals. Demand for lithium, graphite, and nickel will grow as Canada's vehicle fleet electrifies. Announced private investments in domestic battery cell and electric vehicle manufacturing have risen significantly in the past few years, reaching $41 billion by mid-2024 (Kabbarae et al. 2024). The federal government has backed investments for electric vehicle battery factories expected to have a combined production capacity of 200 GWh (Giswold 2024; Office of the Prime Minister of Canada 2023; Stellantis 2022; Volkswagen Canada 2023; Lion Electric 2023). The future of some of these projects has seen added uncertainty due to the rapidly changing trade landscape.

Moreover, the extensive public and private investment in emissions-free power production—both anticipated and already underway—across the country (Dion and Zhang 2024) will drive demand for standing battery storage to balance a grid that is increasingly including renewable sources (Snieckus 2024). By one estimate, new wind and solar projects could provide about two-thirds of the needed new generation capacity (S&P Global 2024).

"Developing its critical mineral reserves—in conjunction with investment in processing and clean tech manufacturing—can ensure Canada builds out and sustains its clean-energy economy without being dependent on other nations for sourcing the raw materials it will need."

Developing its critical mineral reserves—in conjunction with investment in processing and clean tech manufacturing—can ensure Canada builds out and sustains its clean energy economy without being dependent on other nations for sourcing the raw materials it will need.

But production from mines is slow to catch up with increasing demand. Our analysis indicates that, to meet future domestic demand under announced climate policies, Canada would need to almost double production from $9 billion worth of critical minerals in 2023 to $16 billion worth by 2040 (see **Appendix B** for methodology). However, unless Canada expands existing mines and opens new ones, production of the six critical minerals will gradually decrease between now and 2040, leading to significant production gaps (**Figure 2**).

We estimate that annual domestic demand for the six critical minerals will reach over $16 billion by 2040. Of that total, Canadian electric vehicle manufacturers would be demanding close to $7 billion worth of minerals per year. To give an idea of scale, this demand volume would be equivalent to the needs of about 200 GWh of electric vehicle batteries, or 2.3 million new electric vehicles per year.

If Canada is to self-sufficiently meet $16 billion worth of annual domestic demand for critical minerals, we estimate that Canadian mining projects will require a total of $30 billion in capital investment between now and 2040. In other words, we estimate that Canada will need $30 billion of capital investment by 2040 to get industry to the point where it can produce about $16 billion worth of the six critical minerals each year.

Additionally, at least $22 billion in additional investment would likely be required to meet demand for the other 28 critical minerals on Ottawa's shopping list that aren't covered here. Even more would be required when considering capital going towards mining of non-critical minerals at the same site—in practice, 39 per cent of a critical mineral mine's capital tends to go towards extracting other non-critical minerals, which does not count towards the $30 billion target.

These are likely lowball figures as they exclude major project cost overruns. Globally, 64 per cent of mining companies experience project delays or cost overruns; on average, such overruns exceed project budgets by 39 per cent (Hudson 2022).[8] These figures are also based on average capital costs, and if a disproportionate number of future projects end up being in remote areas without access to infrastructure, the necessary investments could be much higher.

The estimated need for new capital vastly exceeds current investment flows in the critical mineral mining sector. From 2018 to 2023, Canada averaged about $2 billion of capital investments a year for critical minerals.[9] Since Canadian mines take nearly 18 years on average to advance from discovery to production—two years longer than the global average and three years longer than the average in China (Manalo 2023; Gunasekara 2024)—exploration to sustain production would need to be underway this decade.

8. Our calculations are based on expected costs.

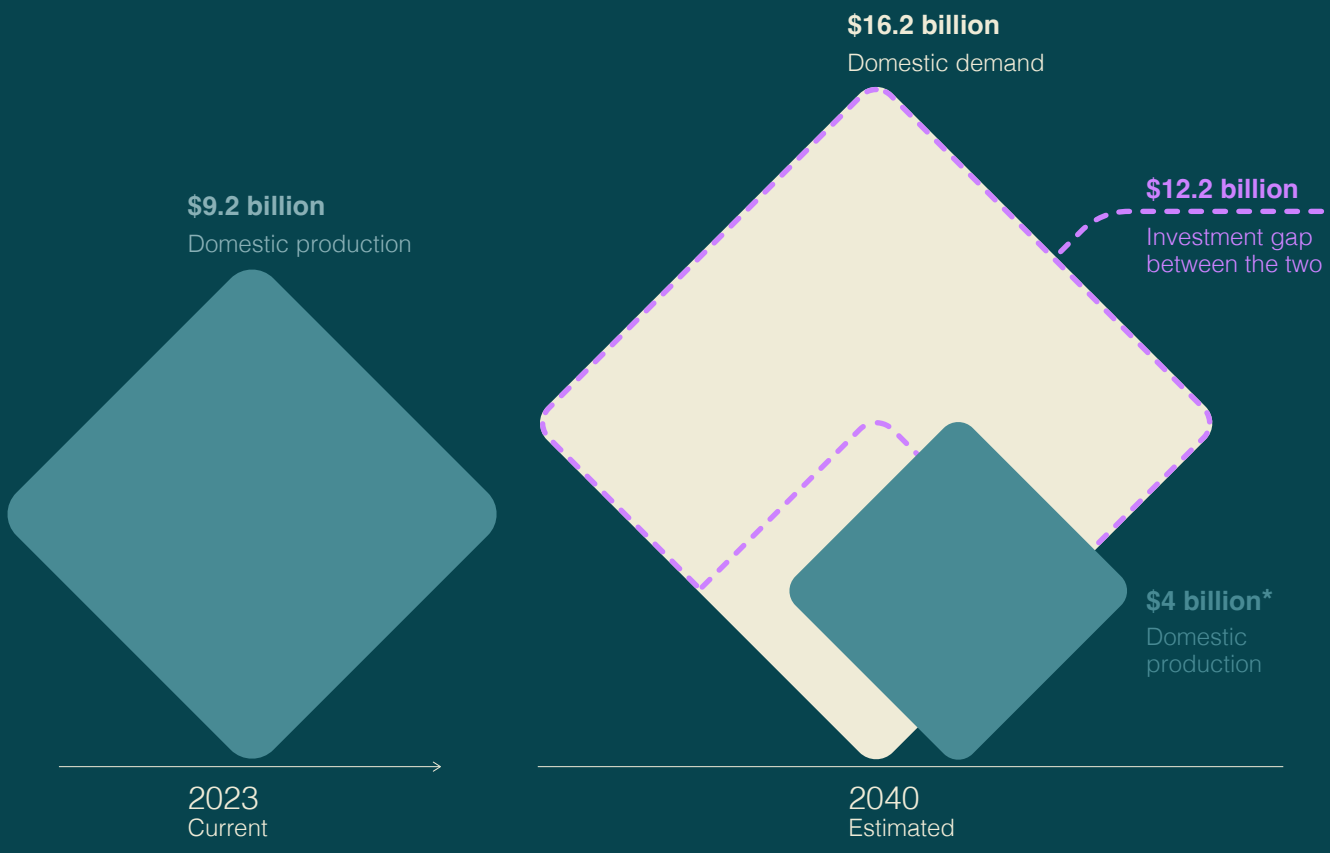
9. From 2018 through to the end of 2023, Canadian mines with completed feasibility studies announced or completed capital investments amounting to $23 billion for initial capital costs and expansion costs. We must then reduce that number to $14 billion, given that only about 61 per cent of capital investment in mines with critical mineral exposure goes towards extracting critical minerals, as opposed to other non-critical minerals at the site (S&P Global 2024).

Figure 2

CANADIAN PRODUCTION GAP TO MEETING DOMESTIC CRITICAL MINERAL DEMAND

Canada risks losing out on billions each year by 2040 if production doesn't meet domestic demand

ESTIMATED VALUE OF MINERALS (CAD)



** The 2040 production estimate has been calculated based solely on existing mining operations, without accounting for the development of new mining facilities*

Production here refers to a scenario where current critical minerals mines continue to produce material from existing facilities with no additional capital investment.

Domestic demand refers to total domestic demand for critical minerals within Canada. It's made up of demand to source local electric vehicle and battery manufacturers and demand from more traditional sources of demand for critical minerals such as nickel for stainless steel production, for example. See Trottier-Chi 2024 for background analysis.

2.2 Realizing export opportunities

New capital requirements would grow larger still if the industry aims not only to meet domestic demand for critical minerals, but also to realize significant export revenue.

In 2021, Canada exported $15.2 billion worth of critical minerals and critical mineral products, of which $6.3 billion went to the United States (Mining Association of Canada 2023). We estimate that export potential to the U.S. could double to $13 billion by 2040[10] if the United States were to maintain announced climate policies and trade relationships between the two countries were to normalize (see **Appendix B** for methodology).

Canada can also diversify its export potential to other markets beyond North America.

The European Union has a growing demand and high import reliance for many critical minerals that Canada can supply (Carrara et al. 2023; Grohol et al. 2023).[11] By 2040, we estimate the EU's demand value for the six priority critical minerals to be between $40 billion and $62 billion, most of which will be met through imports—possibly creating new markets for Canadian products.[12] Growing exports into the European market will be particularly advantageous for Canadian producers if trade relationships with the U.S. remain unstable.

Investment into critical mineral mining projects will need to start now for Canada to realize a sizable share of this export potential.

10. This value includes only six priority critical minerals, and the value of future exports is only based on raw critical mineral prices. The total value for all minerals and their products will be higher.

11. Import reliance is the ratio of net imports to total demand. The EU's import reliance varies by mineral. In 2023, import reliance in the EU was 81 per cent for cobalt and 100 per cent for lithium and rare earth elements (Grohol et al. 2023).

12. Total demand for the EU will be met by a combination of local production, imports, and recycling. The value range reflects the low- vs. high-demand scenarios estimated by a study from the European Commission's Joint Research Centre (Carrara et al. 2023).

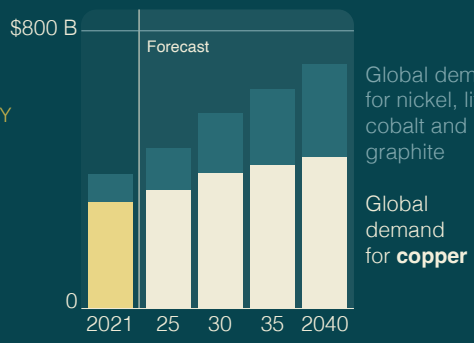
Figure 3a

TOTAL PROJECTED DEMAND FROM CANADA'S TOP THREE EXPORT MARKETS

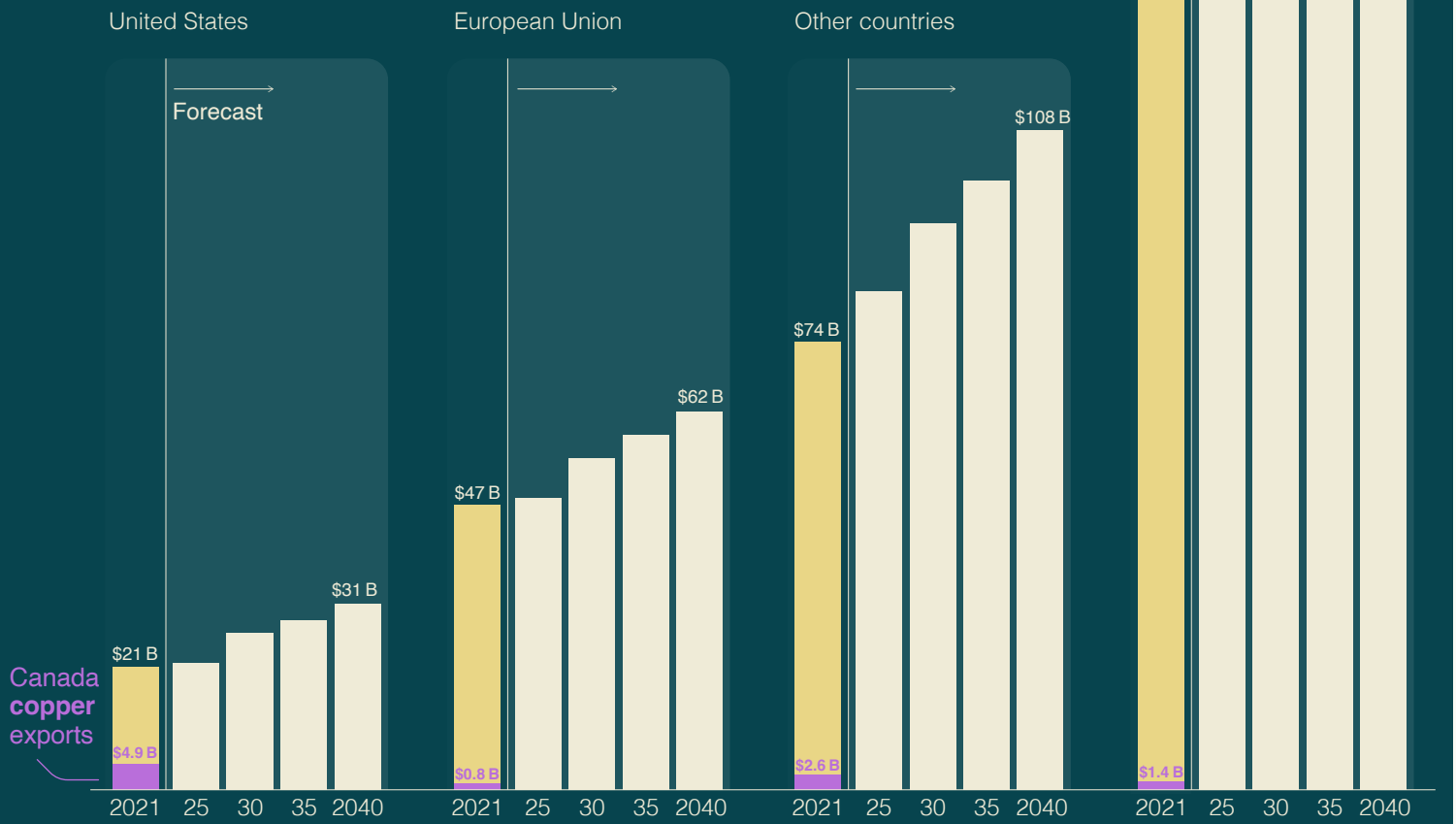
Canada's future exports are not dependent on the U.S. alone—demand in other countries is expected to grow significantly

DEMAND FOR COPPER

GLOBALLY AND BY COUNTRY



COPPER DEMAND VALUE (CAD) IN...

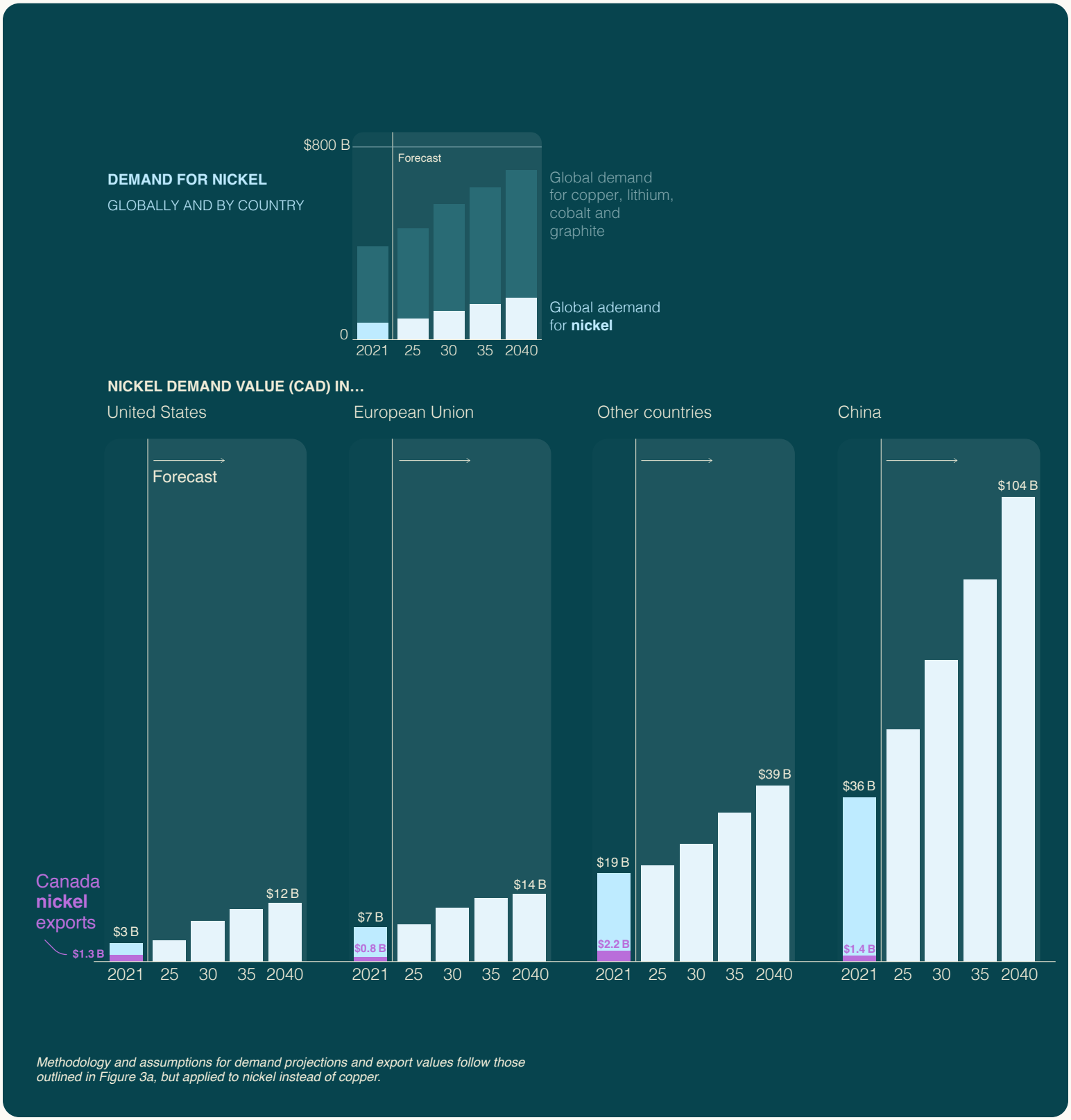


Demand projections for 2024–2035 are based on S&P Global estimates for refined copper consumption by market and are extended to 2040 (S&P Global 2024). Export values by market destination in 2021 are from the Mining Association of Canada (Mining Association of Canada 2023). All figures are in Canadian dollars, converted using average 2024 prices for consistency. Future price changes may affect values.

Actual future demand for each market will be met by a combination of imports from a wide range of suppliers (including Canada), local production, and increasingly recycling.

Figure 3b

TOTAL PROJECTED DEMAND FROM CANADA'S TOP THREE EXPORT MARKETS

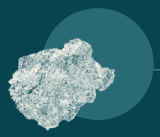


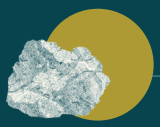
Methodology and assumptions for demand projections and export values follow those outlined in Figure 3a, but applied to nickel instead of copper.

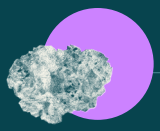
SECTION 3

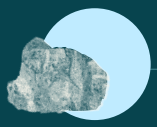
Market risks for investors

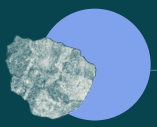
Boosting investment requires de-risking projects

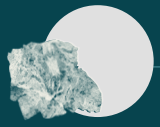












If Canada is to keep pace and capitalize on the economic opportunities detailed in Section 2, investment in mining must ramp up. Only considering the six critical minerals that we focus on in this report, the mining sector will need capital investments amounting to more than $30 billion between now and 2040 (Trottier-Chi 2024).

In this section, we examine the market risks that investors in Canadian critical mineral mines face that create a drag on investment and economic opportunities. Some of these risks are endemic to the industry and the state of global markets, but some are more specific to the Canadian context. While some risks are simply project costs, others are the result of policy problems. Addressing the latter can lead to better outcomes for both projects and for Canada more broadly.

3.1 Financial risks for investors

Exploration uncertainty and long lead time make mining a high-risk industry for investors

There is nothing quick about building a mine. Finding a mineral deposit and developing a mine can easily take a company multiple decades, and requires a vast pool of capital. New mines also have to go long periods without generating revenue, and that revenue is vulnerable to abrupt swings in mineral prices.

Our survey respondents flagged high capital costs and long payback periods as the sector's biggest capital market barrier for attracting investment (32 per cent of respondents; see Bourassa and Arnold 2024).

The construction and start-up stages of a mine are exceptionally capital-intensive. Construction and extraction equipment consume 76 per cent of upstream capital investment.[13] On average, we find that a Canadian mine requires initial capital investments of $1.1 billion.

Box 6

MINING IS AN INHERENTLY RISKY INDUSTRY

The process of financing and building mines is inherently risky and the sector has always been fraught with structural challenges. For example:

Mineral exploration is a long process, with little to no cash flow. Explorative drillings have a one-in-10,000 chance of developing into a producing mine (Association for Mineral Exploration 2021). As a result, mining exploration companies tend to be smaller than the companies actually running productive mines and are fuelled by venture capital or sharemarket capital (Environmental Investigation Agency 2024).

After making a discovery, companies have to further understand the deposit through additional drilling, testing, and a series of studies to progressively evaluate the technical and economic feasibility of a mine. Until production starts, all the costs that mining companies need for drilling, permitting, independent evaluations, and disclosures must be funded prior to generating revenues.

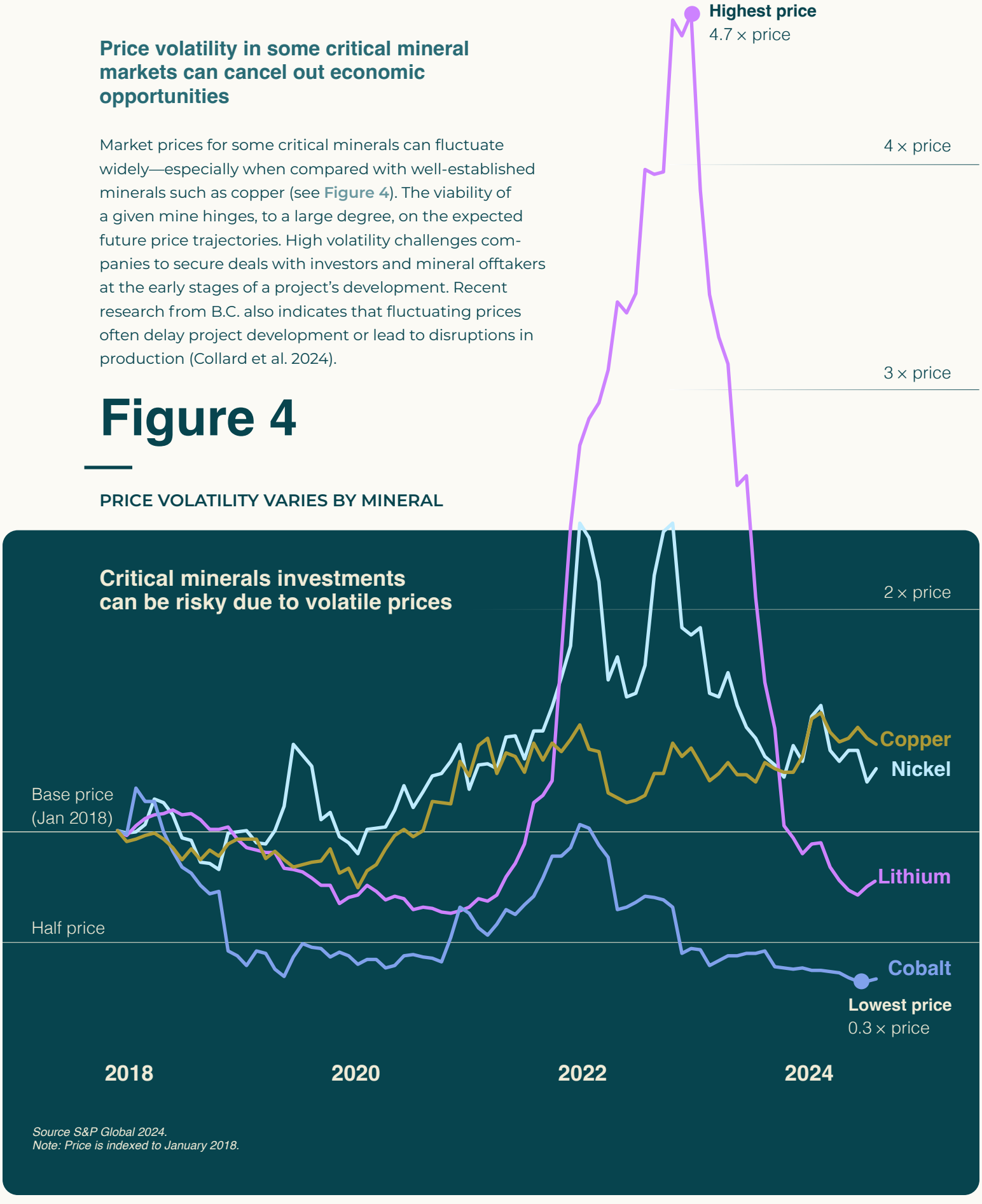
13. Upstream includes extraction, processing, and mineral and metal product (e.g., concrete) manufacturing.

Price volatility in some critical mineral markets can cancel out economic opportunities

Market prices for some critical minerals can fluctuate widely—especially when compared with well-established minerals such as copper (see **Figure 4**). The viability of a given mine hinges, to a large degree, on the expected future price trajectories. High volatility challenges companies to secure deals with investors and mineral offtakers at the early stages of a project's development. Recent research from B.C. also indicates that fluctuating prices often delay project development or lead to disruptions in production (Collard et al. 2024).

Figure 4

PRICE VOLATILITY VARIES BY MINERAL



Source S&P Global 2024.
Note: Price is indexed to January 2018.

Price volatility is partially due to some of these markets being relatively immature. For example, it is instructive to compare critical minerals with other minerals on the London Metal Exchange (LME), the world's largest, longest operating, and arguably most influential commodity exchange.

The LME first listed copper in the 19th century (1877) and although nickel appeared in its lineup more recently (1979), the transaction frequency and sheer volume long ago stabilized the prices of both.

By contrast, lithium is only listed on the LME in the form of futures. Investors buy and sell the rights to future lithium production, not actual physical lithium. The LME does not list graphite and rare earths at all.

As a result, many critical mineral deals, including those for graphite and rare earths, lack an official market price. Buyers and sellers instead negotiate prices on a case-by-case basis in mostly opaque and unstandardized transactions. For example, a graphite producer and a battery manufacturer would need to negotiate directly.

Volatility also comes from China, specifically from its immense market power. The world's largest critical mineral producer mines 60 per cent of all rare earths in the market and 80 per cent of all graphite. On the processing side, China handles 40 per cent of all copper refining, 60 per cent of cobalt and nickel refining, and more than 90 per cent of rare earths and graphite refining. It also holds 85 per cent of battery cell manufacturing capacity (IEA 2024b).

China's market power disrupts market signals. When the country's electric vehicle purchase subsidies expired at the start of 2023, domestic electric vehicle demand growth slowed by more than half and the price of lithium dropped by 80 per cent over the course of the year, which chilled investment interest in the metal (IEA 2024b). Although China signalled the purchase subsidy phase-out well in advance, its shifts in domestic demand nonetheless jolted the global market. This is one example of how critical mineral prices do not yet reflect a stable, somewhat predictable market equilibrium.

Dependence on emerging, policy-driven cleantech markets creates demand risks for investors

Relatively high uncertainty over future demand for emerging clean energy technologies may make investors more hesitant to commit to long-term mining investments.

While a long-term trend toward cleaner energy systems seems certain, and while clean technologies will drive about 60 per cent of global critical mineral demand, according to the IEA's Announced Policies Scenario (IEA 2024b), exactly which solutions will come to dominate global markets, and at what pace, is still uncertain for some key sectors. For example, cobalt's share of the EV battery market is shrinking as new batteries that don't require cobalt take market share (Els 2025). This uncertainty about future technological pathways has profound implications for exactly which critical minerals will be most in-demand.[14]

Some degree of uncertainty about technological pathways exists in most markets for investors—in fact, such risks are routine. However, in clean technology markets, where policies incentivize substantive demand, the uncertainty is partly about policy stability. Policy uncertainty in large markets—for example, about the discontinuation of EV subsidy programs under the U.S. Inflation Reduction Act—may prevent investment in critical mineral mining and influence Canadian projects.

Complex regulatory review processes diminish investor confidence

When we asked survey respondents to weigh in on the most significant sector-wide hurdles to investment in critical mineral mining in Canada specifically, 53 per cent cited regulatory delays. Recent reports and media stories echo this view (e.g., Business Council of Alberta 2023; Orenstein 2023; Electricity Canada 2023). This finding is in line with previous studies that have identified delays caused by slow regulatory processes as a key challenge for critical mineral mining projects (see, for example, PwC 2023) and Canadian competitiveness more generally (e.g., Business Council of Alberta 2023; Orenstein 2023; Electricity Canada 2023).[15]

The reality is that critical minerals are interchangeable commodities, mining is a globally competitive sector, and capital can—and does—flow to the jurisdictions that offer the most favourable conditions. Canada has world-leading reserves but additional risks that are specific to the Canadian context may hamstring Canadian critical mineral mining projects in their quest for capital.

14. Critical minerals have different levels of vulnerability to technology demand uncertainty. Copper and molybdenum will be in demand across a greater range of technology pathways than lithium and graphite (Hund et al. 2020).

15. The notion that Canada's regulatory and permitting regime is slow and unpredictable is not new. In fact, these concerns motivated changes to federal legislation in the past, notably the implementation of the Canadian Environmental Assessment Act in 2012 and its successor, the Impact Assessment Act, in 2019.

Regulatory and permitting requirements should effectively manage social and environmental risks related to new mining projects but not overburden industry. Excessively long and complex project assessment and permitting processes can contribute to making projects uneconomic.

Mining regulations are a shared responsibility in Canada, with the federal, provincial, and territorial governments all overseeing different impacts (see **Box 7** for an overview). Before construction can begin, new mining projects typically go through provincial/territorial and/or federal impact assessments (depending on size), and may require authorization from multiple orders of government based on these assessments as well as additional permits.

Frequently identified causes of delays and uncertainty in regulatory project reviews and permitting include poor co-ordination between federal and provincial processes, poor co-ordination across different departments and agencies within the federal government, and politicized decision-making (Orenstein 2023; Cleland and Gattinger 2025). Such delays may mean projects take longer to start, which further increases uncertainty for investors.

There is a significant amount of criticism concentrated around the federal *Impact Assessment Act* (IAA) in particular. The IAA requires an impact assessment when a proposed project is on federally important land or exceeds a certain size. The IAA also grants the federal government the discretion to order an assessment. The Act came into force in 2019 but the Government of Alberta quickly challenged it with the support of the provinces of Saskatchewan and Ontario, three First Nations, and the Indian Resource Council. The plaintiffs argued that the legislation defined impacts too broadly, which they feared could allow for federal overreach.

In October 2023, the Supreme Court of Canada agreed, and ruled that the IAA was in parts unconstitutional. In response, the federal government amended the Act, but the resulting changes do not fully address ambiguity about what triggers impact assessments, what project impacts are relevant for impact assessments, and how federal, provincial, and territorial assessments should be aligned (Thurton 2024). This leaves the IAA and major projects with lingering uncertainty.

Box 7

THE REGULATORY FRAMEWORK FOR NEW MINING PROJECTS IN CANADA

A complex system of governance and jurisdiction—federal, provincial/territorial, municipal, and Indigenous—oversees the construction of new mining projects in Canada. Mine site regulations, such as exploration, extraction, and reclamation procedures, are primarily within the jurisdiction of provincial and territorial governments while interterritorial impacts and certain environmental impacts can fall under federal jurisdiction.

Mining projects of a certain size must undergo a federal impact assessment. The *Impact Assessment Act* involves a five-phase, multi-year process to identify and assess a mining project's significant biophysical, social, and economic impacts, resulting in a decision on whether the project is in the public interest. The five assessment phases include: planning, production of the impact statement, the impact assessment, decision-making, and the post-decision phase. In addition, mining projects usually require additional federal approvals, including for the use of explosives, and production of toxic byproducts, and other pollutants.

Mining projects are primarily subject to environmental impact assessments at the provincial and territorial level. These are procedurally similar to those under the *Impact Assessment Act*, and these processes often run in parallel. Furthermore, for a project proponent to be able to build and operate a mine, they typically require additional approvals from provincial/territorial governments concerning pollution and safe closure. They also must comply with building and electrical safety codes. All projects also require approval for land use, and larger industrial projects tend to need permits for their waste systems. External contexts like proximity to lakes, the habitats of species at risk, forests, heritage sites, Northern regions, parks, and highways may make more approvals necessary.

Municipal requirements for building mining projects are fairly consolidated in comparison. Municipalities enforce provincial and territorial building codes and enact bylaws to fill any gaps.

Impacts on Indigenous communities are governed through shared and co-ordinated jurisdiction between the federal government and Indigenous governments. Land use on reserves has historically been governed federally in accordance with the *Indian Act* and its regulations. But the more recent *First Nations Land Management Act* enables First Nations with reserve land to develop their own laws about land use. Underlying both acts is the Crown's constitutional duty to consult and accommodate Indigenous Peoples before undertaking activity that may adversely impact Indigenous rights (Brideau 2019). The federal government and the government of British Columbia both recognize an additional legal duty to obtain free, prior, and informed consent from Indigenous Peoples before embarking on such activity. Usually, federal, provincial, and territorial regulatory oversight bodies (e.g., the federal Impact Assessment Agency) fulfill consultation duties on behalf of the Crown as part of the environmental impact assessment processes, with parts sometimes being delegated to third parties like project proponents.

Gaps in energy and transportation infrastructure amplify market risks for investors

Increasingly, unexploited high-grade deposits in Canada are located in remote areas without reliable access to power grids, rail lines, roads, or ports. Deposits located closer to infrastructure are exploited first. Already, half of Canada's feasibility-stage critical mineral projects are over 50 kilometres from power lines—a clear barrier to increasing critical mineral mining (Association of Consulting Engineering Companies—Canada et al. 2015).

The lack of required energy and transportation infrastructure can be a powerful deterrent for investment because it amplifies some of the key risks for investors. Closing the infrastructure gap requires securing financing and regulatory approvals. These large-scale projects may carry significant environmental risks as well as risks to impacted Indigenous communities. In other words, these projects face many of the same risks as the critical mineral mine itself.

In terms of capital requirements, we find that critical mineral mines more than 50 kilometres away from power lines have more than three times higher capital costs than those within that radius (see **Appendix B**) (S&P Global 2024). This echoes a study co-authored by five Canadian mining-industry associations (Association of Consulting Engineering Companies—Canada et al. 2015). That study found that projects in Northern Canada can carry capital costs almost triple those in the south. The authors attribute up to 61 per cent of that premium to their remoteness.

"More than half of the $30 billion of capital investment required for building new critical mineral mines is linked to the need for building infrastructure to address their remoteness."

We estimate that more than half ($15.6 billion) of the $30 billion of capital investment required for building new critical mineral mines is linked to the need for building infrastructure to address the remoteness of these new mines (see **Appendix B** for methodology).

Ontario's Ring of Fire region offers a case in point. The province's most promising critical minerals deposit stretches across 5,000 square kilometres and is about 550 kilometres north of the port of Thunder Bay. Wyloo Metals, the Australian company holding claims to much of the region, pegs the value of its resources at about $90 billion (Turner 2023).

The industry leaders we interviewed for this report confirmed that the Ring of Fire's remoteness and minimal infrastructure are impeding its development. In 2020, the Government of Ontario announced it would study the feasibility of building an access road into the region (Gray and McGee 2020). However, in the best-case scenario, that public road would not likely get underway until the end of this decade.

Wyloo Metals had hoped to have a nickel mine up and running in the Ring of Fire by 2027. But the company appears to be waiting for the government to first build the needed access route, which could cost Queen's Park up to $2 billion and would be difficult to recoup (Friedman 2022; McGee 2021). A range of complications have stalled that infrastructure project, including environmental considerations and lack of unified Indigenous consent among the impacted Indigenous communities. (We discuss these matters in detail in **sections 4** and **5**).

3.2 Identifying policy priorities

As we have shown, investors in Canada's critical mineral mining sector are grappling with at least five distinct market risks (see **Table 1**). All of these risks make investment in Canadian mines less attractive, but Canadian governments should only intervene to address those that are both rooted in policy problems and that have a material chilling effect on capital flows.

Some of these material policy problems are sector-specific in their scope and have corresponding, scalable policy solutions that governments could implement in the near term to make an immediate difference. Others cut across sectors and require more systemic, economy-wide changes. While Canadian governments should address both types of policy problems to unlock capital flows, the analysis and recommendations in this report focus solely on solutions to material policy problems within the critical minerals sector.

Our analysis shows that interventions to stabilize prices for domestic producers are the most effective measure governments can take to reduce market risks for investors in the short term. At the same time, governments should also tackle delays and uncertainties in project-approval processes.

High price volatility in some critical mineral markets is a significant deterrent for investors and it is largely rooted in market failures related to market immaturity and concentrated market power in the hands of a few suppliers. This policy problem is limited to a small number of critical mineral markets (e.g., lithium, nickel, and rare earth elements), and can be addressed with focused solutions.

Delays and uncertainties in regulatory project reviews create material risks for investors, and these inefficiencies constitute a policy failure. While regulators can tweak their processes and requirements to address some of the

concerns specific to critical mineral mines, the situation calls for broader solutions (Cleland and Gattinger 2025).

Gaps in clean energy and transportation infrastructure for critical mineral mining projects are a material, sector-specific policy problem to solve for Canadian governments. Canadian governments should support private companies in their investments in clean energy and transportation infrastructure in rural mining regions given the strategic importance of critical mineral mining for Canadian energy security. These investments will also have wider benefits for remote communities, and even national security, when it comes to infrastructure in the Arctic (Yukon Arctic Security Council 2024). That is one reason provincial governments have stepped up funding of infrastructure development in mining regions, and why the federal government established the Critical Minerals Infrastructure Fund as part of its critical mineral strategy in 2022 (NRCan 2024c). Originally set at $1.5 billion, the fund recently received an additional $500 million, although disbursement of funding has been slow to date (Government of Canada n.d.b.; NRCan 2025).

Importantly though, as outlined earlier, these large-scale infrastructure projects are likely to encounter some of the same challenges as mining projects when it comes to regulatory approvals, management of environmental risks (e.g., impacts on biodiversity and cumulative effects), and risks to Indigenous communities. Therefore, this report's insights on environmental safeguards and partnerships with Indigenous communities will be essential to building critical mining infrastructure projects at the scale and pace required to support the ramp-up in critical mineral mining.

Uncertainty about the future demand for critical minerals is also deterring investment in the sector. This may be at least partly rooted in a policy problem because policy frameworks shape the market's interest in critical minerals and demand for clean technologies, and uncertainty around the continuation of these policies reduces investor confidence. However, domestic Canadian annual demand for $16.1 billion worth of critical minerals in 2040 would amount to just two per cent of the global total (IEA 2024b). Overwhelmingly, it will be actors beyond Canada's borders enacting the policies that influence the future pathways of clean energy technologies and thus demand for critical minerals.

Nevertheless, this is a policy problem for Canadian governments to the limited extent that uncertainty about the future of domestic cleantech policies may immediately affect demand for critical minerals sourced in Canada.

Table 1

SUMMARY OF POLICY PROBLEMS CONCERNING FINANCIAL RISKS ASSOCIATED WITH INVESTMENT IN CRITICAL MINERALS MINING IN CANADA

Is this a policy problem for Canadian governments?	If so, is it significantly deterring investment?	If so, is the scope of the problem specific to the sector?
Extreme price volatility		
YES: Immature markets (for some critical minerals) and concentrated market power are market failures that disincentivize new entrants in the market.	**YES:** Mine development depends on predictable market conditions.	**YES:** Targeted government interventions can stabilize prices or demand for the affected products.
Demand uncertainty from emerging cleantech markets		
PARTLY: This is a policy problem to the extent that uncertainty about the future of domestic cleantech policies immediately affects demand for critical minerals sourced in Canada. However, Canada is too small a player to significantly influence global technology pathways. Therefore, the policies that drive large-scale demand for cleantech are largely beyond Canada's control.	n/a	n/a
Regulatory risks due to delayed and uncertain processes		
YES: Inefficient regulatory processes constitute a policy failure.	**YES:** Survey respondents identified this as the biggest barrier to project investment.	**NO:** Regulatory reforms would positively impact all major projects.
Gaps in clean energy and transportation infrastructure		
YES: Under-investment is a policy problem because critical mineral mines are strategically valuable for Canada, and public infrastructure can offer co-benefits to rural and Northern communities.	**YES:** Access to transportation and energy infrastructure can significantly lower mining project capital costs.	**NO:** Insufficient investment in infrastructure is a long-standing, economy-wide issue in Canada.

3.3 Addressing price volatility

As noted, certain critical minerals are subject to extreme price volatility, which dampens investor interest and can lead to supply disruptions when low prices make projects less attractive. While Canadian governments cannot eliminate this risk entirely, they can deploy a range of instruments to help share it with prospective producers.

Governments routinely intervene in strategically important markets, such as energy, using temporary measures that aim to boost investor confidence until markets mature or become more transparent. In this section, we outline the measures that hold the most promise for the critical minerals sector, including financial risk-sharing agreements such as equity investments, offtake agreements, and contracts for difference, as well as agreements with international partners.

But first, a caveat: interventions such as contracts for difference and offtake agreements require careful consideration as they inherently disrupt markets and may run afoul of free-trade principles. We recommend governments use these tools judiciously, and calibrate them to the specific degree of price volatility—which differs by mineral—and the strategic importance of the resources they would support.

Equity investments

Raising equity capital remains a major hurdle for mining projects, and taking equity stakes in mining companies is a direct way for governments to help capitalise new mining activities. Governments can become shareholders by purchasing shares directly from mining companies early on in a project's development, prior to the final investment decision. As equity holders, governments participate in both the downside risks and the upside potential of the project and can show higher risk tolerance and greater patience in the face of long payback periods than conventional investors. Such commitments can unlock additional private capital flows.

The Canada Growth Fund, an independent and arm's-length public fund established to speed the deployment of emissions-reducing technologies, has supported two critical minerals mining companies to date, both through private equity placements and alongside other investors (Canada Growth Fund 2024b; Canada Growth Fund 2025).

Offtake agreements

In the mid-20th century, when uranium emerged as a resource critical to national security, the U.S. Atomic Energy Commission guaranteed the industry it would purchase the element at a set price for 10 years (Barker 2024). Today, the United States, China, and others are stockpiling critical minerals in reserves that they can then draw on, as needed, to counter supply shocks or ensure they can meet priority demands (Young et al. 2024; Zhang and Daly 2021; Galea-Pace 2024).

A government can directly procure critical minerals from a producer by entering into an offtake agreement. An offtake agreement is a contract

between a producer, such as a mining company, and a government, in which the government agrees to purchase all or a portion of the producer's output at a predetermined price or term. In lieu of directly acquiring critical minerals, a government could also structure an offtake agreement to secure either the rights to a mine's production—with the intention of reselling those rights—or revenue from its sales. In either case, the buyer, or offtaker, effectively gives the mine up-front cash in exchange for future benefits, thereby securing demand and sharing the risk of an abrupt price drop (Norton Rose Fulbright 2017; Payne Institute 2024).

Offtake agreements, especially when closed early in the mine's development, help attract investment by effectively lowering the risks associated with price volatility. But they can also be costly for governments and they can prevent producers from reaping the benefits of rising market prices.

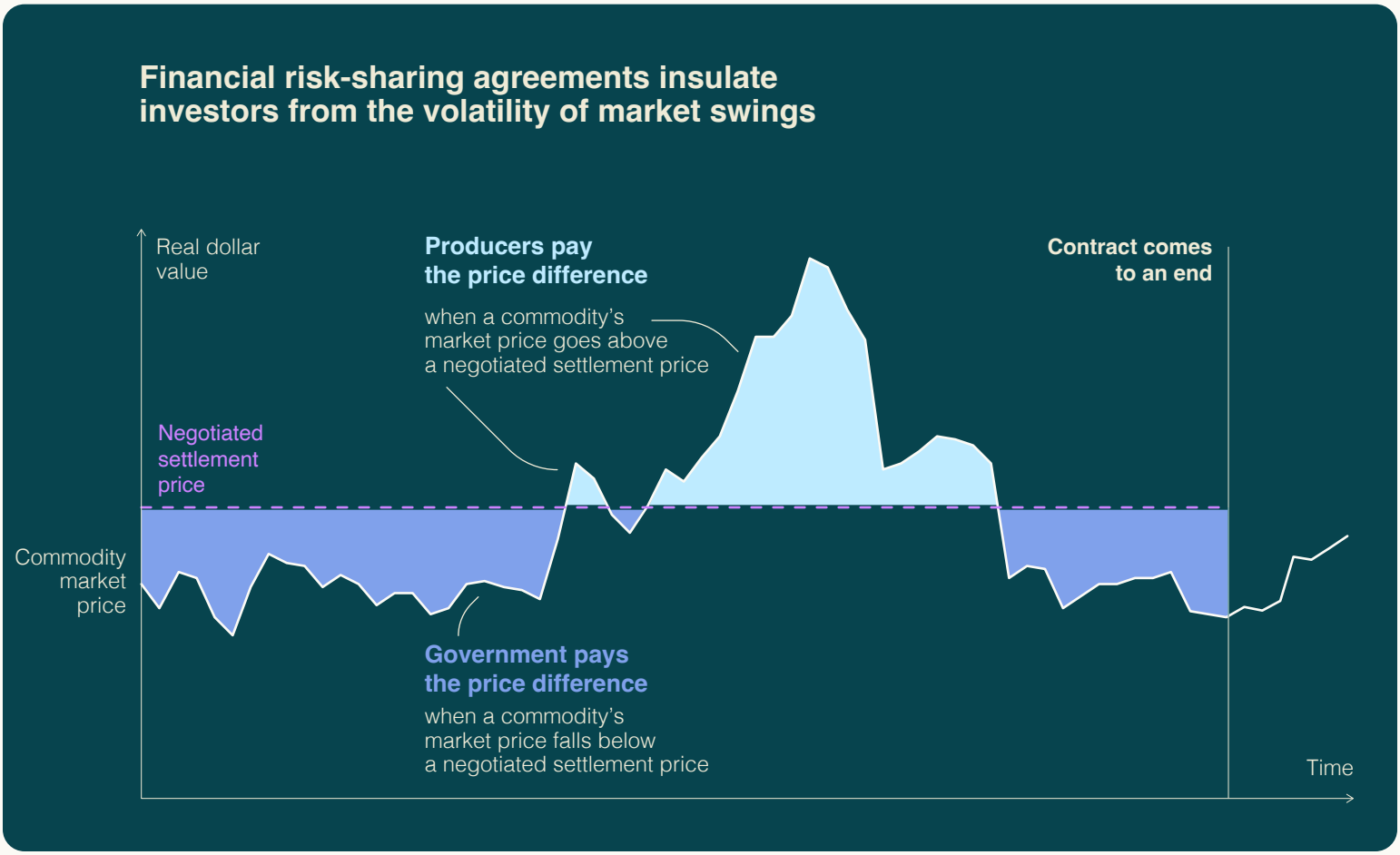
Offtake agreements could be particularly useful when a proposed project has especially high value to Canada; for example, a critical minerals mine in the Arctic may offer national security co-benefits. And given ongoing and emerging trade disruptions, Canadian governments might also consider stockpiling certain critical minerals, although the physical storage of critical minerals may create significant practical challenges, for example, if materials are critical for national security or sensitive to degradation over time.

Contracts for difference

Contracts for difference are another type of financial risk-sharing agreements. These contracts pay producers the price difference if and when a commodity's market price falls below a negotiated settlement price. When prices rise above it, the producer pays the surplus back to the government. Effectively, these contracts guarantee producers a future price for minerals, thereby giving them a more reliable revenue stream. This in turn will make the project more attractive to investors. But there is a trade-off: two-sided contracts imply that governments also participate in the upside potential of a project, which can effectively put a cap on profits for private investors in case of surging prices. Contract design determines the exact allocation of risks and returns between the two contract parties. For instance, contracts may include a price range instead of a single settlement price and/or define limits on maximum payments between parties, which could limit the costs for the governments and soften the cap on private profits (Watson and Bolton 2024; Cook and Wang 2024).

Figure 5

TWO-WAY CONTRACT FOR DIFFERENCE FOR COMMODITIES



For example, starting in 2014, the United Kingdom signed more than 370 long-term contracts for difference with renewable-energy producers. Under their terms, the government will compensate a generator should power prices fall below a defined boundary. But if demand surges and prices crest the top end of the negotiated range, the companies must pay the government back the difference (see **Figure 5**). The independent—but government-owned—Low Carbon Contracts Company manages these arrangements (Monahan and Beck 2023).

Closer to home, the Canada Growth Fund recently inked a contract for difference with Markham District Energy, a utility owned by the City of Markham, Ontario (Canada Growth Fund 2024a). The agreement helps the utility hedge carbon pricing risk.

Trade partnerships and international co-operation

To grow Canadian exports of critical minerals, Canadian governments could help producers forge reliable international partnerships with economies keen to diversify their critical mineral supply chains. Governments could help corral their interest into offtake agreements or pursue project-development partnerships. While the previous U.S. government was proactive in this area, spearheading the Minerals Security Partnership, including Canada and many others in 2022, the current administration has not demonstrated interest in this type of international collaboration, taking a more economically aggressive and isolationist stance.

However, for European Union member states, securing diverse supply chains for critical minerals is a high priority. For example, in September 2024, Germany's development bank launched a raw materials fund to finance overseas critical mineral projects, with support limited to countries where Germany does not already have significant mineral dependencies. This echoes the EU's broader strategic diversification objective: no single country may supply its member states with more than 65 per cent of any given material (KFW 2025; European Commission 2023).

Selling to a European critical minerals "buyers club" could similarly stabilize demand for Canada's producers and reduce their transaction costs. The EU is exploring the idea of forming a critical minerals buyers club, which would empower a single actor to aggregate bulk purchases on behalf of member states rather than ad-hoc individual transactions. It has a successful model in AggregateEU, a demand-aggregation and joint-purchasing platform set up to secure natural gas following Russia's invasion of Ukraine (European Commission 2024).

Comparison of options

Direct equity investment is likely the fastest way for governments to share the risks of new activities with mining companies and help them secure financing. Compared with bespoke offtake agreements, contracts for difference are likely easier for governments to implement at scale, although achieving an allocation of risk between governments and companies that is acceptable to both parties will likely require careful negotiation.

Contracts for difference explicitly target volatile prices—the root of the market failure—while also limiting fiscal burden (Allan and Eaton 2024). Again, governments would only step in if and when prices fall below the agreed-upon settlement price, and even then only pay out the price difference. A government could sign two-sided contracts with producers that would compensate their mines in the event of a downturn and reward

governments with revenue if and when a market price climbs above the settlement price.

In terms of the impacts on Indigenous participation and environmental performance of new mining projects, eligibility rules for equity investments, offtake agreements, and contracts for difference could include minimum standards regarding these criteria to de-risk projects for both public and private investors.

When lined up against financial risk-sharing agreements, trade partnerships and international co-operation may on their own be less effective in lowering investor risk—at least in the short run. Such relationships likely take longer to set up, and given the current unpredictability of global markets, might not last as long as planned.

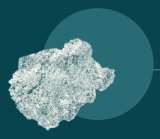
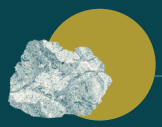
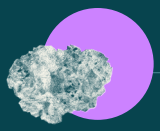
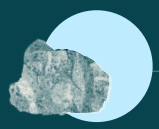
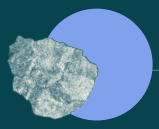
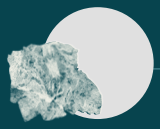
Nevertheless, successful partnerships may also afford Canada an opportunity to promote high environmental and social standards—two areas that are at the core of Canada's long-term competitiveness in the sector.

See **Appendix C** for a more detailed comparison of the various options.

SECTION 4

Risk and opportunities for Indigenous communities

Indigenous self-determination and partnerships will be critical for success

Most or all new critical mineral mines will be on Indigenous traditional territories and may be near Indigenous communities (Von der Porten et al. 2023). We find that 69 per cent of active mines—including operational projects and those in development—are within 50 kilometres of federally recognized Indigenous territories. This data primarily reflects Indigenous reserves, not traditional and unceded territories, which likely leads to a significant underestimation of the overlap between projects and Indigenous lands.

While some Indigenous communities welcome the economic opportunities associated with mining, others oppose new projects because of the high risks involved to Indigenous communities, lands, cultural practices, and rights.

Given the wide range of attitudes toward new mining projects among Indigenous Peoples, it is crucial for Indigenous rightsholders to be involved in decision-making throughout the entire project lifecycle, from exploration to reclamation.[16] Focusing on projects that are Indigenous-led or have Indigenous consent, and enabling economic participation of local communities, will create mutual benefits for both project proponents and Indigenous communities while reducing potential harm.[17] Failing to do so will create potentially insurmountable risks for all involved.

"Canada's future as a competitive, reliable producer of critical minerals is inextricably linked to Indigenous Peoples and their rights to self-determination."

Canada's future as a competitive, reliable producer of critical minerals is inextricably linked to Indigenous Peoples and their rights to self-determination—the fundamental right of Indigenous Peoples to freely determine their political status and pursue economic, social, and cultural development (OHCHR 1960; OHCHR 2007). Self-determination is deeply intertwined with Indigenous Peoples' right to manage and govern their lands, territories, and resources in ways that honour and reflect their

16. Because Indigenous Peoples hold inherent, legally recognized individual rights and title over their land, resources, and culture, as recognized by Canadian and international laws, they are considered rightsholders.

17. Non-Indigenous communities can also choose to support or oppose a mining project, but different legal frameworks apply. Such communities often have relatively more resources and institutional support to advocate for their interests, frequently through municipal governments. By contrast, Indigenous communities face distinct challenges, including limited access to financial and technical resources, which can hinder their ability to mount similar opposition to projects that threaten their lands and livelihoods. This report examines how to increase and improve the resources available to Indigenous communities, enabling them to engage with projects on a more equal basis and with similar capacities.

values, cultures, and priorities. Strengthening Indigenous self-determination in the development of mining projects is the key to identifying the projects where opportunities outweigh the risks for both communities and investors.

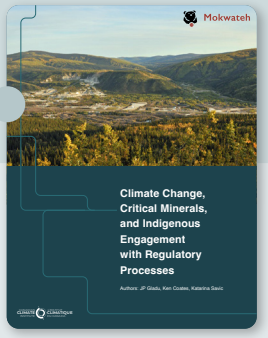
In this section, we discuss risks and opportunities for Indigenous communities, and what elements need to be in place to enable Indigenous communities to exercise their rights to self-determination in mining projects. The discussion is informed by semi-structured interviews with Indigenous community representatives and professionals who have worked in close allyship with Indigenous Peoples in mining projects, and complemented by Indigenous perspectives and knowledge reflected in materials consulted in our literature review and additional commissioned research (see Appendix A for further details).

Looking for a deeper dive?

To inform this section we commissioned two complementary scoping papers:

Climate Change, Critical Minerals, and Indigenous Engagement with Regulatory Processes by JP Gladu, Ken Coates, and Katarine Savic.

Forthcoming: *Empowering Indigenous Nations in the energy transition: Why strengthening local capacity is the first—and necessary—step to Canada's future in critical minerals* by Jordan Peterson and Dakota Norris.



4.1 Risks and opportunities

Mining projects without respect for Indigenous rights create significant risks for communities

The federal and provincial governments have a duty to consult with Indigenous Peoples and accommodate them, where appropriate, when proposed actions may adversely affect Indigenous rights (Crown-Indigenous Relations and Northern Affairs Canada n.d.a; Eyford 2015). Such actions include critical minerals projects and policies that promote them. This duty derives from Section 35 of The Constitution of Canada, and its interpretation in practice (e.g., the scope of consultations) has been developed through case law. To date, Canadian governments have acted on their constitutional obligation to consult on major resource projects through regulatory project reviews (i.e., environmental assessments or federal impact assessments).

Historically, the bulk of Canada's resource projects have proceeded without meaningful consultation and accommodation of affected Indigenous communities—let alone their consent. And while these resource projects often generated immense wealth for companies, their investors, and Canadian governments, they often brought negative impacts to Indigenous Peoples and their rights (Horowitz et al. 2024; Wale 2023; Vecchio 2022).

Environmental impacts of mining projects can threaten the health and safety of Indigenous communities, limit their access to clean water, and affect their hunting, trapping, and other spiritual and cultural practices (Chong and Basu 2023). In some instances, such as the Giant Mine in the Northwest Territories, the release of harmful mining byproducts into the environment has displaced Indigenous Peoples from their traditional territories, undermining Indigenous rights (Paulson 2021).[18] Moreover, community expectations and regulatory requirements for robust long-term monitoring of environmental impacts are increasing, holding mining companies accountable for the mitigation of ongoing contamination of lands, water, and air (see, for example, Environmental Monitoring Advisory Board 2024).

Mining can have significant social impacts on Indigenous communities, too. Mining projects, especially when they include remote work camps, have brought new risks and harms to Indigenous communities, including human trafficking, sexual abuse, and substance use (OECD 2024; Moodie et al. 2021).

18. Indigenous rights include treaty rights and Aboriginal rights recognized and affirmed by Section 35 of the Constitution Act.

Inclusion, partnerships, and self-determination are key to realizing opportunities

When Indigenous communities are empowered to guide and shape mining projects impacting their lands, they are able to better manage both risks and rewards, with the benefits extending beyond the community to investors and to Canada as a whole.

When done in true partnership with local Indigenous communities, mining can result in significant economic and non-economic benefits for these communities. B.C.'s Golden Triangle serves as a prime example. Rich in gold, silver, and copper deposits, the region accounts for 44 per cent of total exploration expenditures in B.C. (BCRMA n.d.). Mining in the area thrives in large part due to participation and support from local Indigenous communities like the Tahltan Nation and the Nisga'a Nation.

In 2023, these nations created the Treaty Creek Limited Partnership, which allows them to more easily access training and employment benefits from Seabridge Gold's KSM Project. That same year, the partnership generated over $1 million in revenue from KSM-related contracts and more than 50 jobs for nation members (Treaty Creek Limited Partnership 2024).

There are ample other economic opportunities available to Indigenous communities, including the acquisition of equity shares in mining projects or related infrastructure, entering business contracts to support mining operations, and accessing revenue shares that can be reinvested to support community priorities (see **Box 12**) (BC First Nations Energy and Mining Council 2024).

A key factor in unlocking opportunities is strengthening Indigenous self-determination and collaborative decision-making with proponents and governments. By doing so, Indigenous communities can reduce the risks associated with new mining projects while maximizing the benefits.

For example, the Tahltan Nation signed a consent-based decision-making agreement with the Government of British Columbia that recognizes Tahltan title, rights, and jurisdiction over land-management decisions for one of the two mines on their territory, the Red Chris mine (Government of British Columbia 2023b). This agreement enables the Tahltan to conduct their own environmental assessments on any proposed changes to the mine, mitigating environmental risks and creating opportunities to integrate Indigenous knowledge. It also creates regulatory certainty by setting out clear roles and responsibilities for project decisions, which in turn offers investors confidence that projects will receive decisions one way or another without lengthy legal battles.

Box 8

FREE, PRIOR, AND INFORMED CONSENT IS KEY TO ENABLING PARTNERSHIPS WITH INDIGENOUS COMMUNITIES—BUT IS NOT YET A LEGAL REQUIREMENT ACROSS CANADA

Canada signed into law the *United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) Act* in 2021. UNDRIP calls on signatories to include Indigenous communities in decision-making on any project, activity, or policy that would directly impact them—with the ultimate goal of securing their free, prior, and informed consent (FPIC)(Cultural Survival 2023; IRMA 2018a):

- **Free:** The process empowers potentially impacted Indigenous Peoples and communities to establish their own methods for granting voluntary consent.
- **Prior:** Potentially impacted Indigenous Peoples and communities are afforded adequate time to provide their input before activities begin.
- **Informed:** Governments or proponents provide Indigenous Peoples and communities with a full and complete disclosure of the proposed project's impacts and risks—economic, social, cultural, or environmental.
- **Consent:** Critically, FPIC is revokable. Indigenous Peoples and communities retain the right to grant consent, or withdraw it at any time should the relationship deteriorate, or should they decide their needs are no longer being met.

Box 8 *(CONTINUED)*

Canadian governments have been slow to align their laws, regulations, and policies with UNDRIP.[19] In 2023, the government released a 2023-2028 Action Plan that outlines 181 measures to integrate UNDRIP principles with federal policies, including those linked to Indigenous participation and leadership in land, territories, and resources (Justice Canada 2023). However, many of its measures remain nascent. Provincial adoption is taking even longer; to date, only British Columbia and the Northwest Territories have passed legislation to implement UNDRIP (Justice Canada 2024).[20]

The principle of FPIC can help reset a relationship long defined by colonialism to one between "self-determining and mutually consenting parties," where Indigenous Peoples' right to self-determination is core to any decision that could impact their lands or way of life (Papillon and Rodon 2017). **Figure 6** illustrates how interactions could unfold between Indigenous communities and mining proponents and/or governments if they were grounded in FPIC principles.

Some view FPIC as an attempt by some Indigenous groups or nations to override decisions made by non-Indigenous governments. But this view is counterproductive, perpetuating the longstanding power imbalance between Indigenous Peoples and non-Indigenous governments or industry, and setting the stage for an adversarial relationship (Tockman 2017). It also characterizes Indigenous Peoples as obstacles rather than prospective partners.

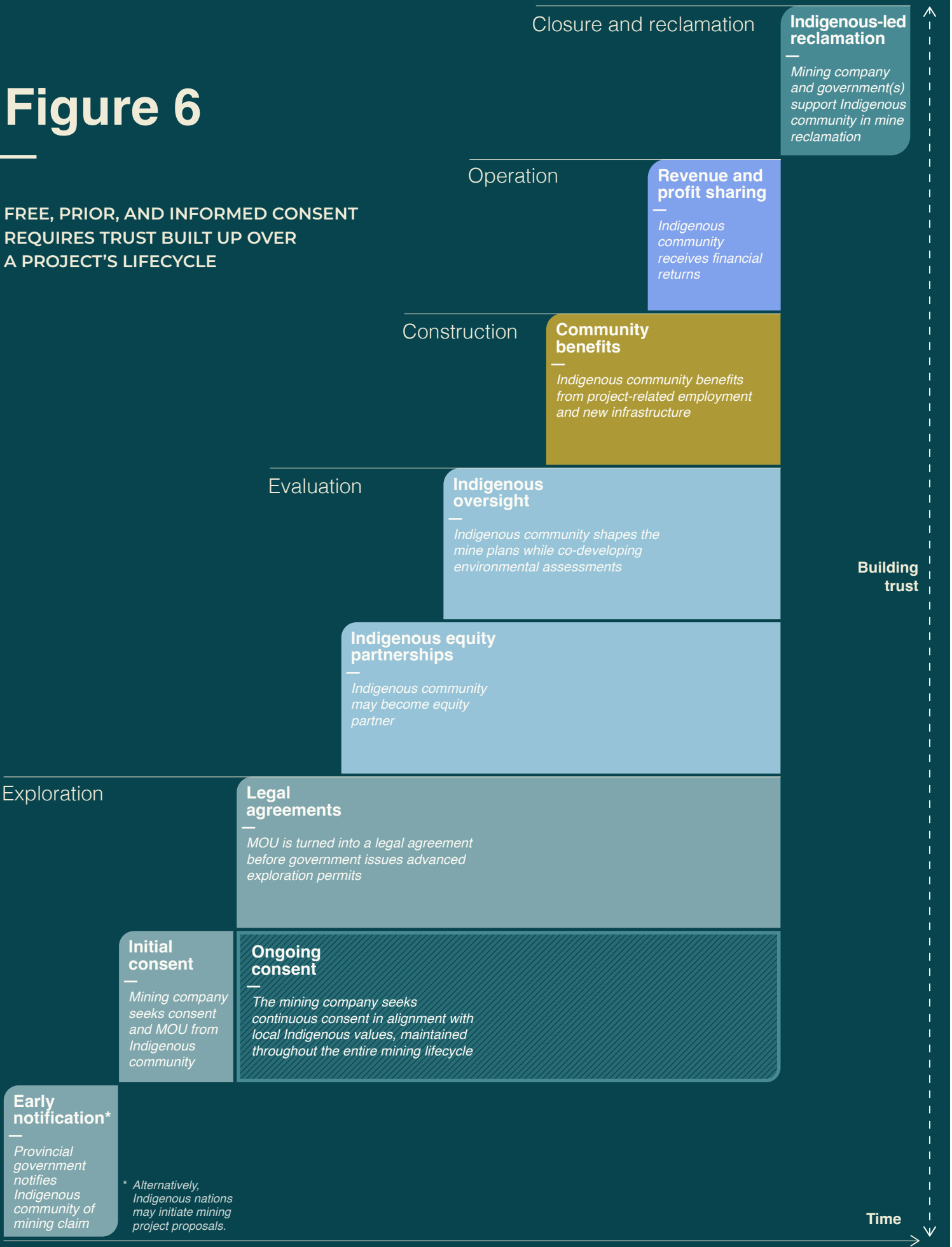
Although FPIC is currently not a legal requirement in Canadian jurisdictions, many mining companies have voluntarily committed to these principles as best practices in their relationships with Indigenous communities.

19. In 2012, the Truth and Reconciliation Commission called upon all orders of government to fully adopt and implement UNDRIP (Action 43) and for the federal government to develop a national action plan, strategies, and other measures to achieve the goals outlined in UNDRIP (Action 44) (Truth and Reconciliation Commission of Canada 2015).

20. In particular, British Columbia has taken steps to align its mineral laws with UNDRIP through reforms to the Mineral Tenure Act (Government of British Columbia n.d.).

Figure 6

FREE, PRIOR, AND INFORMED CONSENT REQUIRES TRUST BUILT UP OVER A PROJECT'S LIFECYCLE



Companies and investors increasingly prioritize projects that have consent from impacted Indigenous communities

Although current laws and policies suggest that future projects may proceed without first securing FPIC from impacted Indigenous groups, our expert interviewees unanimously agreed that any attempt to build a new critical mineral mine without doing so will lead to high risks for both Indigenous communities and investors.[21] In researching this report, we provided industry leaders with a list of barriers to investment in critical mineral projects and asked them to rank them in order of impact. Respondents identified lack of Indigenous consent, sometimes referred to as the social licence to operate, as the third most significant barrier.[22, 23]

Companies that fail to meaningfully engage with Indigenous communities risk high unplanned costs from regulatory delays, lawsuits, reputational damage, lost productivity, reduced sales, and diversion of staff time to manage conflict (Gladu et al. 2025; Davis and Franks 2014).

Mining investors increasingly see Indigenous consent as critical for minimizing risk—especially litigation risk—and ensuring a proposed project's long-term success. A June 2020 Moody's research report suggests that companies that fail to meaningfully engage with and secure the consent of Indigenous communities risk damaging their corporate credit rating (Calla 2021). Unresolved land title disputes may also delay project investments as institutional investors seek to head off potential financial and legal risks (Munden Project 2012). A number of our interviewees also mentioned this as a concern.

21. In some cases, community opposition to projects valued between $3 billion and $5 billion led to costs of approximately $20 million per week (Davis and Franks 2014).

22. Respondents chose from 12 project-related barriers in total; delays in regulatory processes, and remoteness and lack of infrastructure emerged as the first and second most significant barriers.

23. When we asked participants to rank the relative importance of 12 distinct barriers, half of them identified a lack of social licence from communities as either a major or moderate barrier to project-scale investment. During subsequent semi-structured interviews, participants critiqued the term "social licence"—which can encompass support or opposition from non-Indigenous communities and public sentiment in general—and indicated their preference for the more precise term and concept of consent.

In response to the perceived risks associated with developing a project without the consent of impacted Indigenous communities, the bulk of Canada's mining sector and mining investors have voluntarily endorsed FPIC principles. For example:

- In its position statement on Indigenous Peoples, the International Council of Mining and Metals commits to FPIC-guided due diligence and equitable agreements (ICMM 2024).

- The Mining Association of Canada's (MAC) Toward Sustainable Mining Standards and Initiative for Responsible Mining Assurance's Standard for Responsible Mining both include robust standards for respecting FPIC (Mining Association of Canada 2021; IRMA 2018a).

- Individual companies, such as Teck, are creating their own Indigenous Peoples Policies (Teck 2024).

- The Made-in-Canada Sustainable Investment Guidelines, informally known as the "green taxonomy," include environmental, social, and Indigenous objectives, and a "do no significant harm" principle. Twenty-five of Canada's largest financial institutions endorsed the taxonomy framework (Finance Canada 2024).

In practice, parties typically formalize Indigenous consent via negotiated agreement. While the types of agreements may differ (e.g., exploration, benefit sharing, community development, or resource revenue agreements), they can be configured to benefit all parties involved. For Indigenous partners, those benefits could include direct compensation, an equity stake in the mine, jobs, in-kind support, or say in how projects on their territory will be built, operated, and reclaimed (BC First Nations Energy and Mining Council 2024; NRCan 2024b; Mining Industry Human Resources Council 2024). Currently, there are over 500 agreements in Canada between mining companies and Indigenous communities; such agreements, typically called Impact Benefit Agreements, have become the norm (Mining Association of Canada, n.d.).

However, as we show in the following section, voluntary corporate action is not enough. Three significant policy problems contribute to making new critical mineral mining projects risky for both Indigenous communities and investors.

4.2 Identifying policy priorities

Three key policy problems underlie the risks to Indigenous rights and communities associated with new mining projects, and, as a result, to companies and investors, too. Mining projects are more likely to put Indigenous rights and communities at risk of violation and harms if:

- Canadian governments neglect their duty to consult with and accommodate adversely impacted Indigenous groups;
- impacted Indigenous communities lack the capacity and resources to effectively engage with critical mineral mining project proposals (if they wish to do so); and
- Indigenous communities lack access to capital to acquire equity in critical mineral mining projects (if they wish to do so).

These policy problems are all material and require government actions to fully unleash the economic capital investment in Canada's critical mineral mining sector, however only the latter two are sector-specific (see **sections 4.3** and **4.4** for a discussion of potential solutions).

In contrast, insufficient consultation and accommodation by government is a complex, longstanding, systemic issue requiring government intervention well beyond the critical mineral sector. This problem requires long-term solutions but an in-depth discussion of policy solutions is beyond the scope of this paper.

Governments are neglecting their constitutional duty to consult with Indigenous Peoples

Our interviews revealed that governments frequently undermine their constitutional duty to consult and accommodate Indigenous Peoples in major resource development projects by:

- failing to consult all impacted Indigenous communities;
- delegating procedural aspects of consultation to project proponents without holding them accountable;
- not allowing communities sufficient time to engage in the consultation process; and/or
- undermining the process through which companies and communities may reach agreements.

This is a source of risk for Indigenous communities when it comes to new mining developments as there is little assurance that their rights will be respected and their views included in decision making.

The long history of court challenges by Indigenous governments and communities indicates a situation where Indigenous Peoples resort to "implementation by litigation" to hold governments accountable. It is also an immediate risk factor for project proponents because litigation increases uncertainty, causes delays, and adds costs.

For example, in the Gitxaała and Ehattesaht case in British Columbia, the nations argued that the mining claims system grants companies mineral rights without adequate consultation with impacted Indigenous communities (Roine et al. 2023). In September 2023, the Supreme Court of British Columbia ruled that the government must consult with an impacted First Nation before transferring mineral rights between third parties. It also ordered the government to implement a new authentic consultation process before March 2025 (Killoran et al. 2023; Collie et al. 2023). The government has since made progress on reforming its *Mineral Tenure Act*.

Box 9

ANOTHER SYSTEMIC POLICY PROBLEM: AMBIGUITY CONTINUES TO SURROUND INDIGENOUS LAND TITLE

Clarity around Indigenous land title is necessary for safeguarding Indigenous rights in the context of major resource projects. Our survey participants highlighted the ongoing murkiness around Indigenous land title as a major barrier to new investment (Bourassa and Arnold 2024).[24] Similarly, some interviewees—including people working in the critical mineral mining and finance sectors—said they clearly understood the obligation to consult with First Nations but weren't always sure who to call first. This lack of clarity also discourages investors, who fear the risk of increased litigation due to not involving the appropriate Indigenous communities in decision-making.

The ambiguity surrounding Indigenous rights and title is deeply rooted in colonialism and varies across Canada, driven in part by regional nuances in historic treaty-making.[25] For example, many Indigenous communities are still actively negotiating modern treaties with governments—48 such negotiations are underway in British Columbia alone (Crown-Indigenous Relations and Northern Affairs Canada n.d.c). In 2022, the Assembly of First Nations and the federal government launched the Specific Claims Implementation Working Group to develop a fully independent land claims process to resolve outstanding land claims.

This complex policy problem extends beyond the scope of the critical minerals sector and merits further discussion beyond the scope of this paper.[26]

24. See **Appendix A** for survey methodology.

25. Generally speaking, Eastern Canada's Peace and Friendship treaties did not require Indigenous Peoples to surrender their land rights; treaties in Quebec and the territories clarify land and resource ownership; numbered treaties on the Prairies clarify land title (although disputes linger within communities); and British Columbia territories remain mostly unceded, with ongoing negotiations underway and overlapping claims.

26. See the scoping paper on Climate Change, Critical Minerals, and Indigenous Engagement with Regulatory Processes for further details on Indigenous rights and title as they relate to natural resources.

Some Indigenous communities have limited capacity to engage with industry and governments around resource development projects

Indigenous Peoples and communities require significant capacity to effectively manage their land and resources when it comes to major resource projects. By "capacity," we mean the organizational and financial means Indigenous nations and communities have to participate in and contribute meaningfully to mining-related regulatory processes, policies, and activities. Participation often requires dedicated staff time and long-term funding. Engaging with mining project proposals can easily strain this capacity. Likewise, resources can be stretched when opportunities arise for communities to themselves become equity partners.

Project participation—from exploration to reclamation, including decision-making about whether and how to participate—may require community meetings, collection of Indigenous knowledge from Elders and Knowledge Keepers, inclusion in environmental assessments, legal representation, training and skills development, and economic development (e.g., feasibility studies, land surveys, and appraisals, etc.). Without the necessary capacity, Indigenous communities are unable to engage in these processes, leading to stalled regulatory reviews and project decisions. This can result in delays and financial losses for companies and investors but also potentially lost opportunities for affected First Nations.

Colonialism casts a long shadow across Indigenous communities, resulting in profound disparities of income, education, health, and housing compared to non-Indigenous communities. At any given time, a community could be balancing multiple investment priorities such as energy projects, infrastructure improvements, health and social services, language reclamation, and education and training—in addition to prospective participation in critical minerals projects.

Canada is home to more than 630 First Nations communities, and their capacities to engage with project proponents (if they choose to do so) range from minimal involvement to equity ownership. While some nations with a history of resource development may have the resources needed to navigate deals and negotiations, many may require external support (Lèbre et al. 2020).

Some communities cannot access the capital needed to acquire project equity

Acquiring an equity stake in a project can drive economic development in Indigenous communities and empower Indigenous communities to directly influence operational decisions on employment, procurement, ecosystem stewardship, and cultural heritage (Kung et al. 2022). That is why many Indigenous advocates increasingly consider equity participation as the leading standard for earning and maintaining consent from Indigenous communities.

However, Indigenous governments, communities, and entrepreneurs often lack access to the necessary capital.[27] The roots of the issue reach all the way back to 1876, when the federal government enacted the *Indian Act* to control and assimilate Indigenous Peoples. Nearly 150 years later, it remains in force, restricting Indigenous access to capital and own-source revenue streams by barring use of title land as collateral, limiting livestock and agricultural sales, and restricting commercial use of reserve land and property tax collection (Assembly of First Nations 2021).

Beyond the *Indian Act*, the federal transfer-based system also perpetuates colonialism. While it facilitates financial transfers to Indigenous communities for essential services, it also hinders them from accessing capital. Transfers are insufficient and unpredictable, and the system constrains Indigenous access to revenue-generation opportunities such as taxation.

Put together, these economic barriers increase the perceived and actual risks of lending to Indigenous communities and entrepreneurs, which constrains their ability to access capital from commercial banks. As a result, companies and investors also miss out on the opportunity to form mutually beneficial partnerships with Indigenous communities and entrepreneurs.

27. This is not the case with all industries. Indigenous equity ownership is increasing in wind energy, for example, because it offers stable pricing and revenue. In contrast, mining is both capital-intensive and highly volatile. A mining project that initially seems viable may become less so over time as market conditions change or the project moves through regulatory processes. This deters investors, including Indigenous investors.

Box 10

LOW CORPORATE LITERACY TOWARD INDIGENOUS CULTURES, VALUES, AND KNOWLEDGE IS NOT A PUBLIC POLICY PROBLEM

Notably, a mining company's low literacy of Indigenous culture, values, and knowledge, and the resulting inability to effectively engage with Indigenous communities early on in project development, is not a public policy problem—it is companies' responsibility to establish these relationships. Interviewees representing communities, mining companies, environmental organizations, and consulting firms flagged that proponents' enduringly poor cultural literacy is hindering potential Indigenous partnerships.

Our semi-structured interview participants identified several factors contributing to low corporate literacy. While larger mining companies often have dedicated Indigenous-relations teams, typically smaller exploration companies are less capable. Mining projects also usually change ownership multiple times from exploration to operation, which limits opportunities for fostering long-term community relationships. However, the interviews highlighted that establishing early relationships within an Indigenous community—and actively involving community members in a proposed mine's planning from the start—can significantly reduce risks both for Indigenous communities and project proponents.

Table 2

SUMMARY OF POLICY PROBLEMS CONCERNING RISKS TO INDIGENOUS RIGHTS AND COMMUNITIES FROM CRITICAL MINERALS MINING IN CANADA

Is this a policy problem for Canadian governments?	If so, is it significantly deterring investment?	If so, is the scope of the problem specific to the sector?
Governments are neglecting their constitutional duty to consult		
YES: Failures arise from policy design and implementation issues, and inconsistent application.	**YES:** This creates uncertainty for mining proponents on how best to engage Indigenous communities. Companies have begun implementing principles of FPIC voluntarily, to mitigate these risks.	**NO:** Affects major projects in numerous sectors across the economy.
Ambiguity continues to surround Indigenous land title		
YES: Modern treaties and self-government agreements are shaping the evolution of land title and resource rights across various sectors, extending beyond mining.	**YES:** Murkiness surrounding the owners of the land and its resources leave proponents guessing which Indigenous groups they need to consult. This increases uncertainty for investors and heightens litigation risk.	**NO:** In many regions, governments are actively negotiating treaties that would restore and clarify land titles. This complex policy problem extends well beyond the scope of the critical minerals sector.
Some proponents lack literacy toward Indigenous cultures, values, and knowledge		
NO: This is not a problem for governments to resolve.	n/a	n/a
Some Indigenous communities have limited capacity to effectively engage with industry		
YES: Discriminatory policies limit the ability of Indigenous communities to raise revenue and develop economic opportunities.	**YES:** Without sufficient expertise, Indigenous communities will be challenged to exercise their right to consent, engage in decision-making processes, and maintain representation.	**PARTIALLY:** Governments can leverage existing Indigenous capacity-building programs specifically for critical mineral projects. However, wider socio-economic inequities can complicate their implementation.
Host communities cannot access the capital needed to acquire project equity		
YES: Discriminatory policies continue to restrict Indigenous nations and communities from conducting economic activities on their land and leveraging their assets for collateral.	**YES:** Without access to capital, Indigenous nations and communities may find it difficult to secure equity stakes in projects, which in turn limits their influence over key project decisions and revenue streams.	**YES:** Some sector-specific federal and provincial programs support Indigenous equity ownership in critical mineral projects.

4.3 Resources to engage on mining projects

Decades of colonial policies have effectively dismantled many Indigenous governance structures, leaving communities with limited capacity to manage their land and resources. Canada's governments now have an opportunity and an obligation to reverse that harm, and support them to make decisions on critical minerals projects from a position of strength and self-determination (Raderschall et al. 2020).

In this section, we explore different policy options to bolster the capacity and resources of Indigenous communities to integrate their knowledge and values into decision-making processes, if and how they choose to. Again, the evaluation of policy options in this section is informed by literature review of Indigenous-led research as well as semi-structured interviews with Indigenous community representatives and professionals who have worked in close allyship with Indigenous Peoples in mining projects.

Our research and discussions with Indigenous representatives found that capacity building can enable Indigenous participation in project siting and design, mitigation of operational impacts as well as monitoring and land reclamation after closure. For companies and investors, enhancing Indigenous capacity can foster stronger partnerships as Indigenous communities can actively engage as partners and reduce project risks. Doing so can ensure Indigenous communities can provide valuable input on potential impacts and ensure better alignment with community values and priorities.

Government grants to create and fund community-based positions for co-ordinating mining projects

Governments can support capacity building in Indigenous communities by funding dedicated positions to co-ordinate the consultation process and critical minerals project opportunities between the community, governments, and mining companies. These individuals would share the company's plans for mining on Indigenous land with the community and facilitate meaningful engagement from the early stages of exploration through to mine reclamation.

The specific positions needed will vary based on each community's governance structure, capacity, and priorities. For example, the Tahltan Nation has a major projects co-ordinator while the Cree Nation has sectoral development advisors and other specialized roles to support engagement and development. Flexibility in the types of positions being funded can enable

community members to fill positions in line with community interests and priorities (Attygalle 2020).

For example, in 2009, Ontario's Independent Energy System Operator launched a series of programs intended to build capacity on matters of energy within Indigenous communities. One of its programs, the Community Energy Champion Program, has since provided close to 100 First Nation and Métis communities and organizations with grants to support the recruitment of individuals who assist in planning, implementing, and evaluating energy-related priorities (IESO 2023).

Government grants to fund capacity-building activities

Governments can provide funding for Indigenous communities to plan, evaluate, and implement capacity-building services and activities (e.g., economic-readiness assessments, pre-feasibility studies, environmental evaluations, and skills training). Under this approach, governments would leave it up to communities to decide how best to allocate their funds. This approach allows communities to either invest in building capacity within the community or bring in external expertise.

For example, in Manitoba, Prairies Economic Development Canada recently leveraged federal funds to launch the Manitoba Indigenous Critical Minerals Partnerships Initiative (Prairies Economic Development Canada 2024). The initiative supports workforce development, capacity building, and business development in the critical minerals sector. Seven Indigenous communities have already received a combined total of $945,000 in funding for engaging with mineral development opportunities.[28]

Governments' delivery of capacity-building services

Governments can also directly deliver capacity-building services, either as the sole provider or in collaboration with partners. By offering a service to support Indigenous engagement with project proposals, the government can help facilitate early collaboration between communities and proponents. This approach can help address broader issues and mitigate conflicts, and might be helpful for active jurisdictions where communities are juggling multiple ongoing projects. Some interview participants noted that this approach can offer Indigenous communities help managing the

28. Funding recipients include: Norway House Cree Nation, to complete a business plan and deliver training programs ($300,000); Marcel Colomb First Nation, to develop and deliver a workforce readiness program ($380,000); and the Manitoba Communities Economic Development Fund, to create and expand community development corporations ($265,000).

burden of engaging on numerous proposals without taking away capacity to support other community priorities.

For example, in its Plan for the Development of Critical and Strategic Minerals, launched in 2020, the Government of Quebec opted to deliver capacity-building services directly to communities (Government of Quebec 2020). The Ministry of Natural Resources and Forestry provides the services via an "offer of social acceptability." As the name suggests, the program seeks to achieve social acceptability—Quebec's equivalent of consent—for critical minerals projects.[29]

Partnership models for service delivery

Capacity building in Indigenous communities can also be supported through broader partnerships. Under this approach, governments, communities, their local institutions, and companies share the financial and administrative responsibilities for capacity-building services. A range of our interviewees told us that companies generally are quite willing to provide communities with capacity funding. They're often motivated to build strong personal and business relationships, help communities better understand their project proposals, and ensure smoother consultations. Governments can build on the industry's willingness to invest in communities by topping up corporate funding and supporting Indigenous-led service delivery.

For example, the Indigenous Centre of Excellence for Mineral Development offers a model for this approach (Indigenous Centre of Excellence for Mineral Development. N.d.). The Centre seeks to equip Northern Ontario Indigenous communities—as well as industry and governments—with information and tools to improve Indigenous engagement, consultation, and consent protocols for stronger, more respectful partnerships (Indigenous Centre of Excellence for Mineral Development n.d.). The Waubetek Business Development Corporation leads the initiative in partnership with Rio Tinto, the Federal Economic Development Agency for Northern Ontario, Natural Resources Canada, and Laurentian University. Rio Tinto has contributed $1 million to the Centre over five years, along with technical expertise, while FedNor and NRCan have each committed $1.8 million (Rio Tinto 2019). Voluntary mining standards, such as TSM and IRMA, also include commitments to support capacity building.

29. Quebec provides communities with three distinct tranches of support: A regional project manager helps identify potential land-use conflicts, and informs both Indigenous and non-Indigenous communities of their rights related to the projects in a particular area. A sector-based mining and energy advisor also ensures a given project complies with regulations. Finally, a third team creates summary documents to help inform decisions in other communities (Government of Quebec. n.d.).

Comparison of options

Government grants to fund a position in the community or support community-led capacity-building activities can help Indigenous communities allocate funds to address the capacity and resource gaps they identify across a mine's full lifecycle. Indigenous-led programs enable communities to establish and lead capacity-building activities in line with Indigenous knowledge, priorities, and values. These types of Indigenous-led approaches can ensure associated programs respond to community needs and endure far into the future (Attygalle 2020).

The other co-led (e.g., partnership model) or non-Indigenous-led (e.g., government services) policy options can provide additional capacity support to communities if and when needed. For example, they may make sense in more complex or larger-scale projects, or in regions facing cumulative impacts from multiple projects. These options can also be more cost-effective by supporting multiple Indigenous communities at once.

The more companies and/or governments involve themselves in program design and delivery for these co-led or non-Indigenous-led options, the higher the risk that pro-development biases will find a way in. The goal must be to authentically empower Indigenous communities to make more informed decisions on projects, not to get them to say yes to a project.

If we assess the four options above for relative fiscal burden and ease of implementation, we conclude that Indigenous-led options may cost more but would be relatively straightforward to implement and scale. The non-Indigenous-led options likely cost less, simply because they would seek to support multiple communities at once, but may not respond as effectively to the needs of individual communities.

See **Appendix C** for a more detailed comparison of the various options.

4.4 Access to capital

Many Indigenous communities and entrepreneurs want to participate in critical minerals projects by taking an equity stake in a project, developing associated infrastructure (e.g., clean electricity infrastructure), and/or loaning a proponent money.[30] However, they cannot easily access the needed capital.

Companies and investors can also benefit when Indigenous communities and entrepreneurs have access to capital. This is because partnering with Indigenous communities and entrepreneurs that have access to low-cost capital and preferential lending rates creates opportunities for more cost-effective financing, reduces capital costs for projects, and strengthens long-term partnerships with Indigenous rights holders who are invested in the project's success.

Traditional financial instruments do not often meet the unique needs of Indigenous communities and entrepreneurs. Governments can address this by offering them assisted market sources, such as loan guarantees, and non-market sources, such as grants (Pasternak 2018; National Aboriginal Economic Development Board 2017).

Indigenous Financial Institutions (IFIs) will also play a critical role. These autonomous, Indigenous-controlled, and community-based financial organizations provide developmental lending, business financing, and support services to First Nations, Métis, and Inuit businesses.

Recent Indigenous Services Canada research found that Indigenous entrepreneurs "feel a stronger and more personal relationship" with IFIs than they do with conventional lending institutions (Indigenous Services Canada 2023). This is likely because IFIs understand the challenges their clients have historically faced when accessing capital, such as absence of a financial track record or limited access to assets, which can make it difficult to meet traditional credit requirements for financing (Momentus 2023). Instead, IFIs create programs that consider the realities and capacities of Indigenous

30. Few Indigenous communities yet have the capacity to lend to mining companies, but Taykwa Tagamou Nation is an exception. The nation is investing $20 million at 4.75 per cent interest over five years in Canada Nickel's Crawford Nickel Sulphide Project. Although the nation has invested via convertible notes, once converted, they would own roughly eight per cent of the company. This is the largest First Nation investment in a critical minerals project to date (Taykwa Tagamou Nation and Canada Nickel Company 2024).

entrepreneurs, ensuring they receive tailored support to access capital markets while respecting cultural values and community needs.

Canadian governments have introduced various financial tools to improve Indigenous access to capital. In this section, we assess these tools, to identify those with strong scaling potential for critical mineral mining projects.

Loan guarantees to support Indigenous equity

Loan guarantees allow governments to support Indigenous communities and entrepreneurs in acquiring equity in mining projects without directly providing funds. Instead, government guarantees reduce default risks for traditional lenders, incentivizing them to offer more attractive terms to applicants (Fantauzzo et al. 2024). Over time, Indigenous borrowers and private lenders gain experience working together, improving the odds that Indigenous communities can access commercial loans in the future while lenders become more familiar with their unique needs and dynamics (Vogel and Adams 1997).

In December 2024, the Canada Development Investment Corporation, a federal Crown corporation, launched the Canada Indigenous Loan Guarantee Program as a subsidiary. Initially aimed at unlocking up to $5 billion in loan guarantees, the program was expanded in March 2025 to provide up to $10 billion to support Indigenous ownership in natural resource and energy projects, including mining projects (Canada Development Investment Corporation 2024; Canada Development Investment Corporation. 2025).

Loan guarantees in this program range from $20 million to $1 billion; the program could support anywhere from 10 to 500 projects, depending on the size of the loan guarantee awarded (Canada Indigenous Loan Guarantee Corporation 2024). Applicants may stack both federal and provincial loan guarantees, providing up to 100 per cent coverage of an equity stake. They may also stack the guarantee with other federal programs, covering up to 75 per cent of project costs.

Alberta, Saskatchewan, and Ontario have each offered loan guarantees to Indigenous communities in the past, and Manitoba and British Columbia are in the process of developing such programs—although not all include equity participation in mining projects.[31]

The two provincial loan guarantee programs that include mining projects in scope—the Alberta Indigenous Opportunities Corporation (see **Box 11** for more information) and Saskatchewan Indigenous Investment Finance Corporation—have yet to back a loan for equity in a mining project.

31. Some provincial Crown corporations consider mining projects within their scope, such as Alberta's Indigenous Opportunities Corporation, Saskatchewan's Indigenous Investment Corporation, and Ontario's Indigenous Opportunities Financing Program (Alberta Indigenous Opportunities Corporation n.d.; Saskatchewan Indigenous Investment Finance Corporation n.d.; Government of Ontario 2025). Others are still being developed. British Columbia's First Nations Equity Financing Framework will likely include natural resources projects while Manitoba's Indigenous loan guarantee program is so far focused on wind energy (Government of British Columbia 2024a; Government of Manitoba 2024).

Box 11

ALBERTA'S SUCCESSFUL MODEL OF GOVERNMENT-BACKED INDIGENOUS LOAN GUARANTEES

Alberta's $3 billion Indigenous Opportunities Corporation (AIOC) is enabling Indigenous communities to take ownership in natural resource projects. By offering government-backed loan guarantees between $20 million and $250 million, AIOC helps Indigenous nations, communities, and nation- or community-owned businesses secure the funding they need to buy equity stakes (Alberta Indigenous Opportunities Corporation n.d.). AIOC supports only commercially viable projects to protect Indigenous communities' revenues, which can also serve as collateral for future borrowing (Calla, 2021).

In just five years, AIOC's loan guarantee capacity has doubled from $1.5 billion to $3 billion, reflecting the growing demand for partnerships between government, industry, and Indigenous communities in resource development projects (Alberta Indigenous Opportunities Corporation 2024). To date, AIOC has given out $680 million in guarantees, supporting seven deals and benefiting 42 First Nations and Métis communities.

Another aspect that sets Alberta's Indigenous loan guarantee model apart is its capacity-building support. The AIOC reserves discretionary funds to help Indigenous communities access legal, technical, and economic expertise to develop deals. Due to this support and engagement with every Indigenous community in Alberta, it is no surprise that the AIOC has been involved in half of Alberta's Indigenous equity deals since its inception (Carruthers and McClusky, 2023).

Multiple interviewees emphasized the importance of both federal and provincial loan guarantee programs. They also expressed concern that Indigenous communities with access to major mining projects could rapidly deplete the federal loan guarantee program as such projects require large sums of capital. As initial capital costs easily run $1 billion per mine, the $5 billion federal program could potentially be fully subscribed within a year or two. A double-layer structure, with provinces and territories also contributing guarantees, would help provide a longer runway.

Loan guarantees offer Indigenous communities and entrepreneurs an opportunity to acquire equity in a critical minerals project without direct financial exposure. But should numerous projects fail, with lenders calling in their guarantees, governments could end up carrying a significant fiscal cost—a more likely outcome in a volatile sector such as critical minerals.

Loans for acquiring equity

Governments can also provide loans to Indigenous communities, especially for critical minerals projects or for associated infrastructure projects that may not yet meet traditional lending criteria. An Indigenous community could access these loans to either acquire an equity stake in a critical minerals company or project, or finance its associated infrastructure.

For example, in 2023 the Canada Infrastructure Bank (CIB) launched its Indigenous Equity Initiative (IEI) to support economic inclusion in green infrastructure, clean power, public transit, trade and transportation, and broadband internet (Canada Infrastructure Bank 2023).

IEI loans help Indigenous communities purchase equity in infrastructure projects. CIB can offer lower interest rates to support community-based projects that might not be feasible with a conventional loan. In February 2024, the bank awarded its first IEI loan of $18 million to a coalition of 13 Mi'kmaw communities, granting them equity in the Nova Scotia Energy Storage Project (Canada Infrastructure Bank 2024).

This model offers several advantages: it gives communities a say in major project decisions and allows them to benefit as equity partners, and it reduces a community's exposure to potential losses, as both CIB and the Indigenous community are co-investors. However, critical minerals projects are inherently risky ventures. By providing loans, governments assume part of that risk, as loan repayment depends directly on the project's fluctuating profitability and dividends.

Resource revenue-sharing agreements

Indigenous Peoples are increasingly seeking a share of the fiscal benefits that accrue to companies mining on their traditional territories. Resource revenue-sharing agreements represent one avenue to do so.

The B.C. First Nations Critical Mineral Strategy argues that provinces must assign public royalty taxes to critical minerals projects and direct all Crown mineral taxes and fees for mineral claims and mining leases to the impacted nation (BC First Nations Energy and Mining Council 2024). Meanwhile, the First Nations Tax Commission has similarly called for a First Nations Resource Charge (First Nations Tax Commission 2023).

In 2018, the Government of Ontario signed Resource Revenue Sharing Agreements with three Indigenous councils that together represent 35 distinct nations. The government provides the communities with 40 per cent of taxes and royalties that mining companies pay the government at

the time the agreements were signed, and 45 per cent of those from future mines in the areas covered by the agreements (Government of Ontario 2020).[32]

To date, the three agreements have directed $89 million from mining taxes and royalties to Indigenous communities (Government of Ontario 2023). The communities may use the revenue for economic development and community development, among other things.

Multiple Indigenous voices champion this policy option as it offers an avenue for sharing the economic benefits of development on Indigenous land.

The above notwithstanding, widespread revenue-sharing agreements would require provinces to forego a portion of public revenue. Increasing royalty tax rates in response would reduce mining profitability, potentially deterring investors seeking high returns.

32. The tax rate on profit subject to Ontario's mining tax is 10 per cent for non-remote mines, and five per cent for remote mines (Government of Ontario 2022).

Box 12

INDIGENOUS-LED MODEL FOR MAXIMIZING THE VALUE OF MINERAL REVENUES

In British Columbia, Nations Royalty, Canada's largest majority Indigenous-owned public company, is helping the Nisga'a Nation leverage mining royalties from Impact Benefit Agreements to create new financial opportunities and build wealth.[33] The Nisga'a Nation, which owns 77 per cent of Nations Royalty, has pooled royalties from five mining projects within the province's Golden Triangle region to form the publicly traded company (Nations Royalty 2024).

By consolidating royalties from multiple projects at various stages of development, Nations Royalty creates a portfolio of royalty income from First Nations, thereby lowering the risk for each individual royalty, which creates value for both Nations Royalty and the participating Indigenous communities.

33. Australia has a similar resource revenue-sharing mechanism called the Aboriginal Benefit Account (ABA), which collects and distributes funds from mining on Aboriginal-owned and -controlled land in the Northern Territories. To date, the Account has invested $620 million (AUD$680 million) in Aboriginal Investment, an Aboriginal-led corporation that provides grants and financial support to promote Aboriginal economic self-determination (Aboriginal Investment n.d.).

Comparison of options

Governments can choose from an array of policies to help Indigenous communities and entrepreneurs partner on critical minerals projects or the associated infrastructure.

Government-backed loan guarantees reduce default risk for commercial lenders. Governments assume these potentially significant risks (critical mineral mining is a risky venture, see **Section 3**), but they only pay out in the event of a default. Governments will need to carefully vet prospective projects for economic viability. Governments could also combine loan guarantees with other instruments to reduce financial risks, including offtake agreements or contracts for difference (see **Section 3.3**).

In the long run, loan guarantee programs can help Indigenous communities and entrepreneurs build experience as project owners, and give commercial banks experience working with Indigenous lenders. That, in turn, will eventually help the banks feel more comfortable loaning to Indigenous communities without government backing.

Loan programs provide many of the same benefits as loan guarantee programs but carry much higher immediate costs for governments that actually have to pay out the loan up-front. They also bypass commercial lenders, which limits opportunities for banks to learn about the preferences and needs of Indigenous clients.

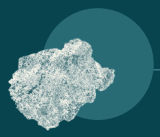
Revenue-sharing agreements can round out the above policy options by ensuring communities capture income from resource development activities on their lands. However, increasing royalties to boost Indigenous revenue sharing could cool investor interest in new mines. Should that occur, Indigenous communities and entrepreneurs could end up confronting more barriers to project equity ownership, not fewer.

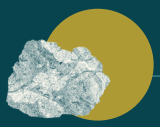
See **Appendix C** for a more detailed comparison of the various options.

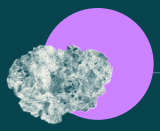
SECTION 5

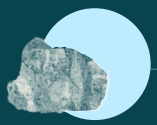
Environmental risks

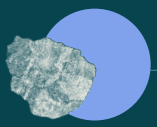
Public support for mining hinges on reducing environmental risks

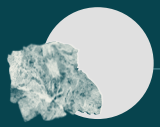












While the industry has made progress on how mines are developed and managed, environmental risks remain inherent to mineral development. These risks are related to altered landscapes, biodiversity damage, and a potential increase in greenhouse gas emissions from the mining sector.

Environmental risks are increasingly becoming project risks: whether projects secure financing, get built, and stay in operation hinges on how well environmental risks are managed.

In this section, we dig into the key environmental risks of increased mining and unpack how they can affect investment decisions. We also evaluate these risks to identify those that are rooted in policy problems, impact investment decisions, and warrant government intervention.

Looking for a deeper dive?

To inform this section we commissioned two complementary scoping papers:

Managing environmental risks of mining critical minerals in Canada by Christopher Pollon and Eyab Al-Aini.

Mining Decarbonization: Enhancing Canada's low-carbon advantage in the global critical minerals race by Eyab Al-Aini.

5.1 Risks from mining

Several environmental risks can create local opposition and exacerbate investment risk.

Mining waste and abandoned mines can pose severe risks for local water systems

Mining operations present acute local risks to water, soil, and air. In addition, there is the ever-present risk—both real and perceived—of a tailings-dam failure, or that a company will abandon a no-longer-profitable project, leaving behind long-term environmental liabilities.

At the project level, tailings management poses significant environmental risks, in particular to local rivers, lakes, and watersheds.[34] Tailings are the slurry of waste materials left behind after a company has extracted minerals or metals from ore. They typically consist of finely ground rock particles, water, and often-toxic chemicals. As mining companies must safely store vast quantities of this waste material on-site, the required storing facilities represent a significant environmental risk.

In 2014, the Mount Polley disaster in British Columbia, brought tailings management issues to the forefront of public and investor awareness (Government of British Columbia 2015). Ten years later, in June 2024, a heap leach pile failed at the Eagle Gold Mine in North Central Yukon, sending cyanide and other contaminants into a nearby salmon-bearing creek (Government of Yukon 2025). Data from the latest report on the performance of mines subject to Metal and Diamond Mining Effluent Regulations show an increased number of harmful substances exceedances nearly doubled between 2018 and 2022 (ECCC 2024).

34. With a few exceptions where ore is not processed, most mines generate tailings to varying degrees. The magnitude and severity of tailings storage failures have increased globally since the year 2000 as lower grade mines generate more waste material. (Hudson-Edwards et al. 2024).

Environmental impacts on local water systems can linger long after a mine winds down its operations. Natural Resources Canada's National Inventory of Orphaned and Abandoned Mines includes 4,340 known sites that are classified as abandoned. The government classifies 86 of them as high risk with potential to cause environmental, public health, and public safety concerns.[35] For example, the abandoned Tulsequah Chief mine in British Columbia, which operated between 1951 and 1957, has been discharging acid runoff since it closed, with cleanup and monitoring efforts expected to continue in 2025 (Government of British Columbia 2025).

Mining can put biodiversity and ecosystems at risk—especially when combined with other industrial activities

Mining can broadly impact the ecosystems that clean the air, filter water, fertilize the soil, regulate the climate, and provide wildlife habitat, especially when combined with other industrial activities. Practitioners and regulators refer to these collective harms from past, present, and potential future activities as "cumulative effects" (Government of Canada n.d.a.).[36]

Unless governments effectively assess and manage these cumulative effects by considering them in planning decisions and new-project approvals, impacted Indigenous communities may challenge critical mineral mining projects in the courts due to a violation of their rights.

For example, in a precedent-setting 2021 decision, the Supreme Court of British Columbia directed the Government of British Columbia to stop signing off on new industrial projects in the extensive traditional territories of the Blueberry River First Nations until they started accounting for cumulative effects. The court's decision confirmed cumulative effects can add up to a breach of Treaty Rights.[37] The province ultimately developed a Cumulative Effects Framework to identify and manage such impacts consistently and transparently across its natural resource sector (Government of British Columbia 2024b).

35. The vast majority of these mines are in Ontario. Abandoned mines range in size from small exploration sites consisting of open pits, trenches or exploration shafts to large-scale operations that contain many hazards to public health, safety, or the environment.

36. Different definitions exist, but the term generally refers to effects that may be individually minor, but collectively significant.

37. The Government of British Columbia and the Blueberry River First Nations reached an agreement in January 2023 that includes actions to address cumulative effects (Government of British Columbia 2023a).

Business-as-usual mining will raise heat-trapping emissions

Mining is an emissions-intensive activity. Depending on the resource being extracted, each tonne of produced minerals will emit between five and 100 tonnes of carbon dioxide equivalent (SKARN 2024).[38] Extraction and processing operations produce heat-trapping emissions but land disturbance can also contribute to the problem by releasing carbon sequestered in carbon-rich soils, such as peatlands (see **Box 13**).

Under current practices, a significant expansion of mining could lead to a substantial corresponding increase in the sector's emissions. And while the sector's overall contribution is relatively modest to start with, we estimate that emissions from extraction and processing could grow by 159 per cent by 2040, approximately an increase from three to 7.5 million tonnes of carbon dioxide-equivalent (CO_2e) compared to 2023 levels in a high-demand scenario (Al-Aini 2025; Trottier-Chi 2024).[39]

Box 13

LAND-USE EMISSIONS FROM DISTURBANCE OF ECOLOGICALLY SENSITIVE AREAS

The mining sector's emissions impacts extend beyond those associated with extraction and processing. Open-pit mines can sprawl across several square kilometres, and when adding all the supporting facilities and infrastructure, the impact can cause a significant land disturbance.

The issue is particularly acute when a deposit lies beneath peatlands that have stored carbon for thousands of years. By one estimate, a hypothetical project in the proposed Ring of Fire region that disturbed one square kilometre of peat could release between 224,000 and 431,000 tonnes of CO_2e (Harris et al. 2021). These land-use emissions could, in some cases, outweigh those from energy use and the benefits of cleaner technologies on a lifecycle basis, underscoring the importance of accounting for them in environmental assessments.

However, because land-use emissions vary with the characteristics of the stored carbon, lifecycle assessments do not always include them. To provide a more accurate representation of mining's environmental footprint, standards and practices must evolve to consider all significant sources of greenhouse gas emissions, including land use.

38. The emissions intensity for the mineral can also vary between different projects and production methods for the same mineral.

39. This projection is for only three minerals: copper, nickel, and lithium.

High environmental risks are becoming a problem for investors

Mining companies increasingly recognize how some of the environmental risks associated with new or expanded mining operations may affect their ability to secure funding:

- Significant environmental impacts can delay regulatory approval of a proposed project, or regulatory agencies may reject the application outright.

- A local community (Indigenous or not) might oppose the project due to risks of adverse health impacts or its impacts on biodiversity (e.g., wildlife for hunting) (Scholte 2023).

- A full-blown disaster[40] could have direct financial implications for the company, disrupt supply chains for buyers, create reputational damage, and further erode the public's confidence in the industry (Davis and Franks 2014; Hunter 2014; CBC 2024).

A number of voluntary, global industry standards exist that require their membership to adhere to sustainability principles (Pollon and Al-Aini 2025).

The Initiative for Responsible Mining Assurance (IRMA) is a leading global standard for many environmental and social issues associated with mining. IRMA's commitment to transparency, multi-stakeholder governance, and rigorous and transparent third-party auditing sets it apart from some other frameworks. Towards Sustainable Mining (TSM) is another, made-in-Canada mining standard that has been adopted by 12 other mining associations around the world. TSM shares IRMA's commitment to transparency and is accompanied by national multi-stakeholder panels as well as independent, transparent third-party auditing. In Canada, the independent TSM Community of Interest Panel shares decision-making with the Mining Association of Canada's Board of Directors.

Institutional investors are increasingly recognizing the extent to which environmental risks can impact the long-term value of projects. For example, in 2019, a coalition of institutional investors mobilized in the wake of a tailings dam failure in Brumadinho, Brazil, leading to the Global Industry Standard on Tailings Management (Global Tailings Review 2020). Mining companies have embraced this standard, with many committing to have all their tailings facilities be in compliance by August 2025 (ICMM 2020).

40. In this paper, we characterize the failure of a tailings storage facility a "disaster" if and when the incident severely disrupts the functioning of adjacent ecological and social systems. The Mount Polley event meets this criteria.

An investor-led coalition subsequently established the Global Investor Commission on Mining 2030 to "define a vision for a socially and environmentally responsible mining sector," and figure out how to make it happen (Global Investor Commission on Mining 2030 2022). The Mining Association of Canada also launched a review of its TSM tailings standard after the Mount Polley disaster.

The trade-off: a 'green premium' is yet to emerge in critical mineral markets

Canadian critical mineral producers are competing on an uneven playing field when it comes to addressing environmental risks. Markets do not yet differentiate between responsibly produced minerals and those extracted under poor environmental conditions—both are traded at the same price for a given commodity. Competition remains almost exclusively the purview of cost; the most diligent Canadian producers, which commit to low carbon emissions and high environmental standards, go head to head with producers in countries with far less stringent regulations.

For example, in early 2024, Australia and other producers urged the London Metal Exchange (LME) to consider creating a "green nickel" benchmark that would reflect the environmental standards associated with low-carbon nickel production. After consulting market participants and citing insufficient interest, LME declined to create a separate benchmark (London Metal Exchange 2024). While green nickel is available to be traded on the spot markets, the quantities of low-carbon nickel that are purchased are modest.

Developing credible, consistent, and transparent standards that clearly define these minerals as distinct from others with lower environmental performance is a necessary condition for critical minerals projects with high environmental performance to earn a "green premium". Critical minerals are bulk commodities that move through complex supply chains en route to a given final product, and effective standards must trace environmental performance, including emissions intensity, along every step. Mineral markets are a long way from having this type of traceability.

Environmental performance differentiators

A **green premium** refers to a product's perceived or actual higher value if it is produced with strong environmental standards, including low carbon emissions.

Conversely, a **carbon discount** refers to the lower value or discount for assets that environmentally underperform, or have high carbon emissions intensity.

5.2 Identifying policy priorities

These environmental risks should be a concern for Canadian governments because voluntary corporate action is likely not sufficient to reduce environmental risks to levels that are acceptable to local communities and beneficial for the Canadian economy as a whole. Importantly, high environmental risks will make supply interruptions more likely—which may put Canada's role as a reliable supplier with international trading partners at risk. Also, the perceptions of local communities and the broader public can significantly influence the fate of a given proposed project—and ultimately the fate of a rapid ramp-up in critical mineral mining activities across the country.

The central policy problem underlying all of these environmental risks is therefore that mining companies may not internalize the full environmental risks associated with mining operations in their decision-making—especially when mitigation is costly and pollution pricing is absent. When these risks to local watersheds, biodiversity, and the global climate are not adequately internalized in a mining company's decisions about where to build a project, which technologies to use, or how to plan for the mine's end of life, these risks are shifted on others: local communities (including Indigenous communities) and the general public (e.g., by using taxes to pay for cleanup of an abandoned mine).

As mentioned above, there has been some voluntary action from industry, but voluntary standards that mining companies can adopt must not replace enforceable regulations. Only mandatory regulations can set reliable safety baselines for the entire industry that may go beyond what some mines may be willing to commit to voluntarily. Even one mine that is non-compliant with voluntary standards can cause great damage to local communities, ecosystems, and public confidence in the mining sector in Canada. This is a sector-specific policy problem that can materially deter investment. We discuss policy options on how to address this in **Sections 5.3** and **5.4**.

For cumulative effects due to a new mining project, there is an additional layer to the underlying policy problem: Canada's regulatory review processes primarily evaluate the environmental impacts of a proposed new mine in isolation, and don't consider the collective impacts of the wider region's previous, active, and proposed industrial activities.

The federal *Impact Assessment Act* includes provisions on Regional Assessments with the purpose of assessing cumulative impacts, but to date, only one regional assessment has been concluded. Cumulative impacts are included in the Ring of Fire Regional Assessment, which started in 2020 but

only published its terms of reference in January 2025 (Impact Assessment Agency of Canada 2025).[41] This policy problem can chill investment by contributing to long regulatory assessment processes and litigation (as illustrated by the Supreme Court of British Columbia's decision on the Blueberry River First Nations case mentioned earlier).

Consideration of cumulative effects is important for all proposed major projects in Canada, and is not limited to critical mineral mining. In fact, assessments of cumulative impacts should consider all industrial activities in a specific region. See **Section 6** for further discussion of cumulative effects and regional assessments.

When it comes to carbon emissions, while mining is included in Canada's large-emitter trading systems, additional policies may be needed to lower the emissions intensity of mining operations further, including investment in clean electricity infrastructure, technological innovation and adoption.[42] Carbon-related risks do not seem to be a significant driver of investment in the mining sector right now, but this may change in the future. We discuss these dynamics in this report's complementary scoping paper, **Mining decarbonization: Enhancing Canada's low-carbon advantage in the global critical minerals race.**

41. Once they start, individual project assessments are, by design, limited in scope and time. Project proponents may not have the knowledge or capacity to assess cumulative impacts from multiple projects.

42. Large-emitter trading systems are also known as industrial carbon pricing systems.

Table 3

SUMMARY OF POLICY PROBLEMS CONCERNING ENVIRONMENTAL RISKS FROM CRITICAL MINERALS MINING IN CANADA

Is this a policy problem for Canadian governments?	Is it significantly deterring investment?	If so, is the scope of the problem specific to the sector?
Local environmental risks: mining tailings and abandoned mines		
YES: Mining companies do not (fully) internalize these risks in their decision-making, leading to lower investment in risk mitigation.	**YES:** Communities may oppose mining projects due to a combination of high perceived environmental risks and low confidence that regulations will mitigate them.	**YES:** Targeted interventions can significantly improve the management of the environmental risks associated with mining.
Risks to ecosystems and biodiversity: cumulative effects		
YES: Lack of comprehensive assessment prevents full consideration of these risks in decision-making about the project.	**YES:** Prolonging project approval processes and making them less predictable. Proactive regional assessments can speed up regulatory processes for individual projects and increase investor certainty.	**NO:** Assessments must account for all activities on the land beyond critical minerals mining and thus require a cross-sector approach beyond mining.
Risks to the global climate: greenhouse gas emissions		
YES: Mining is included in Canada's large-emitter trading systems, but barriers to decarbonization remain.	**NO:** Emissions are not yet a key driver of investment decisions in critical minerals projects; for investors, other environmental considerations loom larger.	n/a

5.3 Managing risks from mine closures

Federal, provincial, and territorial governments share responsibility for regulating the mining sector's environmental impacts and risks. For example, Ottawa monitors impacts to fish habitat through the Fisheries Act while provinces and territories oversee other environmental risks, including those associated with mine closures, site reclamation, and tailings management (Pollon and Al-Aini 2025).

In this section, we focus on policy solutions that mitigate local environmental risks associated with mine tailings and mine closures. You can find more details on the considered policy options in this report's complementary scoping paper about the environmental risks of mining, **Managing environmental risks of mining critical minerals in Canada.**

Increasing stringency and coverage of financial assurance for mine closures

Financial assurance is a security—a bond or cash equivalent—that a company posts to cover the costs of cleaning up the site and restoring the land once the mine closes.[43] The company must also remove its equipment, treat any contaminated water, and actively monitor the site.

In the past decade, Canadian governments have made great strides in better regulating these end-of-project-life liabilities, and to one degree or another, all provinces and territories now require mine operators to submit a monetary guarantee known as financial assurance. But these contingency payments frequently fall short of what is ultimately needed to fully cover a mine's environmental liabilities (Fionda et al. 2024).

The Province of Quebec currently leads the country with its financial assurance mechanisms. In Quebec, a company must front an amount that would cover all of the estimated reclamation costs for its entire mining site within two years of approval of the closure plan (Government of Quebec 2024).

Quebec's stringent approach aims to avoid a situation like that in British Columbia, where total unpaid mining liabilities nearly doubled between 2014 and 2022—from $2.25 billion to $4.12 billion (Fionda et al. 2024).[44] For its part, the Government of Ontario relies on a phased approach to financial assurance. Both British Columbia and Ontario fall short of the IRMA standard (Innes et al. 2020).

43. Mining companies provide financial assurance to a government or regulator to fund the mitigation and management of environmental and other liabilities related to a mine's closure, should the company fail to fulfill its obligations.

44. While liabilities have grown, British Columbia has increased the amount of securities it collects from industry. This has reduced unfunded liabilities from approximately $1 billion in 2014 to about $700 million in 2022 (Fionda et.al 2024).

Governments can strengthen current mine closure financial assurance by:

- requiring an independently verified closure costs estimate based on actual closure costs (IRMA 2018b);
- accepting only liquid securities, and limiting the use of equipment or reserves as collateral for closure securities; and
- limiting or eliminating discretion in the enforcement of these requirements.

Industry has pushed back against more stringent assurance requirements, citing untenable financial burdens and delays in project development.[45] But only stronger regulations will build and maintain local community trust and support for the sector's necessary expansion.

Policies that increase the stringency of assurance measures will incentivize companies to improve their environmental practices throughout project life, as doing so would limit their clean-up costs. Strengthened financial assurance may also help advance Indigenous rights, so long as it explicitly allocates compensation for mine-impacted Indigenous communities.

Broadening the scope of closure plans and making them publicly available

All mining jurisdictions in Canada require proponents to submit a closure plan—either as part of the approval process or before commencing operations. Governments can strengthen these regulations by increasing the scope of closure plans, adding a requirement for independent review, and making the plans publicly accessible. Transparency of mine closures can also help communities plan ahead and avoid impacts to jobs and housing after a mine closes.

Transparency on closure plans and post-closure monitoring can reduce the risks that clean-up costs will exceed the security provided, and better inform communities of the plan to return impacted landscapes to an ecologically functional state.

45. Quebec introduced some of Canada's most stringent assurance requirements in 2013 and no clear evidence has yet emerged to suggest investments in the province have deviated from national trends. Meanwhile, in 2023, Ontario relaxed its mine-closure regulations by allowing less-capitalized proponents to submit financial assurance in phases. The move aims to streamline regulation while maintaining environmental standards; not enough time has passed to assess its efficacy.

Enhanced mandatory closure plans include a built-in incentive to limit environmental risks while the mine is still active, but to a lesser degree than financial assurance obligations. Increased transparency, in the form of publicly accessible closure plans, can increase public pressure on companies to improve environmental performance. Accessible mine-closure plans would enable Indigenous communities to actively engage with and participate in long-term site monitoring.

Comparison of options

From a fiscal perspective, both options would be relatively inexpensive for governments. The measures could prove to be net-positive by reducing the risk that a given jurisdiction would need to dip into public funds to cover a mine's closure and clean-up. Additionally, administration is likely to be straightforward, as both options build on existing regulations.

Of course, increased assurance requirements would compel companies to come up with more money at the start of a project. But governments could phase in the requirements over time and provide long-range compliance deadlines. This provides both government and industry with flexibility and predictability. See **Appendix C** for a more detailed comparison.

The two options outlined above are complementary, allowing each mining region to concurrently adopt both approaches. Because they require monetary commitments, financial assurance mechanisms may more effectively drive change, but increased transparency via mandatory disclosure of mine closure plans can increase accountability and also enable industry peer learning.

Together, these options may significantly reduce the residual environmental risks associated with mine closures, increasing trust with local communities and the Canadian public, and bolstering investor confidence.

As always, governments have to thread a needle: they must strike a balance between collecting securities sufficient to cover the full scope of a mine's closure and reclamation while maintaining the sector's competitiveness during economically volatile times. While not all risks can be eliminated, reducing them to a community-accepted level is essential for effective risk management.

5.4 Managing risks from tailings

Governments can better manage tailings risk with regulations designed to sharply reduce the likelihood of a disaster and, should a devastating spill occur despite preventative measures, ensure sufficient funds are available to address ecosystem and community impacts.

Banning or restricting the use of upstream tailings dams

The risk of failure of tailings facilities varies across projects and locations and depends as much on the specific design and effective management as on the choice of technology. Nevertheless, of the three major types of storage facilities, so-called upstream tailings dams are usually the cheapest for companies to build and generally considered less reliable (Franks et al. 2021). Companies construct them atop a base of mining waste rather than solid ground (Warburton et al. 2019). Industry watchdog groups have long urged governments to ban upstream tailings dams and prohibit companies from building or expanding tailings facilities in locations where slurry could reach inhabited areas in the event of a collapse (Warburton et al. 2019; Lapointe 2019). To date, four mining jurisdictions have banned these structures outright: Chile, Peru, Ecuador, and Brazil (Jamasmie 2019). Opponents of such bans argue that proper design, regular maintenance, and frequent monitoring adequately mitigate the risk (Global Tailings Review 2020).

Publicly available data indicates that upstream tailings dams are not common practice in Canada. The Global Tailings Portal database shows that Canada has 122 active tailings facilities of which 28 are classified as upstream failings facilities with extreme or high consequences in case of failure (Global Tailings Portal 2025). There is a general trend in the mining industry away from upstream dam construction (**Emerman 2022**).

Extending financial assurance to include tailings

Similar to the assurance mechanism associated with mine closure, a regulator pursuing this option would require a company to post financial security commensurate with the risk of its chosen tailings-management approach. For example, it could base the value of the security on a third-party assessment of a specific planned tailings facility.

The challenge with this approach is that tailings disasters, while rare, are exceptionally costly. A government may struggle to predict the clean-up costs associated with a worst-case, or likely case, scenario. The figure could far exceed what any individual mine operator, especially a smaller company,

could realistically set aside. To address this, governments could direct every operator of a tailings facility to contribute a fixed amount to a shared pool of funds that would be dedicated to disaster clean-up and remediation.

Other similarly exposed Canadian industries have adopted just such a collective disaster fund. Companies that transport oil by rail and ship pay into an industry fund designed to cover environmental disaster costs that exceed the insurance coverage of any individual operator, and thus their individual ability to pay (Ship and Rail Compensation Canada n.d.).

Phasing in requirements to meet leading tailings standards

Every mining province and territory has a set of tailings-management regulations on its books—but the landscape is uneven. For example, as a consequence of the Mount Polley disaster, the Government of British Columbia now requires all companies that run tailings facilities to participate in an Independent Tailings Review Board; Ontario has no such requirement.

If provinces and territories agreed to align their regulations with a recognized global standard, such as Towards Sustainable Mining (TSM) or the Global Industry Standard on Tailings Management (GISTM), tailings management practices, monitoring, reviews, audits, and disclosure across all mines in Canada would improve and become more consistent across the country (Global Tailings Review 2020).

The GISTM includes 15 principles, some of which provinces and territories could easily introduce as new requirements in existing regulations, including, for example:

- appointing an Engineer of Record;
- requiring an Independent Tailings Review Board (ITRB); and
- mandating public disclosure of how companies have complied with GISTM requirements at each of their tailings facilities.

TSM includes similar requirements. Sites must meet a detailed set of requirements and demonstrate compliance through independent audits.

Governments would not need to change existing regulations that already meet the standards, and would only need to add any missing requirements.

Comparison of options

Each of these three options amounts to a trade-off between cost, ease of implementation, and complexity. Governments should incentivize companies to proactively reduce and manage their tailings risks, and strike a balance between stringency and compliance costs—the latter of which could prove especially challenging for junior operators.

All three options can reduce one of the largest risks of the environmental imperative. A complete ban of upstream tailings facilities may reduce some risks, but its impact would be limited to new projects, and upstream dams have not been the primary practice in Canada to date. An assurance mechanism provides financial incentives, but wouldn't proactively address technical risks and human error. A phased approach to TSM or GISTM addresses most aspects of tailings risks for both existing and new tailings facilities.

Which options are likely to attract the most capital to the sector? A financial assurance mechanism moderately supports investment by building public trust—though increased financial burdens may deter some companies. Phased GISTM requirements offer moderate attractiveness as institutional investors value reduced risks, but this option's compliance costs could discourage smaller players. A ban on upstream tailings dams may prove the least attractive of our options as it would raise costs regardless of risk profile, potentially deterring new investment.

As for Indigenous interests, all three policy options can reduce communities' exposure to environmental tailings risks that may impact their Indigenous rights, lands or way of life. As mentioned above, a moratorium on upstream tailings facilities only addresses risks from new mines, and the mining industry is already moving away from upstream dams. But the other two options are more effective when it comes to the mitigation of tailing risks for existing mines. Moreover, the financial assurance mechanism option could provide benefits to local Indigenous communities by offering compensation for those affected in case of a disaster. Making compliance with the GISTM mandatory could contribute to advancing Indigenous rights by requiring free, prior, and informed consent.

Each option impacts government budgets differently. The financial assurance mechanism option reduces government liability, yielding a positive fiscal impact. Phased TSM or GISTM carries minimal additional costs, as many of the needed regulations are already in place, but enforcement could increase some expenses. A ban on high-risk tailings practices would shift costs to companies, minimizing the fiscal burden on governments.

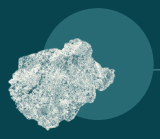
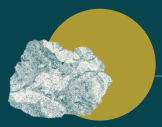
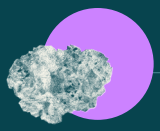
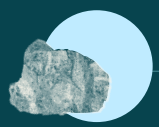
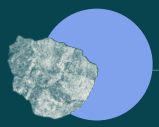
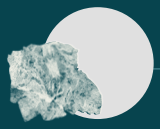
Ease of implementation also varies. The financial assurance mechanism option is likely the most challenging on this front because accurate estimates of disaster risks are vexingly difficult. Phased TSM or GISTM can be more straightforward, especially in jurisdictions where existing regulations largely meet its requirements. While banning high-risk tailings practices is easier to implement, industry may need transitional periods to allow companies to adapt.

See **Appendix C** for a more detailed comparison of the various options.

SECTION 6

Reducing delays in project reviews

Building projects faster requires cutting inefficiencies—not cutting corners

To recap, three interconnected types of risks associated with more critical mineral mining are slowing investment in new projects: financial risks for investors, environmental risks for local communities, and risks for Indigenous communities.

In **Sections 3**, **4**, and **5**, we identify material policy problems underlying each of these risks that are specific to the critical mineral mining sector alone. We also discuss policy options for how to address these policy problems to unlock Canada's opportunities in critical mineral mining quickly.

However, we also identify three complex policy priorities that can hold back investment in critical mineral mining projects in Canada—but not exclusively in that sector. Rather, these issues slow investment in major projects in a number of clean growth sectors (e.g., clean energy generation, transmission lines, green hydrogen plants, etc.) beyond critical mineral mining.

They include:

- Canada's layered system for regulatory reviews of major projects contributes to the long time it takes for Canadian mines to bring their products to markets, thereby increasing financial risks for investors.

- Canadian governments' often insufficient, inconsistent consultations with impacted Indigenous groups violate Indigenous rights and also often contribute to delays in regulatory approvals and litigation.

- Poor assessment and management of cumulative effects of several land use decisions and decisions about project developments in one region can contribute to both violations of Indigenous rights (Powell 2023) and long regulatory processes, which are typically focused on the impacts of individual projects.

Due to their complexity, these priorities may take Canadian governments longer to address, and detailed policy recommendations on how to approach these issues for critical mineral mining projects specifically are beyond the scope of this report.

However, respondents to our survey identified regulatory delays as the most important barrier to investment in critical mineral mining in Canada (Bourassa and Arnold 2024), and multiple Canadian governments, both federal and provincial, have recently taken action to reduce red tape for mining projects. Without developing specific recommendations, some of the insights from this analysis should help inform governments' approaches to reforming regulatory regimes as a means to getting critical mineral mining projects built faster.

Compromising on environmental standards and Indigenous rights as a 'quick fix' to long regulatory timelines can backfire

This analysis finds that projects built on strong Indigenous partnerships and effective management of environmental risks have a higher likelihood of being profitable and contributing to the successful growth of Canada's critical mineral mining sector. Well-designed systems for regulatory review and permitting can play a central role in identifying these "winning" projects—without burdening project proponents with inefficient, redundant processes.

Long project review and permitting timelines are a well-documented problem for investors in the mining sector and beyond (Cleland and Gattinger 2025; Business Council of Alberta 2023; Electricity Canada 2023). But given the present pressures to develop critical minerals fast, there is a risk that governments cut red tape in the wrong places—and inadvertently make the problem worse.

Recent research recognizes that expediting project approvals at the cost of building positive, trusting relationships with Indigenous and local communities can easily backfire and ultimately lead to long project delays and high costs for proponents. For example, looking at case studies of mining projects in the U.S., Davis and Franks (2014) find that conflicts with communities directly translate into financial costs for the company, mainly due to lost productivity due to shutdowns and delays in project development. However, community opposition can also discourage future project development or expansion, leading to potentially significant opportunity cost. Teschner and Holley (2021) develop an approach to quantifying the risks related to community-company conflicts and adjusting a project's net present value accordingly. The authors find that project value can drastically drop once these social risks are considered.

While stringent regulatory reviews are not a guarantee for community support, taking away assessments and reducing requirements for public engagement and Indigenous consultation can significantly reduce

communities' confidence in safety and decision-making processes. Since pollution is a key concern for both Indigenous and non-Indigenous communities when it comes to mining developments, diligent environmental risk assessment and management can play a central role in building communities' confidence and securing support (Davis and Franks 2014). Therefore, lowering environmental standards to achieve shorter approval and permitting timelines at the beginning of a project may lead to delays and higher costs later on.

However, several recent analyses indicate that there are sizable opportunities to reduce delays in regulatory assessments and permitting by removing inefficiencies and redundancies (Electricity Canada 2023; Orenstein 2023; Cleland and Gattinger 2025). These studies identify a number of inefficiencies in regulatory approval systems in place across Canada that can contribute to long timelines, including insufficient co-ordination between relevant government departments and regulatory agencies, insufficient collaboration between jurisdictions, and limited capacities (in terms of human resources and expertise) and a lack of focus on learning within responsible government departments and regulatory agencies.

Cleland and Gattinger (2025) indicate that addressing these inefficiencies within the regulatory system is a complex task for Canadian governments but overall a tractable one. Suggested solutions include the establishment of central offices in government tasked with shepherding projects through assessments and permitting processes (Business Council of Alberta 2023; Electricity Canada 2023); federal and provincial governments coming together to agree on substitution agreements that would help end parallel assessment processes for projects (so far only B.C. has a comprehensive one in place) (Orenstein 2023); and making more resources available to responsible agencies and departments.

Considering new mining developments at a regional level may be a win-win solution

In addition to optimizing the efficiency of individual project review processes, Canadian governments have another tool in their tool box to help improve decision-making on mining projects: promoting the use of regional approaches to impact assessments. Considering new mining developments and their impacts on ecosystems and Indigenous rights at a regional level, as opposed to local one that is project-specific, has the potential to address all three cross-sectoral policy problems identified in this report at the same time.

First, regional approaches can better capture cumulative effects of the mining sector in one region and inform their management. Second, having this information available early in project development can help speed up regulatory reviews for individual proposals and also by helping companies' put together proposals that are more likely to receive approval, enabling them to make better informed decisions about mine location and design. Moreover, regional approaches can also advance consultations with Indigenous communities around new mining projects by creating a shared understanding of anticipated impacts on the lands that are critical for Indigenous rights.

Canadian governments can promote regional approaches to assessment in different ways, depending on their jurisdiction, to capture these potential benefits.

At the federal level, the IAA includes provisions for conducting regional assessments (Impact Assessment Agency of Canada n.d.; Olszynski 2024). For example, a regional assessment of the anticipated impacts—both positive and negative—from potential future mining is currently underway in northern Ontario's Ring of Fire, co-led by the federal Impact Assessment Agency and 15 First Nations partners (Regional Assessment Working Group 2025). However, this is one of only four regional assessments currently in progress, and long timelines may reduce their usefulness in practice (e.g., federal project reviews in the Ring of Fire were already underway when work on the regional assessment began in 2020). To increase the usefulness of regional assessments for project proponents, Indigenous communities, and government agencies, Orenstein (2023) suggests the federal government should use them more frequently, while ensuring that they deliver timely, relevant information for decision-making about future projects.

Independent of federally led regional assessments under the IAA, provincial/territorial governments have jurisdiction over regional planning, which also offers an opportunity for strategically evaluating and managing the impacts of mines (and other industrial activity) in a specific geographical area.[46] Again, this approach can give investors more clarity at the outset about where and under what conditions new projects are possible—or not.

Indigenous communities across the country are increasingly leading or co-leading regional planning processes (Indigenous Leadership Initiative n.d.). Recent land use plans produced by Indigenous communities may honour both Indigenous knowledge and Western science, and identify what type and scale of development—if any—may be appropriate in various

46. Provincial/territorial governments frequently delegate authority to regional/municipal governments.

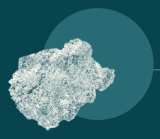
geographic zones. For example, companies can consult the Gitanyow Lax'yip Land Use Plan to review environmentally sensitive and restricted zones across approximately 6,200 square kilometres of British Columbia's Mid-Nass and Upper Skeena watersheds (Kispiox Land and Resource Management Planning Team 2001) to learn about what is possible and what is not—prior to even putting together a project proposal.

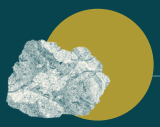
Regional planning processes also offer provincial/territorial governments the opportunity to consider mining projects in parallel with the designation of new conservation areas to proactively limit cumulative impacts on ecosystems and biodiversity in the region. Indigenous leadership/partnerships should be included in the regional planning process and the designation of conservation areas, as well as in the management of these areas.

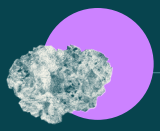
SECTION 7

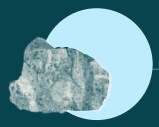
Four recommendations to put Canada on the critical path

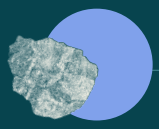
Smart policies can attract investment in critical minerals

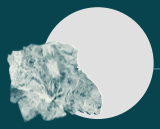












The opportunity for Canada in critical mineral mining is clear.

But large uncertainties in global markets and in the regulatory review process can slow investment in Canadian projects. The critical mineral mining industry is incredibly uncertain: the geopolitical environment is unpredictable and tense, and markets for some minerals are immature and controlled by a few players, resulting in highly fluctuating prices.

Buyers, both domestic and international, are looking for secure and reliable supply—and fast.

How can Canada become a reliable supplier? What should Canadian governments do to attract the necessary investment in critical mineral mining (at minimum, $30 billion by 2040) to strengthen national energy security and deliver economic growth?

Canadian governments should give investors confidence and as much certainty as possible in a market that is both full of opportunities and risks.

In this paper, we argue that strong environmental safeguards and Indigenous participation in the opportunities are necessary conditions for Canada to successfully ramp up critical mineral mining at the pace and scale required. Otherwise, the opposition of Indigenous and local communities will slow new projects at a time when speed is a strategic imperative. A race to the bottom in terms of social and environmental impacts is not a viable option for Canada's mining industry—even if it may seem like one way to save costs and time in the short term.

In our survey among critical mineral mining stakeholders, over 80 per cent of respondents agreed that limiting negative impacts to the local environment and communities is important, and over 90 per cent indicated their belief that Canada can achieve these objectives while remaining competitive (Bourassa and Arnold 2024).

The following recommendations provide Canada's provincial, territorial and federal governments guidance on the building blocks of a policy package to unlock investment in critical minerals mining. These policy measures will help Canadian projects secure financing, enable Indigenous communities to participate from exploration to reclamation if they choose to, and help build trust with local communities through best-in-class environmental risk management.

Recommendation 1

The federal government should give an arms-length financial institution the mandate to develop or expand financial risk-sharing agreements, such as equity investments, contracts for difference, and offtake agreements, to temporarily share the risk related to the high price volatility for some critical minerals with investors.

The extreme price volatility in global markets for some critical minerals (e.g., lithium, rare earth elements) stems from the market's immaturity and the market power of a few influential suppliers.

The federal government should temporarily share these risks with investors in Canadian mines for these critical minerals because these projects hold strategic value for Canada in terms of national energy security and economic growth. Markets are likely to stabilize somewhat in future, as market volume grows and global supply chains diversify, diminishing the need for these public support mechanisms over time.

The most direct and scalable way for a public investor to share the financial risks of a mine is to take equity shares in the project. As equity holders, governments participate in both the downside risks and the upside potential of the project, and can show higher risk tolerance and greater patience in the face of long payback periods than conventional investors while still sharing in the economic upside of projects.

Risk-sharing agreements like contracts for difference are more fiscally conservative than outright subsidies to projects because governments only step in when prices fall below a set strike price and can benefit from price upswings if contracts are two-sided. Well-designed contracts for difference will sufficiently reduce risks to incentivize investment without creating unacceptably high liabilities for public budgets.

The federal government should use offtake agreements as a complementary tool to support specific critical mineral mining projects with a particularly high strategic value for Canada or to build a strategic stockpile of critical minerals.

This recommendation is primarily targeted at the federal government because federal funding institutions are likely to have larger, more diversified portfolios and may therefore be more able to take on the risk exposure that comes with equity investments, contracts for difference, and offtake agreements at a large scale. However, provincial governments could equally adopt this policy tool to promote investment in critical mineral mining projects in line with their provincial/territorial strategies.

1.1 The federal government should make a project's eligibility for risk-sharing dependent on the project's environmental performance and on Indigenous consent.

Meeting these conditions helps de-risk the project and makes sure that public financial support goes to projects that have a higher chance of going through project approval processes quickly and operating successfully in the long run. The definition of concrete eligibility criteria for Indigenous consent should be co-developed with Indigenous Peoples. The definition of concrete eligibility criteria for environmental performance should meet the requirements outlined in **Recommendation 3** and also align with any future advancements in the development of a Canadian climate investment taxonomy (Finance Canada 2024).

1.2 In addition to financial risk-sharing agreements, the federal government should also pursue trade partnerships and international co-operation to attract international investment and develop international demand to further stabilize markets for Canadian producers over time.

Given the growing uncertainty around economic relationships with the U.S., it is crucial for Canadian governments to build new alliances with investors and buyers in other parts of the world, including in Europe, to enhance long-term certainty for Canadian producers. International co-operation could include the establishment of offtake agreements with international buyers, pursuing project development partnerships, or selling Canadian products to a possibly emerging European buyers' club.

Recommendation 2

Canadian governments should support the ability of Indigenous communities to exercise their right to self-determination and economic participation in critical mineral mining projects by scaling up resources for capacity building and enhancing access to capital for equity ownership in projects.

To enhance the capacity of Indigenous communities to actively participate in critical mineral projects:

2.1

The federal government should scale up funding to communities for capacity-building activities throughout the mining lifecycle, from exploration to reclamation.

Funding should be flexible so that Indigenous communities can allocate funds where they are most needed and in line with their knowledge, values, and priorities. This will likely be different across communities, therefore eligible expenses should include both 1) support for a dedicated position in the community and 2) activities that relate to strengthening consultation capacity to enable Indigenous participation from exploration to reclamation. Funding for Indigenous-led land use planning and environmental assessments could be particularly useful given they support Indigenous self-determination, expedite project decisions, and manage environmental impacts, yet are often resource intensive.

2.2

Provincial governments should scale up support for Indigenous-led capacity-building hubs in mining regions in partnership with the federal government, the critical minerals industry, and educational institutions.

These hubs should cater to Indigenous regional capacity-building needs across multiple communities and projects by pooling resources and knowledge. As bricks-and-mortar facilities, they should ideally be centrally located within a region to ensure accessibility for a range of Indigenous communities. The hubs should offer both direct staff support and online resources to participating communities, ensuring access to those far from the facility. By pooling resources from different orders of government, industry, and educational institutions, these hubs would reduce the financial burden on any single partner, maximize impact through economies of scale, and promote collective learning across communities.

To enhance access to capital for Indigenous communities to partner on critical mineral projects:

2.3

Provincial governments should create Indigenous loan guarantee programs that include equity participation for critical mineral projects.

Some provinces do not currently have Indigenous loan guarantee programs while others do, but exclude critical minerals mining as an eligible activity.

Provincial loan-guarantee programs should be designed to target Indigenous communities partnering on small- to medium-sized critical mineral projects. This would help lessen the risk of smaller Indigenous communities being left behind as larger, more capital-intensive projects in bigger Indigenous communities can consume the federal loan guarantee program.

The guarantee pool should also be large enough to cover the substantial capital costs associated with mining—the average mine requires $1 billion in initial investment. Since governments assume default risk, it makes sense to first reduce the exposure of projects to risks related to extreme price volatility in global markets (see **Recommendation 1**).

Given Indigenous Financial Institutions' strong capacity to meet the needs of Indigenous communities and entrepreneurs, they should play a central role in designing and delivering loan-guarantee programs, in collaboration with provincial governments.

2.4

Provincial governments should share resource revenue from taxes and royalties with Indigenous communities whose lands are impacted by mining, through resource revenue-sharing agreements.

These agreements should provide communities a pre-determined financial benefit and the flexibility to determine how to reinvest revenues, including using funds to acquire equity stakes in other mining projects. This approach should be independent from any impact and benefit agreements communities may sign with mining companies, and instead serve as an additional mechanism for generating own-source revenue.

Recommendation 3

Provincial governments should strengthen mining regulations to reduce environmental risks and liabilities for communities, and ensure reliable supply.

3.1

Provincial governments should strengthen existing financial assurance mechanisms for end-of-mine-life liabilities by requiring more exact cost estimates, accepting only liquid securities, enhancing enforcement, and making closure plans publicly available.

Strengthening the financial assurance requirements incentivizes mining companies to proactively mitigate post-closure risks using practices that reduce environmental risks throughout the project life.

3.2

Provincial governments should enhance existing tailings management regulations to meet leading global standards such as the Towards Sustainable Mining (TSM) requirements or the Global Industry Standards for Tailings Management (GISTM).

Many mining companies are already voluntarily moving towards compliance with TSM or GISTM—often in response to pressure from institutional investors. Governments of provinces where the TSM or GISTM requirements are currently voluntary should make compliance mandatory to set an effective safety baseline across Canada. These standards cover the whole lifecycle of a tailings facility, from early design to planning for disaster response.

Recommendation 4

Canadian governments should avoid cutting back environmental safeguards and Indigenous consultations to shorten regulatory approval processes for critical mineral mining projects (and other major clean growth projects), as doing so is likely to backfire.

Regulatory delays contribute to above-average development timelines for Canadian mining projects, but they are not the only drivers (Collard et al. 2024). High price volatility and lack of capacity or resources in Indigenous communities to engage with project opportunities also contribute to long timelines.

Findings from this analysis suggest that cutting back on rigour in project reviews when it comes to environmental risk mitigation and Indigenous consultation can lead to delays later on, due to community opposition or litigation. Risks related to social conflict and opposition can significantly lower a project's economic value (Davis and Franks 2014; Teschner and Holley 2021).

Reforming Canada's complex regulatory system for ensuring that mining projects serve everyone better—project developers, Indigenous Peoples, and the Canadian public—requires time and careful consideration. Quick fixes are likely to backfire.

However, recent studies identify ways in which governments can enhance the process efficiency of regulatory reviews (see, for example, Cleland and Gattinger 2025).

Also, considering new mining development at a regional level—i.e., in parallel with conservation planning—can help protect ecosystems and biodiversity while also giving investors more clarity early on about where and under what conditions new projects are possible—or not. Indigenous leadership in land-use planning and in identifying conservation areas that are off limits for new mines can safeguard Indigenous rights and speed up reviews for individual projects while also building broader support.

SUBSIDIARY SECTIONS

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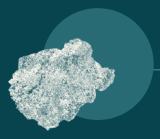
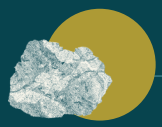
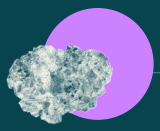
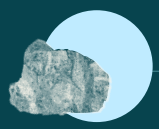
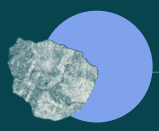
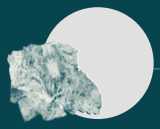
References

Glossary

Critical minerals Refers to six raw minerals—cobalt, copper, lithium, nickel, graphite, and rare earth elements—that are crucial for the global shift toward clean energy systems. Canada has vast quantities of these minerals and they are in high demand to produce clean energy technologies such as solar PV modules, wind turbines, electric vehicles (EVs), charging stations, and various types of batteries.

Capacity The organizational and financial capacity of Indigenous nations and communities to participate in and contribute meaningfully to mining-related regulatory processes, policies, and activities.

Decarbonization Refers to the transition from carbon-intensive mining and production methods to low- or zero-emission processes, typically powered by clean technologies and renewable electricity, in order to reduce carbon emissions per unit of minerals extracted.

Free, prior, and informed consent Is a globally recognized principle ensuring Indigenous Peoples' right to self-determination and their active participation in decisions about activities affecting their rights and lands. Centred on Indigenous self-determination, it includes: no coercion (free), adequate time for decision-making (prior), full disclosure of impacts (informed), and the right to withdraw consent at any time (consent).

Indigenous community The report uses the term "Indigenous community" to refer to a formal First Nation, Inuit, or Métis community.

Indigenous Peoples In this report, the term "Indigenous Peoples" refers to the collective of Indigenous People in Canada from the distinct societies of First Nations, Inuit, and Métis people (Crown-Indigenous Relations and Northern Affairs Canada n.d.b).

Indigenous self-determination The inherent right of Indigenous Peoples to freely determine their political status and pursue their economic, social, and cultural development. This is closely linked to the rights of Indigenous Peoples to manage and govern their own lands, territories, and resources, as set out in UNDRIP.

Indigenous territory Refers to a geographic area that Indigenous Peoples identify as traditionally occupied by their ancestors and/or where Indigenous communities continue to live today and make use of the land for community, social, economic, or cultural purposes.

Investors Individuals or entities that provide capital to a mining company in exchange for a stake in the project or company, or for financial return. Investors can include, but are not limited to, governments, banks, communities, venture capitalists, and shareholders. They engage in various forms of financing, including debt, equity, and royalty financing.

Own-source revenue Money Indigenous governments raise through taxes, agreements, and business activities across various sectors, including natural resources.

Project proponents and mining companies This includes junior miners, which primarily focus on early-stage mineral exploration, as well as major (or senior) mining companies, which are responsible for building and operating mines. In this report, the terms "project proponents" and "mining companies" are used interchangeably.

Resources vs. reserves Resources refer to the total estimated quantity of a mineral deposit within a specific area, identified through techniques such as drilling, sampling, geological surveys, and other data-gathering methods. Reserves, in contrast, are the portion of these resources that have been determined to be economically viable for extraction. This determination depends on factors such as current market prices, available extraction technologies, and operational costs. Only those resources that can be profitably extracted under existing conditions are classified as reserves.

Upstream, midstream, and downstream The critical minerals value chain is divided into three key stages. Upstream includes mineral exploration and extraction. Midstream encompasses intermediate processing and advanced manufacturing. Downstream involves the assembly, end-use, and recycling of products (e.g., EV batteries).

Appendices

Appendix A

Methods and analytical framework

The objective of this report is to better understand the opportunities and risks linked to a ramp-up of critical mineral mining in Canada and what governments should do to turn these risks into opportunities for Canada's prosperity and energy security.

Data collection

Given the complexity and breadth of issues related to critical minerals mining, we deployed a range of both quantitative and qualitative methods to inform our analysis:

Review of academic and non-academic literature on opportunities and risks in Canada's critical minerals mining sector, the state of critical minerals mining industries, markets, and policies in other jurisdictions, and mining technologies, as well as relevant Canadian policies and regulations. The literature review included works by both Indigenous and non-Indigenous authors.

Primary **quantitative analysis** using asset-level data from S&P Capital IQ, which provided cost and market data, and Skarn, which provided greenhouse gas emissions data.

Engagement with stakeholders and rightsholders (n=92) took place through informal virtual calls from January to May 2024. These individuals were selected from our existing network, new connections made through conference attendance, and mutual connections via a snowballing approach. Very few were contacted through cold emails, and those were identified based on prior familiarity with their work. All individuals were experts in critical minerals with backgrounds in the mining industry, finance, government, non-governmental environmental organizations, or Indigenous organizations and communities.

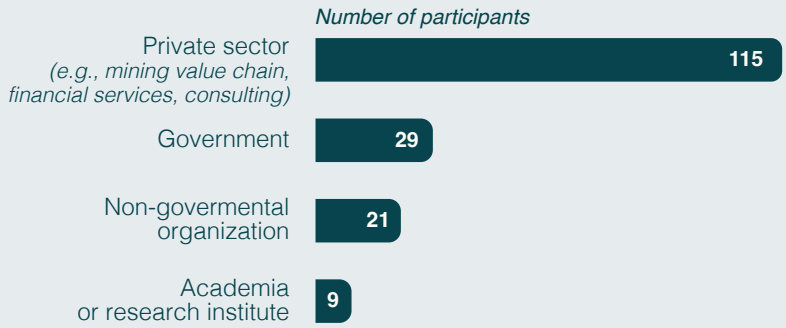
The primary goal of this engagement was to gain a high-level understanding of participants' different perspectives on the challenges of increasing critical minerals mining in Canada. We also shared our research question

and inquired whether the stakeholders and rightsholders would be interested in participating in our survey and semi-structured interviews, resulting in a subset of individuals who took part in both.

An **online survey** (n=174) that investigated the barriers and potential solutions to building out Canada's critical minerals value chain was conducted from April to August 2024 (Bourassa and Arnold 2024).

In total, 174 representatives from a range of organizations participated in our survey. The table below breaks down the survey respondents by their perspective on critical mineral mining. Please contact us to see the full set of survey questions.

PARTICIPANTS BREAKDOWN OF ONLINE SURVEY



Semi-structured interviews (n=33), conducted from July to December 2024, provided detailed insights on the main barriers associated with financing and building new critical minerals mines.

In total, we interviewed 33 participants representing 28 organizations (two interviews included two or more participants). The table below breaks down research participants by their perspective on energy transition mineral mining.

ORGANIZATIONAL BREAKDOWN OF SEMI-CONSTRUCTED INTERVIEWS

Analytical framework

As part of our research, we developed and applied an analytical framework to help us identify the key risks that may deter investment in Canadian critical mineral mines and the policies that Canadian governments should adopt to unlock capital flows.

Doing so involved three steps, which we outline here via a series of queries:

1. What are the key risks for investors that are linked to new critical mineral mining projects in Canada?

To begin, we used a literature review, online survey, and semi-structured interviews to identify the central risks that are currently inhibiting private investment in critical minerals projects.

These risks fall into three categories: financial risks for investors, environmental risks for local communities, and risks to Indigenous rights.

2. Which of the identified risks are rooted in material policy problems?

We then assessed which of the above risks are outcomes of market or policy failures.[47] Only those risks that are rooted in market or policy failure are public policy problems that warrant government action.

For example, some of the financial risks associated with investment in new mining projects are inherent to the industry (e.g., low exploration success rate). Since they are not signalling a market failure, this risk for investors doesn't warrant a public policy intervention. Other risks, however, may be due to redundant and uncertain regulatory processes—a policy failure—and thus may warrant regulatory reform.

Having identified the risks that are rooted in policy problems, we then applied another assessment filter, via the following enquiries:

2a. Which policy problems are material—i.e., they significantly deter investment in Canada's critical mineral mining sector?

Risks are material when they represent significant and systemic impediments to increasing private capital investment in the sector. In such cases, targeted government interventions could create lasting change for all industry participants.

2b. Which material policy problems are specific to the critical minerals sector and which are wider in scope?

We distinguish two types of policy problems: sector-specific and cross-sectoral. The scope of sector-specific policy problems is largely limited to the critical mineral mining sector. Analogously, these problems have policy solutions that are scalable to target investment in that specific sector.

Sector-specific policy problems—because of their more limited scope—are both relatively uncomplicated and politically palatable, and therefore can be implemented in the near term, or within three to five years.

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47. According to classical economic theory, functioning markets, with actors that make decisions in their own best interest, lead to outcomes that are optimal for society as a whole. Situations in which markets fall short of such socially optimal outcomes are referred to as "market failures". In such cases, governments have a strong rationale to intervene and improve the market's performance. Similarly, "policy failures" occur when government policies fall short of their intended goals due to poor implementation, unintended side effects, political conflict, or a policy maker's undisclosed agenda. When policies are not performing as intended, governments should adjust them.

For example, Indigenous communities need access to capital to become project equity owners. This is a fairly narrow, straightforward barrier that governments can solve via various responses—for example, by providing Indigenous loan guarantees in all jurisdictions, and resources to build their community and economic development capacity.

In contrast, cross-sectoral policy problems not only hinder investment in critical mineral mining projects but in many (or most) sectors that will drive Canada's economic growth through the energy transition. These policy problems are complex—some of them have been unaddressed for decades and some are politically controversial. These policy problems don't have solutions that are readily scalable to one specific sector; rather, they require more far-reaching, systemic responses. Typically, these types of policy problems take longer for governments to resolve.

For example, uncertainties around Indigenous rights, title, and overlapping claim areas impact multiple sectors and require comprehensive changes that are difficult to right-size for the purposes of expediting critical minerals projects. These challenges are no less urgent to address but more complex and will require more time.

3. What should governments do to address sector-specific policy problems that create material risks for investors, mining communities, and Indigenous Peoples?

Finally, we offer concrete policy recommendations on the narrow set of material policy problems that are specific to the critical minerals sector. To identify recommendations, we evaluate and compare policy options using the criteria and queries noted below.

- **Effectiveness in reducing financial risks to investors:** To what extent would this policy tool help reduce financial risks to unlock the private capital needed to close Canada's critical minerals mining investment gap?

- **Effectiveness in reducing environmental risks:** To what extent would this policy tool promote more environmentally responsible and low-carbon critical minerals mining?

- **Effectiveness in reducing risks and realizing opportunities for Indigenous communities:** To what extent would this policy tool advance Indigenous self-determination and participation?

- **Fiscal burden:** To what extent would this policy require additional public investment?

- **Ease of implementation:** To what extent will governments struggle to design and/or administer this policy tool, or is it relatively straightforward?

- **Spillover effects:** To what extent would the policy create positive spillover effects for companies, Indigenous communities, and Canadian society at large? Similarly, are there risks of unintended costs, aka negative spillovers?

Appendix B

Capital investment modelling methodology

To estimate the amount of capital required for Canada's critical minerals (in this case, copper, cobalt, nickel, lithium, graphite, and rare earth elements), we started by setting a production target.

To do this, we took mineral demand projections from the International Energy Agency's Announced Pledges Scenario, as conveyed in *Global Critical Minerals Outlook 2024* (IEA 2024b). We then scaled demand to Canada using Canadian mineral demand projections from the Transition Accelerator's *A Roadmap for Canada's Battery Value Chain* report (Allan et al. 2022). Using these demand forecasts, we identified the 2040 production gap by comparing against production projections from active, currently producing Canadian mines.

We also developed two alternative demand forecast scenarios: an export scenario by holding the proportion of mineral exports to the United States steady as global demand increases; and a recycling scenario by reducing demand by 25 per cent in line with European Union targets.

Meanwhile we calculated capital cost intensities for each of the critical minerals. Capital intensity is total capital investment per year's worth of salable mineral production. We only took data from jurisdictions considered peers in the Fraser Institute's *Annual Survey of Mining Companies 2022* (Mejía and Aliakbari 2023). We also scaled total capital investment by the share of sustaining capital expenditure (the only type of capital expenditure that was disaggregated by mineral) going to each mineral. By applying our capital intensity estimates to our production gap estimates, we estimate that $30 billion of additional capital is required to meet Canada's 2040 demand in the energy transition, with more required in our export scenario and less in our recycling scenario.

Finally, we extended the analysis to determine the role of infrastructure in raising capital costs. To do so we identified contemporary mining projects—those with startup dates between 2004 and 2040. We compiled their total capital costs and mapped their distance from power lines in QGIS using the government of *Canada's Mines, Energy and Communication Networks in Canada — CanVec Series — Resources Management Features* dataset (NRCan 2023). We also mapped out all critical mineral mining projects at the feasibility stage of development.

We found that 20 per cent of contemporary mining projects are located over 50 kilometres away from power lines and that they have an average capital

cost of $2.3 billion, whereas contemporary mining projects within a 50-kilometre radius have an average capital cost of $635 million. That suggests that mines over 50 kilometres away from power lines have 3.6 times higher capital costs.

Based on average production sizes, we estimate that the $30 billion of capital investment required to meet Canadian critical mineral demand would involve at least 31 new critical mineral mines. We also find that 49 per cent of feasibility-stage mines are over 50 kilometres away from power lines. Using these scenarios with the ratio of remote mines having 3.6 times greater capital costs, we find that mines over 50 kilometres away from power lines have an average cost of $1.5 billion whereas those within 50 kilometres have an average cost of $429 million. The difference in costs from the above $2.3 billion and $635 million figures is because these cost scenarios are scaled for only about two-thirds of critical mineral mine capital going towards critical minerals, as opposed to other non-critical minerals found at the same site. With 49 per cent of new mines being remote, that suggests that $16 billion of the $30 billion cost of building 30 new mines pertains to lack of infrastructure.

All unattributed raw data came from S&P Capital IQ Pro (S&P Global 2024).

Appendix C

Evaluation of policy options

1. Evaluating policy options to address price volatility in critical minerals markets

Equity investments

The government takes equity stakes in mining companies.

Effectiveness in reducing financial risks to investors	**HIGH.** As shareholders, governments participate in all downside risks.
Effectiveness in reducing environmental risks	**MODERATE.** Indirect benefit if tied to environmental objectives (e.g., only mines with high environmental performance are eligible for equity investment).
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**MODERATE.** Indirect benefit if tied to markers of Indigenous self-determination (e.g., only mines with Indigenous consent/participation/ownership are eligible for equity investments).
Fiscal burden	**MODERATE.** The government invests and participates in downside risks as well as upside opportunities.
Ease of implementation (transaction costs)	**EASY.** Private placements are common, relatively standardized transactions.
Spillover effects	+ May unlock additional private capital. - May crowd out private equity investors.

Offtake agreements

The government purchases minerals or options to purchase in the future at a set price.

Effectiveness in reducing financial risks to investors	**HIGH.** Reduces exposure to price risks for proponents; can help mines raise capital from private investors.
Effectiveness in reducing environmental risks	**MODERATE.** Indirect benefit if tied to environmental objectives (e.g., only mines with high environmental performance are eligible for offtake agreements).
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**MODERATE.** Indirect benefit if tied to markers of Indigenous self-determination (e.g., only mines with Indigenous consent/participation/ownership are eligible for offtake agreements).
Fiscal burden	**HIGH.** The government purchases minerals and assumes future price risk without participation in price increases.
Ease of implementation (transaction costs)	**MODERATE.** Past examples of offtake agreements in strategically important sectors exist, and it is one of the instruments included in the Canada Growth Fund's mandate, but each offtake agreement would involve negotiations.
Spillover effects	+ Stockpiling of minerals for energy security and resilient supply chains. - May crowd out private buyers.

Contracts for difference

The government shares the risk of falling prices by committing to compensation when prices drop below a certain point.

Effectiveness in reducing financial risks to investors	**HIGH.** The commitment directly attracts investment by reducing risks from price volatility.
Effectiveness in reducing environmental risks	**MODERATE.** Indirect benefit if tied to environmental objectives (e.g., only mines with leading environmental performance are eligible for contracts for difference).
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**MODERATE.** Indirect benefit if tied to Indigenous self-determination (e.g., only mines with Indigenous consent/participation/ownership are eligible for contracts for difference).
Fiscal burden	**MODERATE.** The government only pays if prices drop below strike price and receive payments when prices swing up (in case of two-sided contracts); temporary in nature.
Ease of implementation (transaction costs)	**MODERATE.** Recent experience with contracts for difference by the Canada Growth Fund but designing a contract acceptable to both parties likely requires careful negotiations.
Spillover effects	+ Learning spillovers from more frequent implementation. - Could distort markets more, fragment Canada from international markets. - Could trigger challenge under the World Trade Organization.

Trade partnerships and international co-operation

The government enters trade partnerships and co-operation with countries interested in importing and/or investing in Canadian minerals.

Effectiveness in reducing financial risks to investors	**MODERATE.** Can lead to offtake agreements or enable foreign direct investment into Canadian mines. Can take time to negotiate and longevity is uncertain because the global market is uncertain.
Effectiveness in reducing environmental risks	**LOW.** Potential benefit, as existing trade partnerships have emphasized the importance of shared commitments to environmental standards.
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**LOW.** Potential benefit, as existing trade partnerships have emphasized empowering local communities.
Fiscal burden	**LOW.** No direct financial investment by Canadian governments.
Ease of implementation (transaction costs)	**DIFFICULT.** International co-ordination and trade diplomacy.
Spillover effects	+ Opportunity to strengthen international quality standards (e.g., environmental, social). - May divert Canadian minerals from supplying the domestic value chain. - Could trigger retaliation from excluded actors.

2. Evaluation of policy options to build capacity in Indigenous communities to engage with mining projects

Grants to fund a position within communities

Governments provide funding to hire a dedicated position within the community to plan, evaluate, or implement projects.

Effectiveness in reducing financial risks to investors	**HIGH.** Community capacity is a necessary condition for informed consent and, thus, successful project development. Greater capacity can speed up processes if/when communities decide to participate in a project.
Effectiveness in reducing environmental risks	**MODERATE.** Indirect benefit since greater inclusion of Indigenous worldviews will likely lead to decisions that more highly value environmental protection.
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**HIGH.** The community has the power to choose the position-holder, strengthening capacity within the community.
Fiscal burden	**MODERATE.** The scale of the program must be aligned with the $30 billion investment challenge and extend over a multi-year time horizon.
Ease of implementation	**EASY.** Well-defined and clear eligibility criteria will help use public funds efficiently.
Spillover effects	+ Learning spillovers within and across communities.

Direct grants to fund planning and capacity building

Provide funding to support strategic planning, capacity-building, and training initiatives that enhance participation in the critical minerals sector (e.g., Federal Strategic Partnerships Initiative).

Effectiveness in reducing financial risks to investors	**MODERATE.** Indirectly attracts investment by enhancing community capacity to make decisions about opportunities, thereby streamlining the consultation process.
Effectiveness in reducing environmental risks	**MODERATE.** Indirect benefit since capacity building activities will be rooted in Indigenous worldviews that prioritize sustainability and stewardship (e.g., funding for Indigenous-led environmental assessments).
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**HIGH.** The community determines when and how to use the grants.
Fiscal burden	**MODERATE.** Scale and duration of the grants programs must align with the investment gap and extend over a multi-year time horizon.
Ease of implementation	**MODERATE.** Several grant options exist, complexity grows with the range of capacity-building activities covered. Well-defined eligibility criteria will help use public funds efficiently.
Spillover effects	+ Learning spillovers within and across communities. - Risk of financial dependency that is not sustainable in the long run as funding may end once government support expires.

Partnership model

A joint partnership between Indigenous communities, industry, government, and academia, serving as a one-stop shop to provide Indigenous communities and the mining industry with project support.

Effectiveness in reducing financial risks to investors	**HIGH.** Helps build relationships between industry and communities. This option gives companies some influence on capacity building but can also create costs for them.
Effectiveness in reducing environmental risks	**MODERATE.** Indirect benefit since partnership provides resources, advice, and guidance on how to negotiate for mining projects aligned with Indigenous values of environmental protection.
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**LOW/MODERATE.** Because of partnership mode, communities have generally less control than in Indigenous-led options.
Fiscal burden	**LOW/MODERATE.** Through a public-private partnership, mining companies, educational institutions, communities, and governments could jointly fund services.
Ease of implementation	**MODERATE/DIFFICULT.** The partnership model may be more complicated to set up (negotiations with partners) and replicate across the country.
Spillover effects	+ Beneficial to support a region that will experience/is experiencing a rapid increase/cumulative effects of projects. + Learning spillovers between partners and across projects.

Government-led service

Government representatives provide advice on critical mineral policies, programs, and regulations, and foster partnerships between communities, industry, and government.

Effectiveness in reducing financial risks to investors	**MODERATE.** Indirectly attracts investment by demonstrating strong support across technical and regulatory dimensions, speeding up processes and lowering the risk of post-hoc litigation.
Effectiveness in reducing environmental risks	**MODERATE.** An indirect benefit may arise if the government facilitates the development of partnerships with Indigenous communities, potentially leading to projects that prioritize sustainability and environmental protection.
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**LOW/MODERATE.** May undermine Indigenous self-determination as the service is provided by the government to the community, prioritizing bureaucratic rules and processes over advocating for the community's needs.
Fiscal burden	**LOW/MODERATE.** Governments bear the full cost of service delivery. However, the model could be more cost-effective if multiple communities share a single service centre, but this approach may mean that community-specific needs are not met.
Ease of implementation	**MODERATE/DIFFICULT.** Delivering community-specific services makes implementation harder but more effective.
Spillover effects	Same as for service through partnership + Learning spillovers. Can promote knowledge transfer and mutual learning for all the partiers involved as they work with various communities.

3. Evaluation of policy options to improve access to capital for Indigenous communities

Government-backed loan guarantees

The government assumes the liability of a borrower (one or more Indigenous communities/entrepreneurs) that defaults on a loan.

Effectiveness in reducing financial risks to investors	**HIGH.** Reduces the lender's risk exposure, enabling investment by the Indigenous communities; Reduces risk for other investors to partner/co-invest alongside Indigenous communities/entrepreneurs. Reduces uncertainty around Indigenous consent because equity ownership in a project is an expression of consent.
Effectiveness in reducing environmental risks	**MODERATE.** Indirect benefit if tied to environmental goals (e.g., guarantees for projects that meet certain environmental standards).
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**HIGH.** Increasing the ability of Indigenous communities to become equity owners.
Fiscal burden	**MODERATE.** Governments assume risk but actual cost will depend on loan defaults. Can be mitigated through thorough evaluation of project viability, but mining is an overall risky industry.
Ease of implementation	**EASY.** There are already successful programs out there that can be replicated. Will need to work alongside loan programs.
Spillover effects	+ Can boost financial sector confidence to work more with Indigenous communities in the future. - Increased transaction costs due to involvement of both government and lenders. - May crowd out private lenders.

Direct loans

The government provides concessional loans to Indigenous communities/entrepreneurs to acquire ownership in a project.

Effectiveness in reducing financial risks to investors	**HIGH.** Reduces risk for other investors to partner/co-invest alongside Indigenous communities/entrepreneurs. Reduces uncertainty around Indigenous consent because equity ownership in a project is an expression of consent.
Effectiveness in reducing environmental risks	**MODERATE.** Indirect benefit if tied to environmental goals (e.g., prioritizing equity stakes in companies/projects with a certain environmental performance).
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**HIGH.** Increasing the ability of Indigenous communities to become equity owners.
Fiscal burden	**HIGH.** Governments assume default risk and also have to actually pay out the loan.
Ease of implementation	**MODERATE/DIFFICULT.** Existing institutions such as the CIB could administer the loans. It may be necessary to set up an Indigenous equity holding company (or special purpose entity) as the borrower, or the community could borrow through existing economic development entities.
Spillover effects	- May crowd out private lenders.

Resource revenue-sharing agreements

Governments share a portion of mining royalty taxes with the local Indigenous community.

Effectiveness in reducing financial risks to investors	**LOW/MODERATE.** Could make Indigenous communities generally more willing to consider new mining developments on their lands. Could deter investors if the mining royalty taxes are too high and are hurting their bottom line.
Effectiveness in reducing environmental risks	**LOW/MODERATE.** If, for example, Indigenous communities use revenues for environmental management.
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**MODERATE.** Indigenous communities can choose where they would like to invest their funds (e.g., economic development, education, health, community development, cultural development). But mining royalties and taxes are relatively low in some Canadian provinces (mining royalties can range anywhere from 1% in Alberta up to 17% in Manitoba) and mining revenues can fluctuate significantly.
Fiscal burden	**LOW/MODERATE.** The financial burden primarily rests on the mining proponent, which pays a percentage of revenues to Indigenous communities, with the impact on profits varying depending on the provincial tax rate. The government forgoes part of its mining royalty tax revenue.
Ease of implementation	**MODERATE.** Implementation would require negotiations, legal expertise, and consultation with the Indigenous community, which differs based on community capacity and relationship with government.
Spillover effects	+ Revenue stream can be used to support economic development, education, health, community, and cultural priorities.

4. Evaluation of policy options to reduce the environmental risks associated with mine closures

Improved financial assurance for mine closures

Governments improve end-of-life financial assurance tools to cover actual costs for end-of-life remediation, and reduce residual risks to an acceptable level.

Effectiveness in reducing financial risks to investors	**MODERATE.** May build public trust and reduce opposition of local communities to new mining projects by matching the mining companies' financial commitment to actual closure costs. But may deter new investment if requirements are set too high.
Effectiveness in reducing environmental risks	**HIGH.** Provides incentive for companies to improve environmental performance over the mine's lifetime to limit clean-up costs.
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**MODERATE.** New financial assurance could include compensation for Indigenous communities.
Fiscal burden	**LOW.** Positive fiscal impact. Reduces financial burden on governments and taxpayers.
Ease of implementation	**MODERATE.** All provinces have some form of financial assurance for mine closure in place already. Easier to raise requirements for new mines.
Spillover effects	+ Promotes proactive closure planning throughout the mine's lifecycle, leading to more efficient operations and cost management. - Increased financial commitment on smaller companies.

Enhanced mandatory closure plans

Governments require project proponents to submit and regularly update closure plans and make plans publicly available.

Effectiveness in reducing financial risks to investors	**MODERATE.** May build public trust and reduce opposition from local communities to future projects by increasing mining companies' public accountability. Unlikely to deter investment.
Effectiveness in reducing environmental risks	**MODERATE.** Greater transparency can increase public pressure on companies to enhance their measures to reduce environmental risks (e.g., participate in a voluntary sustainability initiative).
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**LOW.** More transparent monitoring plans may enable more participation of Indigenous communities in remediation and monitoring activities.
Fiscal burden	**LOW.** Mining companies have this data, and making it public is unlikely to create significant costs for companies and governments.
Ease of implementation	**EASY.** Companies can include this information with existing disclosures. Governments can also add this requirement to existing disclosure regulations.
Spillover effects	+ Increases companies' public accountability and may thereby reduce likelihood that companies underestimate closure liabilities. + Making plans publicly available facilitates learning across industry actors.

5. Evaluation of policy options to reduce the environmental risks associated with tailings management

Extending financial assurance to include tailings

Governments extend financial assurance for mine closure to include non-remediation tailings (disaster) risks for new mines and phased approach for existing mines.

Effectiveness in reducing financial risks to investors	**MODERATE.** May build public trust and reduce opposition of local communities to new mining projects by increasing mining companies' commitment to address tailings risks. May negatively impact new investment if it places a considerable financial burden on companies.
Effectiveness in reducing environmental risks	**MODERATE.** Incentivizes companies to take measures to reduce the likelihood of disasters and tailings leaks.
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**LOW/MODERATE.** Could potentially be used to compensate impacted local communities if/when impacted directly by harmful environmental events.
Fiscal burden	**LOW.** Positive fiscal impact. Reduces governments' liability to remediate impacts of disasters (positive fiscal impact).
Ease of implementation	**DIFFICULT.** Each approach to tailings management presents a range of risks depending on the scenario, and creating an estimate of disaster impact has a high chance of being over- or under-estimated.
Spillover effects	- Increased financial commitment on smaller companies.

Phasing in requirements to meet leading global standards such as the Towards Sustainable Mining (TSM) standards or the Global Industry Standard on Tailings Management (GISTM)

Phasing in regulations that require all tailings to match the requirements of TSM or the GISTM.

Effectiveness in reducing financial risks to investors	**MODERATE.** Institutional investors push companies to reduce tailings risks. But safer tailings management practices may increase costs for mining companies.
Effectiveness in reducing environmental risks	**HIGH.** Requires safer practices and thus reduces tailings failure risks. Increases companies' accountability around tailings risks and risk management.
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**MODERATE/HIGH.** Mitigation of environmental risks lowers risks for local communities. GISTM requires working to obtain FPIC. TSM has a similar requirement.
Fiscal burden	**LOW.** Tailings regulations are already in place in all jurisdictions, but enforcement may become more costly.
Ease of implementation	**EASY.** Governments can incorporate TSM or GISTM requirements in existing regulations.
Spillover effects	+ As more companies aim to comply with the new standard, compliance costs are expected to reduce over time due to learning effects.

Banning or restricting upstream tailings facilities

Governments ban upstream tailings dams in new mines.

Effectiveness in reducing financial risks to investors	**LOW/MODERATE.** This option may reduce risk of new tailings, but not address existing tailings. Upstream tailings dams are the cheapest; banning this technology may deter investment in new mines. Mining companies may require additional capital to build safer, but more costly, tailings structures.
Effectiveness in reducing environmental risks	**MODERATE.** Can significantly reduce risk from new tailings, but the industry trend is moving away from this construction method already.
Effectiveness in reducing risks and realizing opportunities for Indigenous communities	**LOW.** This option by itself doesn't address risks from existing mines for local communities.
Fiscal burden	**LOW.** Implementing this option has low cost impact to governments but could be more significant for mining company costs.
Ease of implementation	**EASY/MODERATE.** Relatively easy, especially if there is a transition period. Decisions will have to be made on existing tailings.
Spillover effects	+ This policy change can drive the development and adoption of advanced tailings-management technologies. - Potential for reduced competitiveness due to higher costs compared to other mining regions.

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