



**THE
CANADIAN
MINERALS
AND METALS
PLAN**



NOTE TO READERS

The Canadian Minerals and Metals Plan (CMMP) respects the roles, responsibilities and priorities of Canada's federal, provincial and territorial governments. As part of this Plan, individual jurisdictions will undertake efforts that best suit their priorities, unique situations and needs. Specific actions can be part of jurisdictions' respective strategies; collaborations with other jurisdictions, partners, or stakeholders; or pan-Canadian initiatives. These will be included in CMMP Action Plans, the first of which will be released in 2020.





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STRATEGIC OVERVIEW

Canada is a global mining powerhouse. Our geological endowment and reputation are the envy of the world. Canadian leadership and expertise can be found at virtually every link along the mining value chain. Other countries look to Canada and Canadian companies for the way we build partnership with Indigenous Peoples, build relationships with local communities, and protect the environment. Canada is a top destination for exploration spending and offers unparalleled access to capital markets. We are innovative, and we have robust junior mineral exploration, clean technology, processing, and mining supply and services sectors.

A VISIONARY PLAN

The **Canadian Minerals and Metals Plan** is a milestone in Canada’s mining history. It includes a vision, principles and strategic directions that governments, industry and stakeholders can pursue to drive industry competitiveness and long-term success. This generational initiative will raise Canadians’ awareness of the importance of the minerals and metals sector, respond to ongoing and emerging challenges, and help position Canada for opportunities offered by an evolving economy.

Canada’s people and natural advantages translate into benefits for Canadians. In 2017, mineral production totaled approximately \$44 billion.¹ Canada produces some 60 minerals and metals at 200 active mines and 7,000 pits and quarries. The minerals sector² (which includes exploration, mining and related support activities, primary processing, and downstream product manufacturing) accounts for 19% of Canada’s total domestic exports, and accounts for 5% of nominal Gross Domestic Product (GDP).³

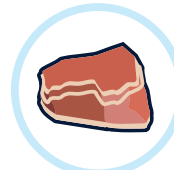
The minerals sector is a major employer, delivering 634,000 direct and indirect jobs throughout the country in rural, urban and remote regions. This includes 16,500 jobs for Indigenous Peoples. Some 7,600 of these jobs are in the upstream mining industry sub-sector, making this the second highest proportional employer of Indigenous Peoples among private sector employers in Canada.

1 All dollar figures are in Canadian dollars unless otherwise specified.

2 **Minerals sector, minerals and metals sector and minerals and metals industry** are used interchangeably in this report and comprise North American Industry Classification System codes: 212–Mining and quarrying (excluding oil and gas); 327–Non-metallic mineral product manufacturing; 331–Primary metal manufacturing; 332–Fabricated metal product manufacturing; 213117–Contract drilling (except oil and gas) where available; 213119–Other support activities for mining, including mineral exploration (where available). The last two include exploration and drilling companies, and service companies operating on a fee or contract basis. They do not include all mining industry suppliers as some entities service multiple sectors.

3 Includes direct and indirect activity. **Source:** Natural Resources Canada, 2018.

CANADA’S TOP MINERAL & METALS PRODUCTS BY RANK AND VALUE OF PRODUCTION, 2017



POTASH
Global Rank: 1
\$4.6 billion



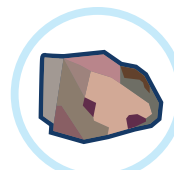
DIAMONDS
Global Rank: 2
\$2.6 billion



URANIUM
Global Rank: 2
\$1.6 billion



ALUMINUM
Global Rank: 3
\$8.7 billion



COBALT
Global Rank: 4
\$277 million



GOLD
Global Rank: 5
\$8.7 billion



NICKEL
Global Rank: 5
\$2.7 billion



IRON ORE
Global Rank: 9
\$3.8 billion



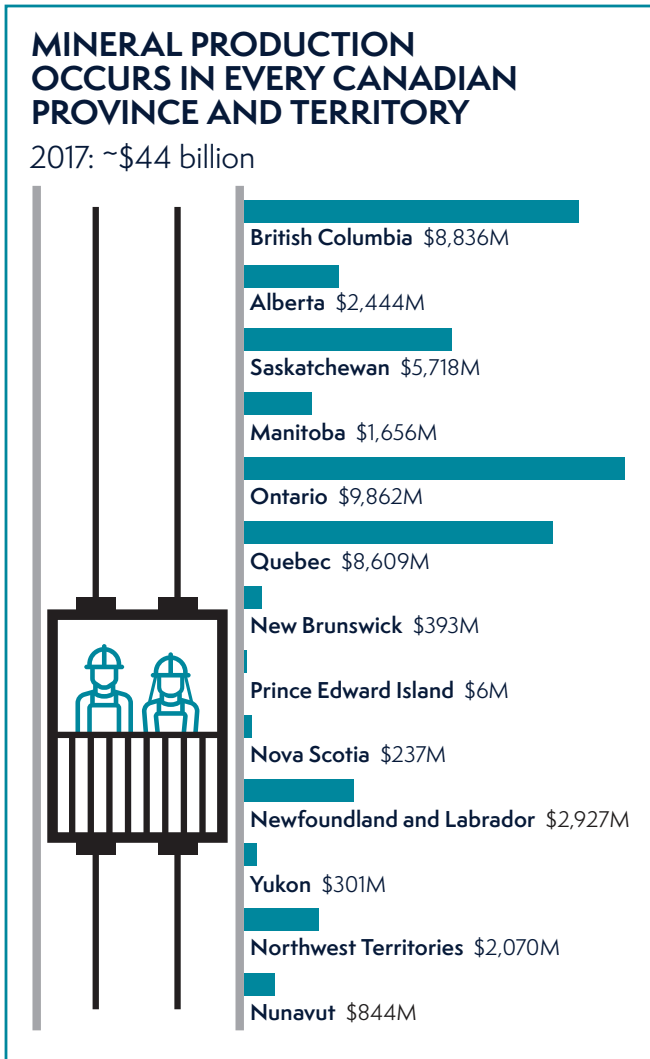
COPPER
Global Rank: 12
\$4.7 billion



COAL
Global Rank: 13
\$6.2 billion

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Source: Natural Resources Canada, Statistics Canada, Annual Statistics of Mineral Production, preliminary estimates, 2017.



Source: Annual Statistics of Mineral Production, Natural Resources Canada, Statistics Canada, 2017.

Leadership means continual improvement. Standing still is not an option as other economies are taking steps to attract investment and support their own mining industries. Canada must take advantage of generational opportunities and improve its competitive position. The world’s economy is increasingly digital and reliant upon clean technologies, and Canada is well-positioned to capitalize on these macro-economic trends.

Mining delivers the inputs that power our digital age. Canada ranks third in the global production of aluminum, fourth in cobalt, and fifth in nickel. It is primed to meet increasing demand for graphite, lithium and rare earth elements. Canada is a key producer of copper, an important metal for items that plug in—electric vehicles, medical equipment, smart phones and appliances, to name a few. All of these products are key for clean technologies, such as wind turbines, solar panels, batteries and energy storage units, transmission lines, wiring for electric vehicles, and other low carbon applications.

The clean technology sector is a significant and growing economic contributor, accounting for 1.4% of GDP and 178,000 jobs in Canada.⁴ Global investment to boost resource efficiency and innovation in resource-based sectors is expected to reach \$3.6 trillion by 2030.⁵ Canada has a promising record on clean technology, and it ranks fourth in the Global Cleantech Innovation Index.⁶

At the forefront of the clean tech revolution is the rapid deployment of solar panels (led by China and India). A solar panel requires 19 mineral products and metals. Eight of these metals are designated “critical materials,” meaning they are particularly important to the technology and also face supply challenges. Fourteen of the 19 mineral products and metals required—including six critical materials—are found and/or produced in Canada.⁷

4 Clean Technology: The Sector Today and Opportunities for Tomorrow Interim Report, Canada’s Economic Strategy Tables: Clean Technology, 2018.

5 Clean Innovation, Why it Matters and how to Accelerate it Across the Canadian Economy, Smart Prosperity Leaders’ Initiative, 2018.

6 The Global Cleantech Innovation Index 2017, Cleantech Group, 2017.

7 The six critical metals found/produced in Canada: copper; indium; selenium; tellurium; gallium; silver. Source: Mining for Clean Energy, Clean Energy Canada, 2017.



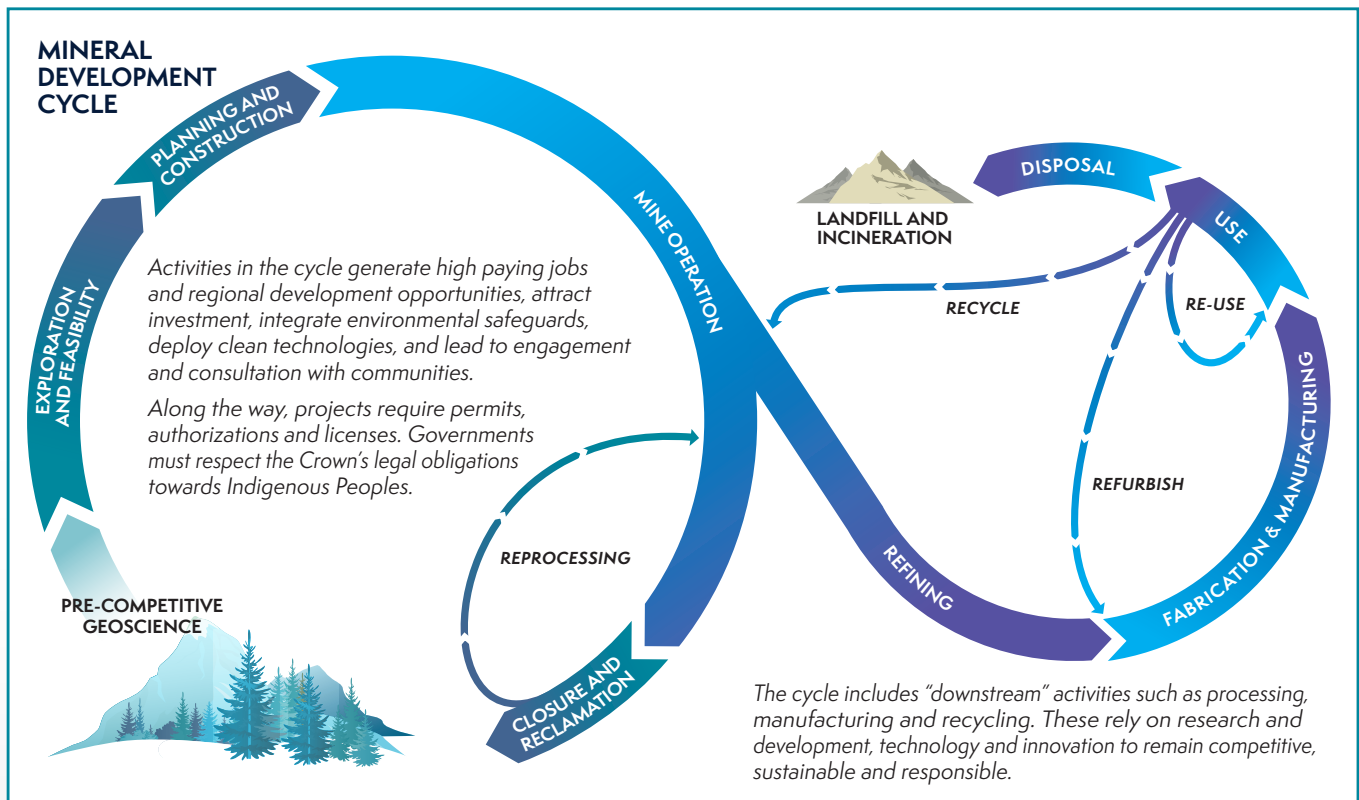
At the same time, demand will remain for “traditional” Canadian products, including base metals, iron ore, metallurgical coal, diamonds and gold.

Mining also offers a pathway to address one of our top domestic priorities—improving the relationship with Indigenous Peoples based on rights, respect, co-operation and partnership. The industry holds great potential to advance reconciliation and Indigenous participation in the economy.

This is directly linked to competitiveness. Recognizing a role for Indigenous Peoples and supporting them through processes contributes to timely decisions and increases certainty. Enabling a skilled local workforce

and reliable supply chains that include Indigenous communities attracts investment and reduces costs. Increasing the use of local knowledge improves project design and certainty around access to land. All of the above increase the participation of Indigenous Peoples in natural resource development, while reducing risk for investors.

The Canadian Minerals and Metals Plan is an opportunity for government, industry, Indigenous Peoples and stakeholders to work together to build on our strengths, capitalize on opportunities, and support a minerals industry that drives Canadian prosperity.⁸



⁸ See Annex B.



REALIZING THE VISION

THE VISION*

CANADA IS THE LEADING MINING NATION

Canada is home to a competitive, sustainable and responsible minerals industry that benefits all Canadians. The country is a global leader in mining-related science, technology, social and environmental practices with a clear and predictable regulatory environment, innovative clean technology solutions, and best management practices. It boasts a skilled and diverse workforce, an attractive investment climate, partnerships with Indigenous Peoples, and strong relations with communities.

PRINCIPLES TO STEER THE VISION

- ▲ The mineral development sequence provides essential products for the evolving global economy and substantial socio-economic benefits for regions across Canada, including northern, remote and isolated communities, and urban centres.
- ▲ Responsible mineral development integrates the concept of sustainability—human, social, economic, and environmental.
- ▲ Canada's bold vision for the industry is responsive and adaptable to emerging global forces and new frontiers.
- ▲ Leading science, engineering and innovation advances the competitiveness of the minerals sector and fosters responsible industry practices.
- ▲ A strong national brand and global leadership advances Canadian interests at home and abroad, strengthens the economies of Canada's regions, and promotes Canadian values.
- ▲ Respect for jurisdictional authority, effective legislative and regulatory frameworks, community engagement, and partnerships are foundational.



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NOT YOUR GRANDFATHER'S MINE

Today's mines use a range of modern, innovative processes and technologies in their operations, including supercomputers, automation, monitoring sensors and artificial intelligence (AI). Some mines use custom underground robots to identify ore and waste rock. Other mines harness the power of genomics to monitor and restore biodiversity during site restoration. By tapping into renewable energy sources and reducing, reusing and recycling water onsite, companies are creating smart mines to produce the minerals and metals for an evolving economy.

* This vision will be achieved through collaboration between the federal, provincial and territorial governments, Indigenous Peoples, industry, advocacy groups and Canadians.



APPROACH TO ACHIEVING THE VISION

The Plan includes six strategic directions:



Canada’s business and innovation environment for the minerals sector is the world’s most competitive and most attractive for investment



Increased economic opportunities for Indigenous Peoples and supporting the process of reconciliation



The protection of Canada’s natural environment underpins a responsible, competitive industry. Canada is a leader in building public trust, developing tomorrow’s low-footprint mines and managing the legacy of past activities



A modern and innovative industry supported by world-leading science and technology—across all phases of the mineral development cycle



Communities welcome sustainable mineral development activities for the benefits they deliver



A sharpened competitive edge and increased global leadership for Canada



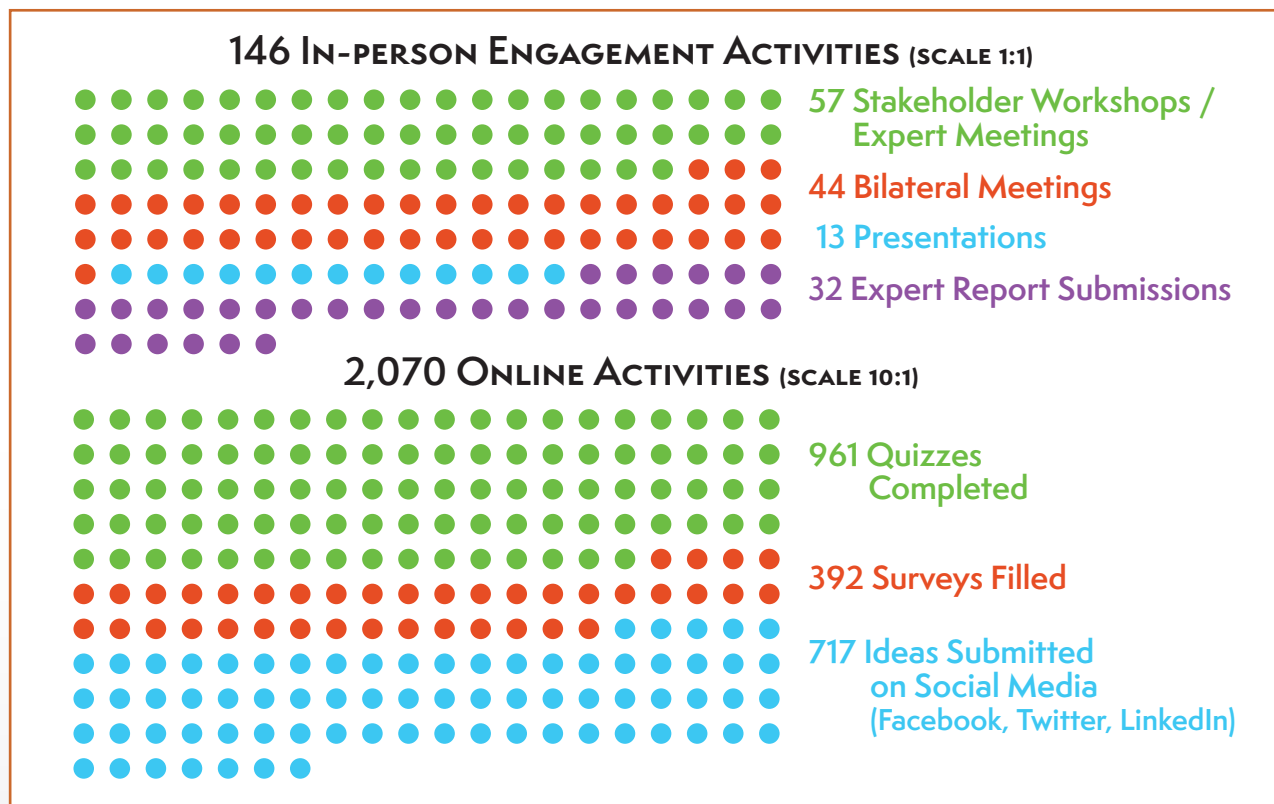
PUTTING THE PLAN INTO ACTION

THE CONVERSATION

This Plan was informed by engagement with Indigenous Peoples, innovation experts, private companies, industry associations, non-governmental organizations, youth, other stakeholders and partners, as well as Canadians from across the country.



ANALYTICS



In summer 2019, Canada’s Mines Ministers will consider actions that government and industry can take to operationalize the Canadian Minerals and Metals Plan. The first Action Plan will be released in 2020 and will include near-term actions supported by current data, rigorous research and analysis, and input from stakeholders and partners. All actions will

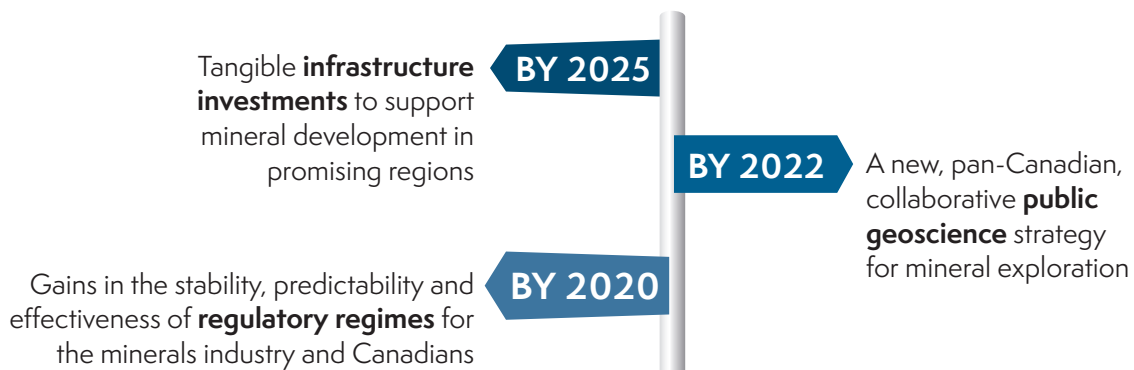
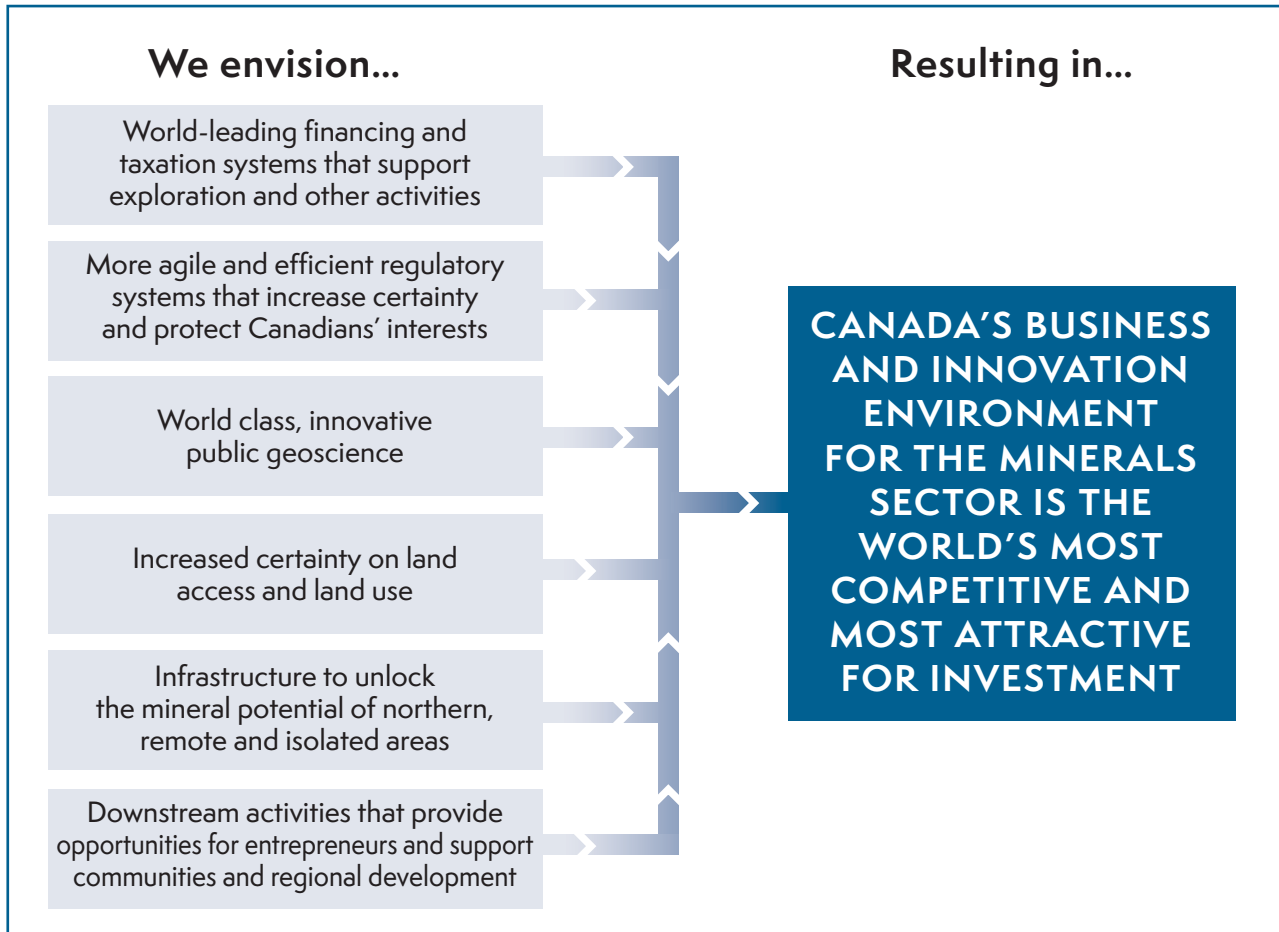
contribute to the vision—that Canada is the leading mining nation.

Subsequent Action Plans will keep this initiative evergreen, respond to new challenges, and capitalize on longer-term opportunities in the industry. The Mining Sector Performance Report⁹ will be used to evaluate the progress of the Canadian Minerals and Metals Plan.

⁹ See Annex C.



ECONOMIC DEVELOPMENT AND COMPETITIVENESS





AREAS FOR ACTION

TAX AND FINANCIAL INCENTIVES

The federal, provincial and territorial governments should review Canada's tax position and adjust tax policies and other fiscal instruments to support cost competitiveness and attract investment.

REGULATION

The federal, provincial and territorial governments should continue to harmonize or mutually recognize regulations, where appropriate.

The federal, provincial and territorial governments should continue to work with industry to develop tools to help stakeholders understand and navigate regulations.

The federal, provincial and territorial governments should ensure that those government bodies conducting environmental assessments have the capacity to deliver advice and decisions in a timely and efficient manner.

GEOSCIENCE

The federal, provincial and territorial governments and industry should explore options for increased funding for geoscience and examine ways to increase international collaboration on geoscience innovation.

LAND ACCESS AND LAND USE

The federal government, in collaboration with the provinces and territories, should continue to settle land claims as a principle for reconciling with Indigenous Peoples.

The federal, provincial and territorial governments should explore ways to provide increased clarity around land use and land access where it does not exist. Decisions should incorporate economic factors alongside social and environmental considerations, and leverage scientific and local knowledge.

INFRASTRUCTURE

The federal, provincial and territorial governments should work with Indigenous Peoples, remote and isolated communities, and industry to identify enabling infrastructure needs in regions of high mineral-development potential.

The federal, provincial and territorial governments could consider dedicating additional resources to unlock the mineral potential of northern, remote and isolated areas.

MINERAL PROCESSING

The federal and provincial governments should study further processing opportunities to expand Canada's smelting, refining, and pelletizing capabilities to contribute added value to our economy.



TODAY

The minerals and metals sector is a significant driver for Canada's economy. In 2017, it accounted for 634,000 direct and indirect jobs across the country, 5% of nominal GDP, 19% of Canada's total merchandise exports, and 5% of non-residential capital investment in Canada.

The sector delivers socio-economic benefits across the country—from small mining communities to large urban centres. Its socio-economic impact is particularly important in Canada's northern,¹⁰ remote and isolated regions. Mining provides indirect benefits, for example through the transportation industry, the legal profession, financial institutions, and small- and medium-sized enterprises (SMEs).

The sector is a significant customer of Indigenous businesses, and mineral development projects can serve as economic pillars for communities and regions. In 2017, it accounted for 23% of the GDP in Nunavut, 19% of GDP in the Northwest Territories, and 6% of GDP in the Yukon.¹¹

Canada is the leading global centre for mining finance. The Toronto Stock Exchange (TSX) and the TSX Venture Exchange are home to almost 50% of the world's public mining companies, and in 2017, more than \$205 billion of mining equity was traded on these exchanges. Combined, they list more mining and mineral exploration companies than any other exchange, and account for the largest share of global mining equity financing.¹²

Competitiveness is paramount in a price-taking industry where mining operations are subject to global economic forces and price fluctuations. Currently, the overall longer-term economic outlook is positive, owing largely to expected global growth from an increasing population and income levels. Demand for minerals and metals should be driven by emerging markets as the middle classes of China and India continue to grow, buy

CANADA'S COMPETITIVE ADVANTAGES

Beyond Canadians' expertise across the mineral development cycle and a rich geological endowment, Canada has significant advantages as a mining nation

- ✓ A stable political environment
- ✓ Preferred access to major markets
- ✓ Stable and competitive fiscal, legal and regulatory frameworks
- ✓ State-of-the-art public geoscience
- ✓ A competitive tax environment with world-leading fiscal incentives for exploration
- ✓ The world's largest junior mining sector
- ✓ The global hub for exploration and mine financing
- ✓ A strong mining supply and services sector
- ✓ People and communities who participate and contribute to the success of this ecosystem

products and services, and adopt clean technologies such as wind and solar power and electric vehicles that rely on mining products.

Continued Canadian success will depend on Canada's ability to attract and retain the world's best people to work in a modern, high-tech sector that increasingly requires skilled labour and uses groundbreaking technologies and processes. This will help the industry deliver the materials for products that we rely upon in our daily lives, and for the technologies and infrastructure needed in an evolving global economy.

Canada is competing for the investment required to develop its mineral resources, to support the development of entire regions, and to drive Canadian prosperity. It must present an attractive investment climate where mineral development happens in a timely and efficient manner.

¹⁰ For the purposes of this report, "northern" and "the North" refer to Canada's territories, lands north of 60° latitude, and the northern regions of provinces excluding the Maritime provinces.

¹¹ Natural Resources Canada estimates using Statistics Canada data, 2018.

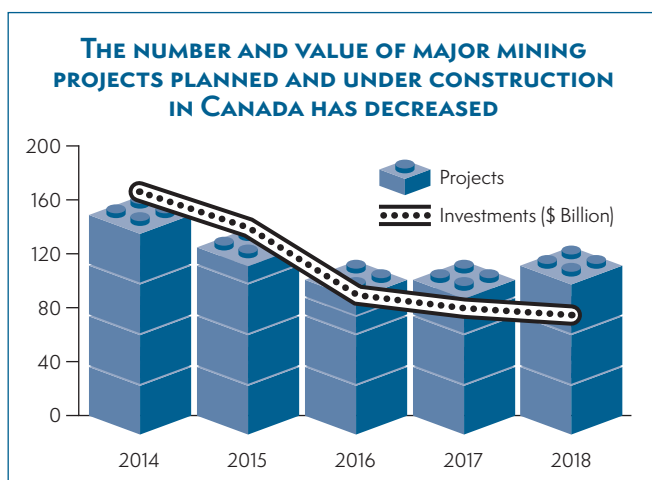
¹² *TSX.com*, *TMX*, 2018.





Canada has long stood as a top destination for mineral investment, but there are indications that its position is being eroded. Canada receives a greater share of non-ferrous exploration budgets than any other country, but this share has declined in recent years. Over the same time, Australia (another top destination for non-ferrous exploration spending) has seen its share remain relatively flat, while the region of Latin America has gained the most.¹³

Reserves of certain metals are trending downwards and the country has experienced a decline in the production volumes of key commodities.¹⁴ The number of mining-related projects planned and under construction dropped from 150 in 2014 to 108 in 2018. The value for such projects also decreased over the same time, from \$166 billion to \$72 billion.



These projects are under construction or scheduled to begin construction by 2028. **Source:** Major Projects Inventory, Natural Resources Canada, 2018.

Numerous factors can explain changes to investment plans and project timelines. Nonetheless, this trend underscores the need to foster a favourable investment climate and to keep improving the competitiveness of the entire sector.

Tax competitiveness is a key component of a country’s mineral investment climate. Canada has one of the **lowest effective tax rates** among international mining jurisdictions. Its Flow-Through Shares mechanism, harmonized with the Mineral Exploration Tax Credit and some provincial measures, is recognized for its innovative approach to stimulating mineral exploration. This helps junior mining companies finance mineral exploration through equity markets, as they do not have internally generated revenue. These exploration activities are key to discovering and establishing future mines.

The industry generally favours reducing the carbon footprint of its activities. Whatever method is used to achieve this, there is concern that the “emissions-intensive and trade exposed” mining industry will be subject to additional costs resulting from pricing pollution, and that northern operations relying on diesel may be disproportionately affected.

Regulations must safeguard the interests of Canadians. Regulatory systems that are strong, agile, transparent, and predictable are a competitive advantage, as they protect the environment, facilitate sound project planning and provide investors with a clear path to timely project approvals.

In Canada, provinces and territories have jurisdiction over property, land resources (including mineral deposits), and mines. Some resources are located on Aboriginal treaty lands, for which modern treaty signatories have specific rights and jurisdictions related to lands and resources within their areas.

Federal, provincial and territorial governments are legally obligated to fulfill the duty to consult when contemplating decisions that could impact Aboriginal and treaty rights.

¹³ *Corporate Exploration Strategies 2017*, S&P Global, 2017.

¹⁴ Natural Resources Canada, 2012.





Regulatory certainty can be advanced by following good practices that facilitate engagement with Indigenous Peoples and stakeholders as early as possible to provide opportunities for communities to participate in economic development.

Many mining projects are subject to both federal and provincial environmental assessments¹⁵ and other legislation. There is a separate environmental assessment process for Canada's three territories, which satisfies federal and territorial jurisdictions.

The time it takes to complete environmental assessments and obtain a project decision is an important factor in the economic attractiveness of a mining project. Decisions should be based on evidence including science and local knowledge, and be delivered within defined timelines. This instils investor confidence and can reduce the time between mineral discovery, or the acquisition of a mineral deposit, and production.

Regional assessments could offer opportunities to identify, analyze, and manage potential cumulative environmental, economic, social and cultural effects at a local or regional scale. This approach could have the potential to streamline approvals at the project level, provide greater clarity on a region's capacity for activity, and support regional development.

Public geoscience refers to geological, geophysical, geochemical, and other data, maps, and knowledge. It can be delivered through spatial reference information systems, such as Quebec's SIGEOM, and is provided free by governments as a public good.

Geoscience serves a range of public and private interests beyond mineral exploration, such as civil engineering projects, land-use planning, clean water supply, environmental impact assessment, public health and safety, economic development, and national sovereignty. It provides communities and organizations with the same information during land negotiations and consultations.

Public geoscience helps exploration companies make informed decisions regarding their exploration plans and allows them to focus on areas of higher potential. The availability of geoscience data and knowledge reduces risks associated with mineral exploration and enhances Canada's attractiveness as a destination for investment.

For years, organizations such as the Ontario Geological Survey, the Saskatchewan Geological Survey, and the Yukon Geological Survey have provided state-of-the-art geoscience that has facilitated major discoveries and mining-related activity.

"Public geoscience is the lifeblood of exploration."

—THE PROSPECTORS AND DEVELOPERS ASSOCIATION OF CANADA

Federal, provincial and territorial governments work together to coordinate and integrate public geoscience activities across the country.¹⁶ Canada also works with other countries to share leading knowledge and practices, participate in international standard-setting, and help gain access to new markets. This has contributed to world-leading public geoscience.

Next generation geoscience is required to reveal additional information about known deposits, and to support the discovery and development of tomorrow's mines. It is critical to tap the vast mineral potential of Canada's North—which holds gold, diamonds, base metals, iron ore, cobalt, rare earth metals, and more—but which is difficult to access and expensive to explore.

The latest knowledge and tools can be used to extend the lives of existing mines and to discover new resources in existing mining camps in all regions of Canada. Coupled with local knowledge, geoscience also supports efforts to address climate change and meet challenges related to infrastructure and logistics.

¹⁵ Environmental assessments may not be required based on a project's size, commodity type, and other factors.

¹⁶ Federal, provincial and territorial collaboration is coordinated through the Intergovernmental Geoscience Accord and the National Geological Surveys Committee.





THE GSC: SUPPORTING DECADES OF ECONOMIC DEVELOPMENT

The Geological Survey of Canada (GSC) works in collaboration with provincial and territorial surveys to generate and deliver geoscience knowledge to Canadians. This knowledge supports communities, regions, and natural resource sectors.

In 2008, when the GSC began delivering the Geo-mapping for Energy and Minerals Program (GEM), only 20% of Canada's North was mapped to modern standards. By 2020, a total investment of \$200 million in the program will bring the geoscience knowledge of the region to the level needed to inform decisions on exploration, land use and the environment.

Geoscience knowledge is essential for a sustainable and growing minerals sector. Ekati, Canada's first diamond mine, was discovered in the Northwest Territories using federal public geoscience. Opened in 1998, it spurred a Canadian diamond industry that produced a total of \$27 billion of diamonds by 2017, resulted in 53,000 person years of employment, and established Canada as the world's second-largest diamond producer.

Using techniques developed in GEM, the GSC confirmed the presence of iron ore deposits in Baffin Island, which led to the development of Baffinland's Mary River mine. The project provides 670 full-time jobs and has an expected lifespan of 21 years.

Geoscience knowledge generated from the 1970s and from GEM and other programs supported Agnico Eagle's discovery of Nunavut's Amaruq gold deposit—a satellite of its Meadowbank mine—which is expected to begin production in 2019.

Certainty around **land access and land use** is important for Canada to capitalize on strong global demand, to attract and retain investors, and to provide sufficient lands for the sustainable development of widely-dispersed mineral resources.

Governments may decide to withdraw land that could otherwise support mining activity for ecological, legal or other reasons.

Canadians value the natural and cultural heritage of their lands. The Government of Canada has established the *Pathway to Canada Target 1*, which includes conserving at least 17% of terrestrial areas and inland water by 2020, through a network of protected areas (including private land acquisition), and other measures. It is important that permanent decisions around land use consider the natural resource and socio-economic potential of lands.

Infrastructure can enable mining-related activities and regional development. Infrastructure needs are more pronounced in Canada's northern, remote, and isolated regions, where a lack of infrastructure is a barrier to sustainable resource development and socio-economic growth.

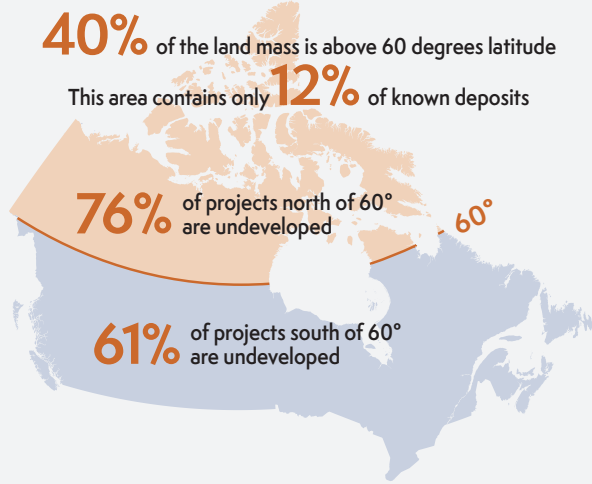
The availability of regional infrastructure is a major cost consideration for mining companies. They must decide if they will make capital investments to develop infrastructure when it is not already present in regions with mineral potential. This significantly increases project costs, lengthens timelines to production, and can render projects less competitive than those in other regions or countries.

Conversely, new infrastructure can help open up mineral-rich regions for further exploration and development, and attract additional investment and natural resource development opportunities.





Much of Canada’s natural resource potential lies in northern, remote and isolated regions —but it is not being fully realized



Source: *Unlocking Northern Resource Potential: The role of infrastructure*, Prospectors & Developers Association of Canada, 2016.

Infrastructure strengthens communities, particularly in northern, remote, and isolated areas. Building infrastructure creates jobs and long-lasting economic and social benefits. Once constructed, it reduces the costs of delivering supplies, improves the viability of local businesses, connects communities, can reduce reliance on diesel, and can attract other industries.

For example, after the Inuvik-Tuktoyaktuk Highway opened in the Northwest Territories in 2017, it welcomed 15,000 travellers and increased tourism in its first year. It has the potential to enhance access to onshore gas fields and possible liquefied natural gas exports, and to attract mining-related activities.

Energy and telecommunications infrastructure powers mines and other facilities, and enables communication in modern operations that increasingly rely on AI, automation, and other digital technologies.

Canada, with its vast geography, faces cost and logistics challenges related to moving products from sites to processing facilities, ports and across borders. Efficient transportation networks allow workers, supplies and equipment to reach exploration and production sites, and allow products to reach global markets.

Canada counts more than **30 smelters, refineries, and pelletizers** in Newfoundland and Labrador, New Brunswick, Quebec, Ontario, Manitoba, Alberta and British Columbia. These facilities process feedstock that contains nickel, aluminum, copper, gold, silver, cobalt, iron ore, lead, bismuth, and platinum group metals.

**CASE STUDY
REVOLUTIONARY
ALUMINUM-MAKING
TECHNOLOGY WILL
BE MADE IN CANADA**



Alcoa Corp. and Rio Tinto Group are collaborating to develop a new aluminum-making process that eliminates greenhouse gases. Based in Montreal and the Saguenay region, the technology will be available to retrofit existing smelters or build new facilities.

Canada and Quebec are each investing \$60 million, Rio Tinto and Alcoa will invest \$55 million, and Apple is providing \$13 million and technical expertise.

“We are proud to be part of this ambitious new project, and look forward to one day being able to use aluminum produced without direct greenhouse gas emissions in the manufacturing of our products.”

— TIM COOK, APPLE CHIEF EXECUTIVE OFFICER

Source: *Apple, Ottawa and Quebec back Alcoa, Rio Tinto venture to develop carbon-free aluminum smelting*, Financial Post, 2018.





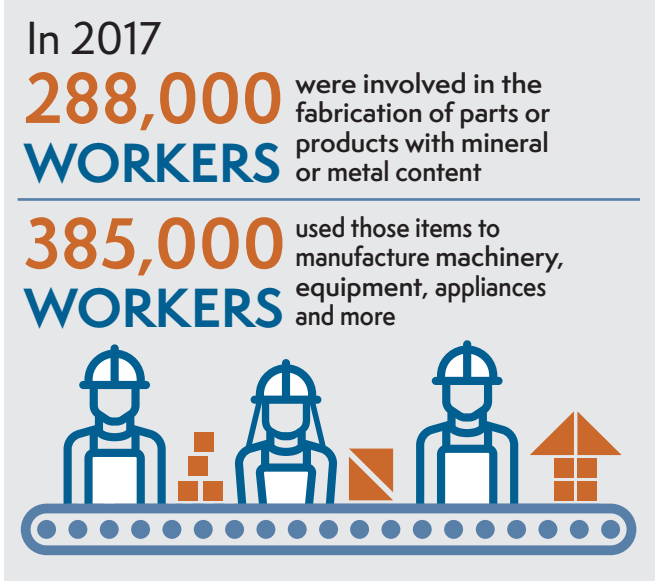
Canada’s nickel industry is fifth globally in terms of production, and includes smelters and refineries that produce some of the best nickel products in the world. Together, Ontario and Newfoundland and Labrador account for 67% of Canada’s refined production of nickel.¹⁷

Canada is a world leader in the production of aluminum, with the Quebec Aluminum Cluster accounting for 60% of North American production. The cluster is anchored by global producers Alcoa, Rio Tinto and Alouette, and includes nearly 1,500 businesses providing expertise, processing, and other services.

The Canadian aluminum industry benefits from abundant, low-cost hydroelectricity in Quebec and British Columbia, a skilled workforce, advanced technology, and deep water ports on the east and west coasts (factors that are also present in other regions).

Like mining projects, smelters, refineries, and pelletizers contribute significant benefits to communities, including high-paying jobs and business development opportunities.

These facilities produce high-quality feedstock for additional value-added activities. Some can process recyclable scrap, as well as recover critical materials (e.g. bismuth, indium, germanium, gallium) as by-products of base metals and recyclables. These outputs provide materials for the manufacturing industry.



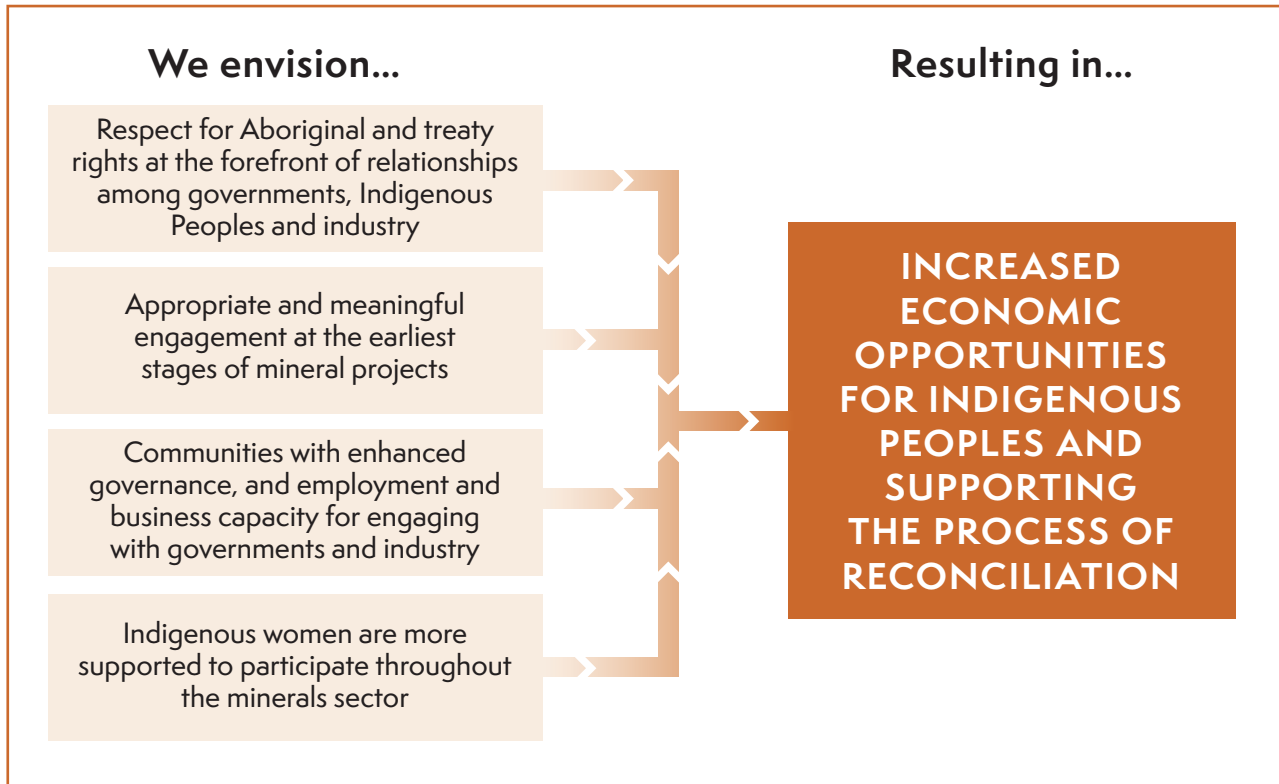
Source: Statistics Canada, 2018.

¹⁷ Natural Resources Canada, 2018.





ADVANCING THE PARTICIPATION OF INDIGENOUS PEOPLES



More **agreements** between Indigenous communities and project proponents

BY 2025

Explore opportunities for increased **Indigenous procurement and business activity**

BY 2021

BY 2022

Introduce integrated **mine training programs**

NOTE—The perspectives of Indigenous Peoples are meant to be represented throughout the Canadian Minerals and Metals Plan. This section acknowledges a unique role for Indigenous Peoples as set out by Section 35 in the Canadian Constitution that affirms existing Aboriginal and treaty rights.





AREAS FOR ACTION

RESPECTING RIGHTS

Governments, Indigenous Peoples and industry should ensure that Aboriginal and treaty rights are respected and are at the forefront of relationships. This should be advanced through processes consistent with the Canadian Constitutional framework.

Governments should have tools available to help industry be aware of Aboriginal and treaty rights when undertaking and advancing mineral exploration and mining.

CAPACITY BUILDING

The federal, provincial and territorial governments and industry should work with Indigenous communities to enhance resources for capacity building to support Indigenous Peoples' participation in the mining industry. Indigenous communities should have resources to meaningfully represent their interests, and to pursue employment and business opportunities.

MEANINGFUL ENGAGEMENT

Industry, Indigenous Peoples and federal, provincial and territorial governments should advance opportunities for meaningful engagement on potential projects —at the earliest possible stage and in a culturally-aware manner.

INDIGENOUS WOMEN

The federal, provincial and territorial governments, stakeholders and Indigenous Peoples should support the greater participation of women in engagement processes and the mining industry, including by eliminating barriers to employment. Industry should support sensitivity and inclusion training for front-line workers, and work to increase the number of women in leadership roles.

ECONOMIC BENEFITS

Industry should work with communities to explore economic benefit sharing with Indigenous Peoples in the minerals sector. This includes long-term benefits that can be derived from across the sector in areas such as skills training, employment, business development, and financial arrangements.

The federal, provincial and territorial governments and industry should work with Indigenous Peoples to explore Indigenous procurement plans and businesses in supplier networks.





TODAY

An objective of **reconciliation** is improving the relationship between Indigenous and non-Indigenous Peoples. This is an important factor in considering ways to create more mutually beneficial relationships in how mineral resources are managed and how benefits are shared.

Mining is a major employer of Indigenous Peoples, and hundreds of Indigenous-owned businesses operate in the supply chain. These socio-economic benefits are advanced by agreements between project proponents and Indigenous communities that set the terms of their relationships. Increasingly, Indigenous communities are establishing protocols, mining policies and regional strategies to represent their members' interests.

The Canadian Constitution **recognizes and affirms existing Aboriginal and treaty rights**. This gives rise to a legal obligation for governments to consult, and where appropriate, accommodate Aboriginal Peoples for impacts to asserted or established Aboriginal and / or treaty rights.

Governments may also have to consult with Indigenous Peoples as per land claim agreements, self-government agreements, consultation protocols and statutory requirements. Leading practices in Aboriginal consultation can include processes and approaches that advance deeper collaboration and new ways of working with Indigenous Peoples.

Meaningful engagement between industry and Indigenous communities is key to building effective and transparent relationships. Mining companies and Indigenous communities are increasingly negotiating agreements, such as impact and benefit agreements, that can include provisions on economic and business opportunities, training and mentorship, environmental and cultural protections, and other areas. Relationship building between industry and Indigenous communities should begin at the earliest possible stages of mineral projects and mines.

Governments and industry need to continue to work with Indigenous communities to develop collaborative approaches for mineral exploration and mining that consider Indigenous perspectives about the land. Industry needs the cultural awareness to properly engage with Indigenous Peoples.

UNITED NATIONS DECLARATION ON THE RIGHTS OF INDIGENOUS PEOPLES

In May 2016, the Government of Canada announced support for the *United Nations Declaration on the Rights of Indigenous Peoples* (UN Declaration) and a commitment to its full and effective implementation in accordance with the Canadian Constitution. This follows the Government of Canada's Statement of Support endorsing the principles of the UN Declaration in November 2010.





CASE STUDY
RAGLAN
AGREEMENT



In 1995, Glencore’s Raglan Mine and five Inuit partners in Northern Quebec signed the Raglan Agreement—the first Impact Benefit Agreement signed in Canada between a mining company and an Indigenous population. It provides that the Raglan project will contribute to the social, economic and cultural well-being of Inuit beneficiaries, particularly those in Salluit and Kangiqsujuaq, who are closest to the mine site.

The Raglan Committee, including representatives from the Makivik Corporation,¹⁸ Indigenous communities and the mine, meets quarterly to discuss key issues and share information on the mine’s environmental, social and business performance. This has been critical for the company to receive feedback and maintain an open dialogue with its partners.

Raglan Mine’s current operations are due to wind down in 2020. The Sivumut project (meaning “moving forward” in Inuktitut) aims to extend the life of the mine. Signatories have agreed to new measures that go above and beyond the initial agreement to foster the conditions for success for local communities and the mine going forward. These include:

- Establishing strategies and programs to attract and retain Inuit workers
- Deploying a procurement strategy with local contractors for goods and services
- Hiring community liaison officers and environmental monitor officers based in Salluit and Kangiqsujuaq
- Continuing to provide annual Raglan Mine community site visits and environmental forums for local communities

Capacity building is critical to support the participation of Indigenous Peoples in the minerals sector. This includes building governance capacity and working to align projects with community priorities. This supports fair mining agreements, opportunity for Indigenous investment, and business development activities. Indigenous economic development corporations can also support community capacity building.

The vision for Indigenous Peoples moves beyond entry-level jobs into supervisory and management positions. This can be facilitated with training in the trades, post-secondary education, and entrepreneurial mentoring. Indigenous businesses can be supported to secure more opportunities in the mining supply chain, and to take on exploration or development themselves.

In some cases, there is also an opportunity for Indigenous Peoples to play a greater role in activities such as archeologic fieldwork, environmental monitoring, traditional land-use studies, and other technical services.

INDIGENOUS PARTICIPATION

The minerals sector* is an important **employer of Indigenous Peoples**, providing jobs to over

16,500 individuals in 2017



An estimated **455** agreements were signed between mining and exploration companies and Indigenous communities or governments

*Includes downstream activities

¹⁸ Makivik Corporation is mandated to protect the rights, interests and financial compensation provided by the 1975 James Bay and Northern Quebec Agreement (the first comprehensive Inuit land claim in Canada), and the Nunavik Inuit Land Claim Agreement. **Source:** Makivik.org.





Indigenous women face specific barriers to participating in the industry related to workplace culture, discrimination, and other factors. Increasing the participation of Indigenous women can bring benefits for communities and help bridge the labour gap for skilled workers.

Industry and governments must consider the concerns and interests of Indigenous women—particularly those factors that affect their safety on projects and in proximate communities—and address barriers to employment.

There is growing consensus that Indigenous participation in the **economic benefits** generated from mineral

resource development improves quality of life and contributes to Indigenous self-sufficiency. These benefits include skills training, employment, procurement, business development and financial arrangements.

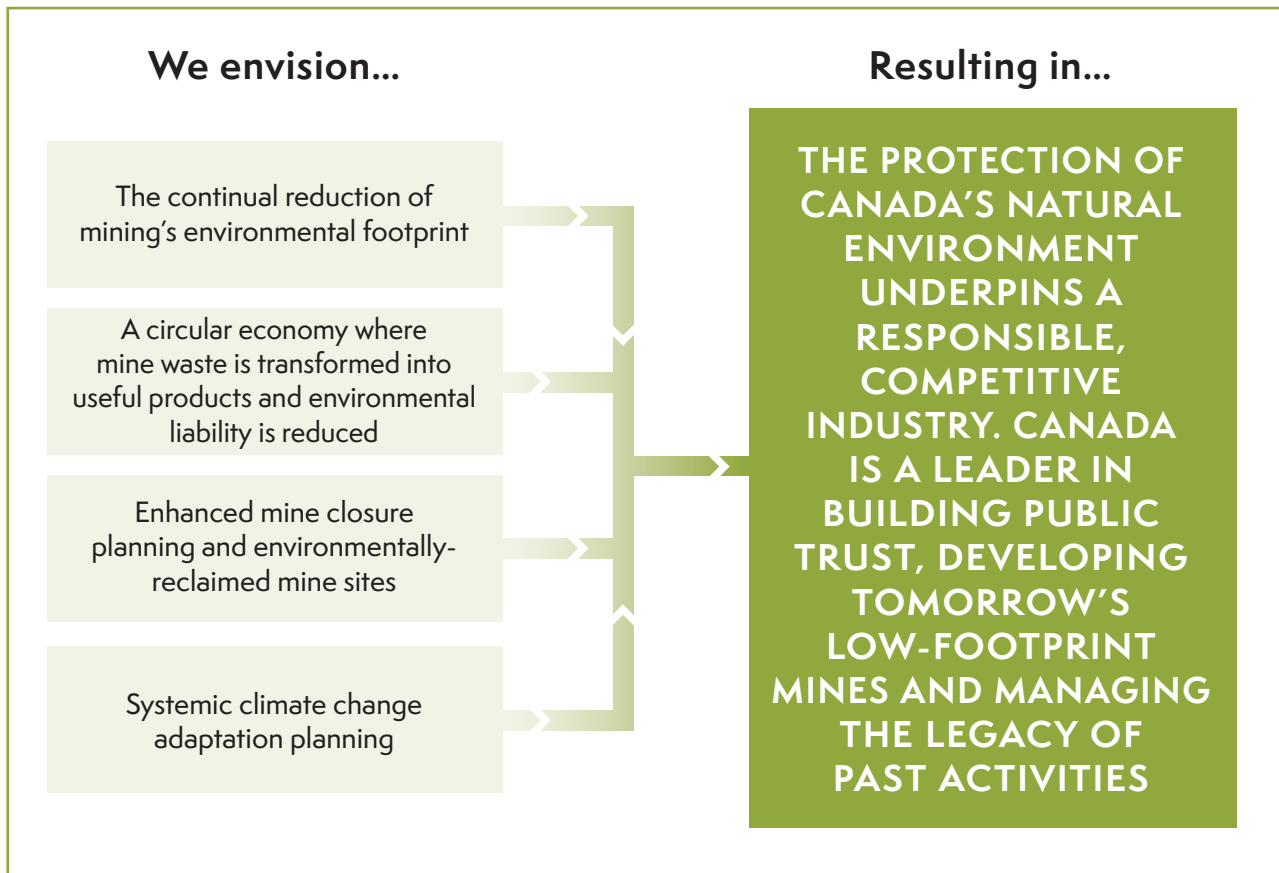
Expanding such benefits would enable Indigenous Peoples and communities to realize long-term, sustainable socio-economic benefits that support communities and sustainable mineral development projects.

Collaborative project planning can also create mutually-beneficial solutions when applied to transportation, energy and social infrastructure projects.





THE ENVIRONMENT



New mine developments demonstrate **environmental leadership** through increased adoption of **best available technologies**

BY 2025

An expanded mandate for **National Orphaned / Abandoned Mines Initiative (NOAMI)**

BY 2020

BY 2020

A pan-Canadian **Mining Value from Waste** research program is established to reduce the footprint of mine wastes and improve environmental performance





AREAS FOR ACTION

REDUCING WASTE

The federal, provincial and territorial governments, industry, academia and other stakeholders should provide more targeted support for research and development (R&D) and innovation that reduces the consumption of water and energy, and the production of waste rock in mining.

ALTERNATE AND RENEWABLE ENERGY

The federal, provincial and territorial governments and industry should accelerate efforts to develop and adopt clean energy sources, particularly for northern, remote and isolated communities that rely on diesel.

The federal government and interested provincial and territorial governments and industry should continue to study the feasibility of small modular reactors in mining operations, as well as the potential market for this technology.

CIRCULAR ECONOMY

The federal, provincial and territorial governments and industry should study Canada's recycling and reprocessing capacity and capabilities to determine how they can support sustainability and competitiveness. This includes taking a holistic approach to mining value from tailings as a source of metals and industrial minerals.

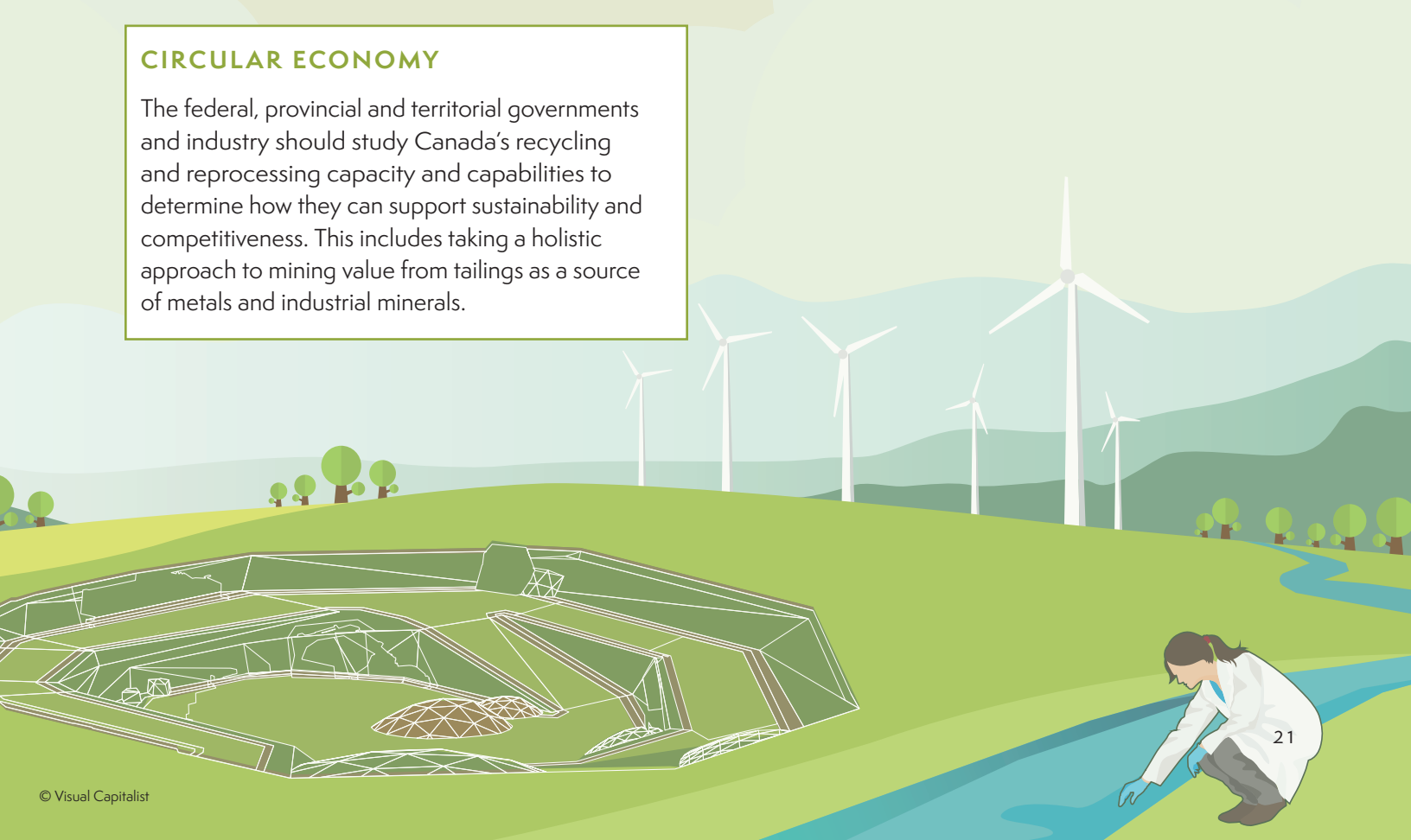
RECLAIMING MINE SITES

Under an expanded mandate, NOAMI should work with provincial and territorial governments and other stakeholders to recommend best practices regarding:

- Ecosystem rehabilitation plans
- Improving financial assurance measures for new mines
- Innovative practices, technologies, and guidelines (regulatory and non-regulatory) to address environmental and other concerns arising from orphaned / abandoned mines

CLIMATE CHANGE ADAPTATION

The federal, provincial and territorial governments should encourage industry to plan for and adopt measures to adapt to climate change (for current and legacy mines).





TODAY

Mining-related activities have the potential to significantly impact people and ecosystems. Canadians place great value on public health and safety, air and soil quality, and wildlife and habitat. Public perceptions about the industry are strongly linked to its environmental performance.

Canadians expect that exploration, mining, processing and related activities include measures to avoid, minimize and mitigate environmental impacts. They also expect that lands once used for mining are restored to a more natural state. Meeting these expectations builds public trust and supports a sustainable, competitive industry.

“For Canada’s mining companies, reclaiming the land we borrow is a responsibility we take as seriously as creating jobs and building vibrant communities.”

—THE MINING ASSOCIATION OF CANADA

Activities such as processing ore, discharging effluents and managing tailings rely on the use of **water**. If not managed properly, mining activities can cause water pollution from acid mine drainage, metal contamination, and erosion and sedimentation. Climate change brings further challenges related to the availability of freshwater, droughts, flooding, snowmelt patterns, changes to water temperature and other issues.

Strong environmental and economic performance require ongoing and expanded efforts and resources to minimize the industry’s reliance on water, reduce the potential for harmful discharge, improve the management of tailings, improve water processing technologies, and reduce the loss of habitat and biodiversity.

The mining industry looks for ways to improve **energy efficiency** and reduce greenhouse gas (GHG) emissions to shrink its environmental footprint.¹⁹ The Mining Association of Canada’s *Towards Sustainable Mining* program includes an energy use and GHG emissions management protocol to promote comprehensive systems for energy reduction and associated emissions.

Primary metal manufacturing is the largest energy consumer in the sector, and energy consumption is one of the biggest expenses at Canadian mines.

CASE STUDY MINING COMPANIES LEAD ON ENERGY EFFICIENCY



The Canadian Industry Partnership for Energy Conservation (CIPEC) presents leadership awards to Canadian industrial organizations that have made exceptional advances in energy efficiency.

In 2018, four mining companies were among the 14 winners:

- Copper Mountain Mines (BC) Limited
- New Gold Incorporated – New Afton Mine
- Teck Highland Valley Copper
- Tahoe Canada

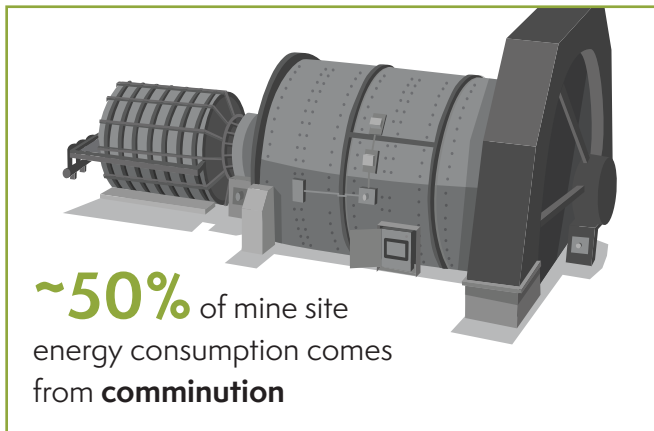
Goldcorp’s Red Lake mine received the first Energy Manager Leadership Award, given in collaboration with the Independent Electricity System Operator of Ontario, which works closely with the mining sector through its Industrial Accelerator Program.

¹⁹ *Facts and Figures of the Canadian Mining Industry*, the Mining Association of Canada, 2016.





Comminution is the process of crushing and grinding rock to liberate valuable minerals. This process accounts for upwards of 50% of mine site energy consumption and up to 3% of all the electric power generated in the world.^{20,21} For underground mining, air ventilation is essential to worker safety. This too is an energy-intensive process. Improving energy efficiency in these and other areas represents a significant environmental and economic opportunity for the industry.



~50% of mine site energy consumption comes from **comminution**

© Visual Capitalist

Energy management programs that feature renewables as a major component can drive down energy costs by 25% in existing mines and 50% in new mines.²²

Mines operating in Canada’s northern, remote and isolated regions that do not have access to electricity grids run primarily on diesel, which is expensive and contributes significant GHG emissions.

Renewable energy sources can reduce or eliminate the reliance on diesel. Examples exist, such as Glencore’s two three-megawatt turbine and storage facilities at its Raglan nickel mine in Northern Quebec. However, issues related to year-round access to sunlight and the intermittent nature of wind limit the uptake of such technologies today.



THE BUSINESS CASE FOR RENEWABLE ENERGY

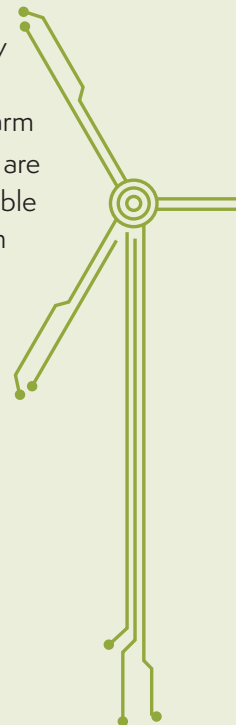
Energy consumption is a major expense at Canadian mines. It includes energy drawn from the electricity grid, as well as consumption of diesel, liquefied natural gas, compressed natural gas and the use of explosives.

As the global economy evolves and renewable energy prices and capital investment costs become more affordable, mining companies look to renewables as a way to reduce costs and offset the impact of volatile conventional fuel prices.

Many of Canada’s northern, remote and isolated communities face challenges resulting from a lack of access to the grid, and seek ways to enhance the competitiveness and feasibility of projects. For example:

- Rio Tinto aims to generate 10% of its energy demand at the Diavik diamond mine in the Northwest Territories from a nearby wind farm
- Third-party partners, such as Tugliq Energy, are funding, developing and operating sustainable energy systems in exchange for a long-term pricing commitment
- Ambri is developing a battery that can store and deliver power for an entire neighbourhood—and be scaled-up further

Rapid improvements in technologies and the expected continual decline in the costs of wind and solar energy suggest that all new mining projects with a lifespan over 10 years will increasingly add renewable power to their energy mix.



²⁰ *Tackling Comminution, the Largest Energy Consumer*, Natural Resources Canada, 2016.

²¹ *Crush It! Challenge*, Impact.canada.ca, 2018.

²² *Renewables in Mining: Rethink, Reconsider, Replay*, Deloitte, 2017.





Small modular reactors (SMRs) are small nuclear reactors with advanced safety features and that could provide power for on- and off-grid operations. Canadian industry and governments in some jurisdictions are studying the potential to adopt SMRs in mining as a means to provide reliable energy and reduce GHGs and costs. Other jurisdictions do not include nuclear energy as part of their energy mix.

The traditional concept of the economy assumes that raw materials travel in a straight line—from extraction to processing to use to disposal. The idea of a **circular economy** is to keep resources in circulation and to minimize discards.

Metals do not disappear when they are used. Most of the time, they retain their intrinsic properties throughout the recycling process. They can be used repeatedly, while maintaining their quality and functionality. By some estimates, recycling saves up to 20 times the energy needed to produce some metals, compared to raw materials acquired through mining operations.

Canada is estimated to account for 16 to 18 million metric tonnes of recycled metal per year, and to export 5.4 million metric tonnes annually (mostly to the United States) worth \$1.37 billion.²⁵

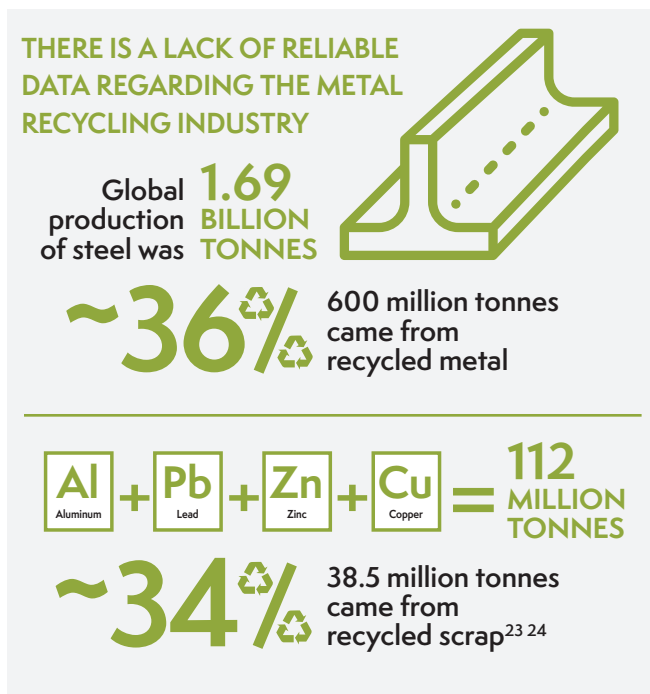
Industries such as automotive, aviation, construction, food and beverage, and the military depend on the recycling industry to manage the costs and the by-products of their work.

The mining process produces “waste,” which could re-enter the circular economy to improve sustainability and derive additional economic value. For example, landfills can be mined to recover minerals and metals. Waste rock is often re-used in mining operations as backfill or in construction. By-products from acid rock drainage treatment—which is high in iron—can be examined as a potential source for pigments. Other by-products can be used in agroforestry or for wastewater treatment.²⁶

Approximately 90% of tailings produced in Canada each year come from metal mines. With most mines operating for decades or longer, there is a large volume of material that could be reprocessed to remove valuables—such as rare earth elements, gold, nickel, cobalt, and tungsten—and to generate biofuels. This process produces significantly less GHGs than producing metals from primary sources, as initial extraction, crushing and grinding has already taken place.

Mining value from waste can also reduce environmental costs, particularly at older operations. For example, sulfide minerals, which cause acid mine drainage, can be extracted from tailings to reduce potential harm to the environment and the associated liability costs for companies.

CanmetMINING at Natural Resources Canada, in collaboration with an intergovernmental working group, launched the pan-Canadian, “Mining Value from Waste” pilot project in 2017.



23 *World Steel Recycling in Figures 2013–2017*, Bureau of International Recycling, 2018.

24 *Non-Ferrous Metals*, Bureau of International Recycling, 2018.

25 Discussions with Canadian Association of Recycling Industries.

26 *The Circular Economy in Mining and Metals*, International Council on Mining & Metals, 2018.





Endorsed by Canada's Mines Ministers, the goal is to develop tools and technologies to de-risk and accelerate the demonstration of full-scale waste reprocessing and repurposing projects. This can reduce environmental impacts and liability from mine waste, and generate additional economic value.

CASE STUDY CMIC'S TOWARDS ZERO WASTE MINING



The Canada Mining Innovation Council (CMIC) coordinates and develops projects and programs in response to life-of-mine challenges defined by its industry members (exploration and mining companies and their service providers).

CMIC's vision is to **transform mining towards a zero waste industry**, with a focus on productivity, energy and the environment.

The Towards Zero Waste Mining program has identified the following opportunities to transform mining processes, advance energy efficiency and reduce GHG emissions:

- Replacing diesel-powered equipment with electric or renewable mining technology
- Capturing lost energy by recovering heat loss in mineral processing
- Developing and deploying new environmental management technologies to minimize waste and improve water quality
- Improving ore reserve definition during exploration to minimize waste extraction during mining and decrease the costs of processing and tailings management

CMIC's programs also prioritize the development of highly-qualified personnel through undergraduate to postgraduate trainees.

Current regulatory barriers, technological constraints, and economics present challenges associated with transforming waste products into valuable materials.

Mining has a long history in Canada and was not always as well regulated as today, where mine reclamation plans (including financial securities) are a condition for granting mine permits. As a result, many former mine sites require varying degrees of maintenance and rehabilitation. Historically, these sites have not been well-documented regarding their associated health or environmental impacts and liabilities.

Orphaned or abandoned mines are those mines for which the owner cannot be found or for which the owner is financially unable or unwilling to carry out clean-up. They pose environmental, health, safety and economic problems for communities.

NOAMI was established in 2002 to address issues concerning orphaned / abandoned mines. Its committee—made up of industry, government, non-governmental organizations, and Indigenous Peoples—has provided recommendations around the cleanup of abandoned mines and the prevention of new occurrences (for which respective mining jurisdictions have ultimate responsibility).

Since NOAMI was established, new issues regarding mine reclamation and closure work have emerged. These include: developing mine closure plans that support the socio-economic development of communities after mines have closed; addressing barriers to the adoption of technologies to reduce the volume and liability of mine waste from abandoned mines; and developing recommendations for a Canada-wide approach to providing financial assurance for new mines to reduce the risk of abandonment and to ensure the proper reclamation of mine sites.





The mining industry must continually assess, manage and prioritize risk. Given the long-term nature of mine closure, this phase of the mine lifecycle is particularly exposed to the impacts of climate change.

Adaptation to climate change is an emerging issue for industrial sectors. For mining, it brings factors such as additional maintenance and repairs to infrastructure, the potential for environmental impacts from the failure of storage facilities, and impacts from extreme weather events such as floods, droughts and wildfires. For workers and communities, it can mean potential work shutdowns, impacts on hunting, trapping and fishing, and impacts on housing and social infrastructure.

In the North, warmer temperatures and melting permafrost bring additional challenges, including for transportation systems that rely on winter roads.

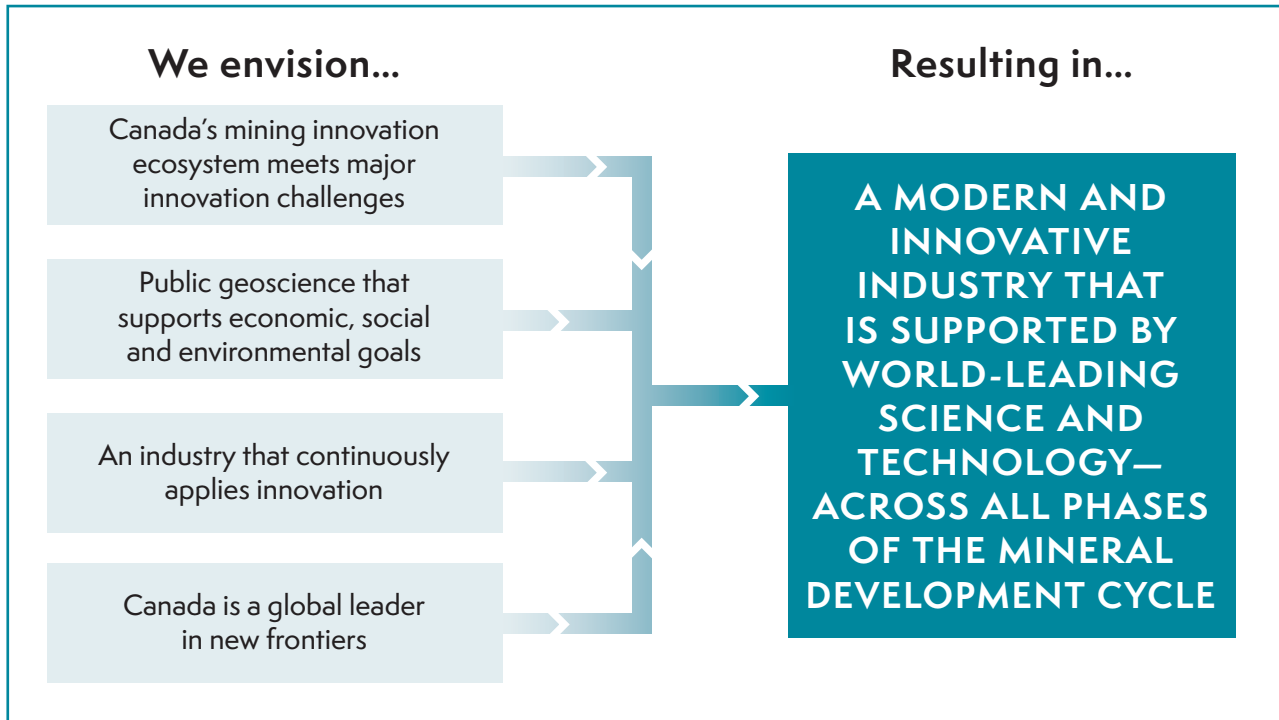
Environmental assessments of projects in the North require analysis to ensure that current and future permafrost conditions have been properly considered in mine plans.

The majority of existing Canadian mines were designed to operate within particular climatic parameters, and to manage the risk of weather events occurring at specific intervals (e.g. one- and 50-year storms). Abandoned mines represent a higher level of risk, particularly where infrastructure and technologies may not have been designed for the full range of future climatic conditions. Increased climate-related risks must be considered in planning, and additional measures may be required to ensure the stability of waste rock and tailings impoundments.





SCIENCE, TECHNOLOGY AND INNOVATION



Significant gains in the commercialization of mining-related technologies and processes, including **next generation geoscience tools**

BY 2025

Incentives to support a "supercluster"-type model for tackling **large innovation challenges**

BY 2022

BY 2022

A **pan-Canadian data strategy** that reflects **transformative technologies** is underway





AREAS FOR ACTION

CANADA'S INNOVATION ECOSYSTEM

The federal, provincial and territorial governments and industry should foster a more effective innovation ecosystem to support activities across all phases of the mineral development cycle.

Industry should identify systemic challenges, work with other sectors, and pool resources to meet challenges head-on.

The federal, provincial and territorial governments should support increased scientific research and innovation funding with a focus on the minerals and metals industry.

The federal, provincial and territorial governments and stakeholders should accelerate the research, development and deployment of digital disruptive technologies to boost industry competitiveness and Canada's position as a leader in mining innovation.

The federal, provincial and territorial governments should practice regulatory innovation to support innovation and adoption, while maintaining safety standards. This can include enabling "sandboxes" that serve as testing grounds for new approaches and outcomes-based regulation.

ADOPTING TECHNOLOGY AND INNOVATIVE PRACTICES

The federal, provincial and territorial governments should work with stakeholders to develop incentives for the adoption of new and clean technologies and innovative practices.

Industry, academia and other stakeholders should lead the development of technology roadmaps for critical emerging technologies and processes.

NEXT GENERATION GEOSCIENCE

The federal, provincial and territorial governments and industry should support the development and deployment of next generation, world-leading geoscience technology and programming.



NEW FRONTIERS

The federal, provincial and territorial governments, industry and other stakeholders should support increased collaboration between Canada's minerals and other industries to advance mutually beneficial technology development and adoption.

Industry should continue to leverage space-based and other technologies to improve efficiency, and develop solutions for mining in deep, remote, and extreme environments.

The federal government should develop a policy approach for mining new frontiers (extreme climates, deep mining, offshore, space) to foster investment and economic development.





TODAY

Applying leading science, technology and innovation is critical to the competitiveness of Canada's minerals industry. The mineral development sequence involves complicated processes, costly and energy-intensive machinery and equipment, and exploring extensive areas of land. Applying innovation enhances efficiency, lowers costs, increases productivity, and improves environmental performance.

Canada is a leader in mining innovation²⁷ and it has advantages, such as a highly-skilled workforce with expertise in extractive technologies, geological and biological sciences, AI, and space.

Innovation that can be applied to mining can come from other sectors. Processes and technologies used in other resource industries, manufacturing, and disruptive digital technologies support modern mining operations. Likewise, expertise and solutions developed and refined for mining can deliver benefits elsewhere. For example, geoscience supports industries such as gaming, oil and gas, renewable energy, transportation and infrastructure, information communications technology, and more.

Canada has strong systems for R&D—including centres of excellence in universities and research chairs—that provides innovative ideas and knowledge for the natural resources sector. It has an open investment climate, and the second-lowest marginal tax rate on new business investment in the G7.²⁸

Canada has people and innovation advantages, but it could do more to leverage these to **tackle industry-wide challenges**. This includes examining the structure and support of Canada's mining "innovation ecosystem" and leveraging expertise from across sectors to improve the transfer of technology.

Collaborative R&D allows organizations to share the risks and benefits of innovation. The Canadian Chamber of Commerce estimates that there are more than 4,000 R&D and innovation programs and some 40 mining research organizations in Canada.²⁹

CASE STUDY GEOSCIENCE DRIVES INNOVATION



Coldblock Technologies Inc. is an Ontario company that uses short-wave infrared radiation to prepare mineral samples using less energy, water and hazardous chemicals. This supports worker health and reduces costs related to ventilation and safety.

The technology has become a commercial success with several global sales partnerships, and is being leveraged in the environmental, food and agriculture, and pharmaceutical sectors. It is the outcome of collaboration between Brock University, the Centre for Excellence in Mining Innovation (CEMI), Barrick Gold Corporation, Ontario Centres of Excellence, the Geological Survey of Canada and other federal organizations.

Technologies developed by small service companies make Canadian mineral exploration cleaner, more efficient and more successful—all of which support a competitive industry.

²⁷ *Supporting Canada to Become a Leader in Global Mining Innovation*, the Canadian Chamber of Commerce, 2015.

²⁸ *Clean Technologies in Canada's Natural Resource Sectors: A Discussion Paper*, Natural Resources Canada, 2016.

²⁹ *Supporting Canada to Become a Leader in Global Mining Innovation*, the Canadian Chamber of Commerce, 2015.





The large number of programs contributes to a silo effect and dampens the collective effort to develop and adopt innovative products and processes. Nonetheless, major resource companies, research organizations, supply service companies, and clean technology providers have demonstrated a willingness to pool resources to tackle systemic challenges in areas such as water use, reducing the environmental footprint of mining, deep mining, and adopting leading edge technologies.

Much of Canada's system for funding R&D focuses on research conducted in universities. Business-led R&D takes place in operating mines, among industry suppliers, and in other areas. These R&D investments are critical to improving Canada's innovation record. However, there are opportunities to better link academic research and industry needs,³⁰ and to bolster and clarify intellectual property protections.

The Mining Supply and Services (MSS) and exploration sectors drive innovation. MSS firms are innovative by nature as they develop solutions for domestic and international companies across the mining supply chain. Their solutions focus on efficiency, productivity, safety, and environmental performance.

Over time, mineral discovery costs have escalated while discovery rates have decreased. New discoveries are found at increasing depth in often complex terrain, and high-quality discoveries are challenging to detect with current models. Exploration success depends on the ability of companies to deploy cost-effective, leading edge tools and techniques.

Next generation geoscience knowledge and tools are being developed to target smaller, higher-grade or deeper deposits, deposits near existing sites, and to leverage advances in technology.

Disruptive Digital Technologies include applications that can deliver significant benefits for the minerals sector. These include AI, robotics and automation, big data, drone technology, advanced processing, the Internet of Things, and more. These technologies can improve data management, decision-making and overall efficiency. They can also contribute to Canada's commitment to a modern economy.

The rapid move towards autonomous vehicles and automated technologies is already revolutionizing mine operations. As the "intelligence" of machines grows, they are able to perform increasingly complex tasks, including difficult or hazardous activities.

CASE STUDY DISRUPTIVE DIGITAL TECHNOLOGIES



Goldcorp is using IBM's Watson cognitive analytics to analyze and synthesize large amounts of data at its Red Lake mine in Ontario. Watson combines geological, drilling, and survey data with historical information and data contained in logs, reports, and studies. It integrates field knowledge from geologists and engineers to determine the exploration targets most likely to succeed.

Goldcorp is also creating Canada's first all-electric fleet for use in its underground mine in Chapleau, Ontario. This represents a significant expansion of disruptive digital technologies in a Canadian mine, including renewable energy, power storage, digitally integrated equipment, wireless monitoring systems, and smart control technologies.

These technologies will cut GHG emissions and reduce operational costs over time to offset upfront adoption costs.

³⁰ Ibid.





Ever-increasing computing power creates volumes of data that are orders of magnitude larger than even a decade ago. Big data can be interpreted with AI and other technologies, but there is much to learn about how to effectively analyze and apply the vast amounts of information that is continually being generated.

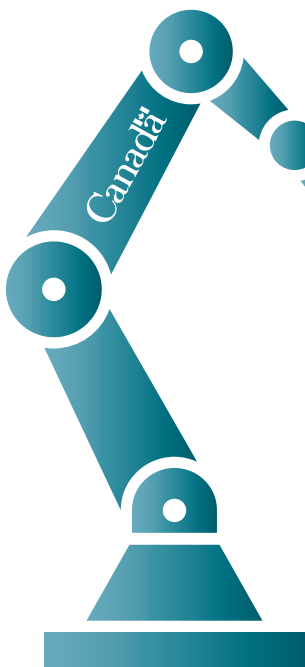
Implementing disruptive digital technologies may present challenges. Automation and AI can affect local business activity, and have the potential to reduce socio-economic benefits for communities that host mining activities. Employment levels may be affected, and workers and companies may require new skill sets.

Regulation must be responsive to innovation. The pace of technological change is rapid, but modernizing regulations in response to technological change takes time. New approaches that protect the interests of Canadians and improve regulatory efficiency will deliver a competitive advantage.

Adopting new and emerging technologies and processes brings opportunities for growth, as well as risk.

Mining companies face pressure to create shareholder value in the short-term. The benefits of innovation can take longer to realize, and the costs associated with investing in innovative machinery and equipment are significant. New ways of doing business also require resources for training.

Companies sometimes view technology needs as site specific. Certain windows of opportunity (at the beginning of mine life, during expansion, at mine closure) are considered most favourable for technology adoption, and mature technologies are typically favoured during mine operation. Companies must ensure that protections are in place so that the use of new technologies do not introduce security vulnerabilities.



CASE STUDY MINING / SPACE TECHNOLOGY TRANSFER



Canada's space sector has decades of experience in research, development and innovation resulting in spin-offs for commercial applications for mining.

Remote sensing and Earth observation satellites, such as Radarsat-2, have been used to map information on mineral, oil, and gas deposits.

In 2008, Ontario Drive and Gear Ltd. was hired by the Canadian Space Agency (CSA) to develop lunar rover prototypes, including the Juno and Artemis rovers.

Building on this experience, the company produced a fully amphibious rover for operation on Earth. The ARGO J5 is the first in a family of robotic vehicles

used in Canada, Europe, Asia and South America for various applications. For example, it uses 3D underground mapping for inspections of unstable or dangerous mining environments resulting from blasting.³¹

The space industry also relies on innovation from the mining sector.

Sudbury-based mining and automation robotics firm, Deltion Innovations, is developing technology for the CSA with the potential for use on missions to the Moon and Mars. The Percussive and Rotary Multi-Purpose Tool is described as a "space-age Swiss Army Knife," which can be installed on the end of a CSA robotic manipulator arm.³²

³¹ Rover technology for space now being used on Earth, Canadian Space Agency, 2016.

³² Deltion Innovations signs contract with Canadian Space Agency, Sudbury Mining Solutions Journal, 2016.





There is a lack of opportunity to demonstrate new disruptive technologies outside of business operations. Having more “safe spaces” to test and adjust new equipment and processes would mitigate risks for firms seeking to innovate. It would also support firms in the MSS sector looking to connect their solutions with buyers.

Such approaches can boost the competitiveness of individual firms and help diffuse new technology that delivers industry-wide benefits.

The global minerals industry is looking to **new frontiers**—such as extreme climates, deep mining, offshore, and space—for exploration and development.

Mining in extreme climates includes mining above the Arctic Circle—such as in Hope Bay, Nunavut—where temperatures can reach -50°C . At the other extreme, ultra-deep underground mines—such as the Kidd Mine in Timmins, Ontario—can reach temperatures of 55°C . Offshore mining relates to the exploration and mining of minerals beyond the coastline, in the sea, or in the seabed. Space mining refers to the use of raw materials from asteroids or planetary bodies.

Nascent industries rely on continuous innovation, and the space sector is one of Canada’s most R&D intensive. Like traditional mining, it is subject to large capital costs

and long timelines to develop projects. Mining in northern, remote, and isolated communities and in space face common challenges related to exploration, infrastructure development, and operating in harsh and remote environments. The minerals sector is taking advantage of space solutions such as robotics, remote sensing, and aerial and earth observation technologies to create safer, cleaner and more efficient operations.

Technologies for mining in extreme climates and offshore are being developed, and mining in space may be decades away. Nevertheless, the equipment and methods being developed for these new frontiers can help today’s mining industry improve productivity and lower costs.

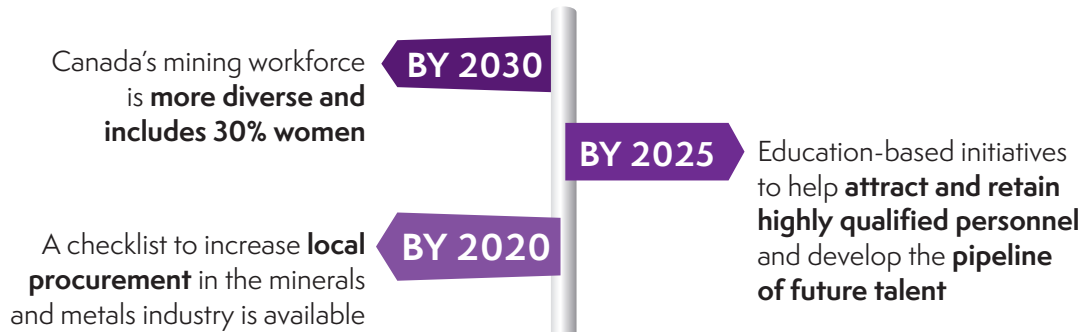
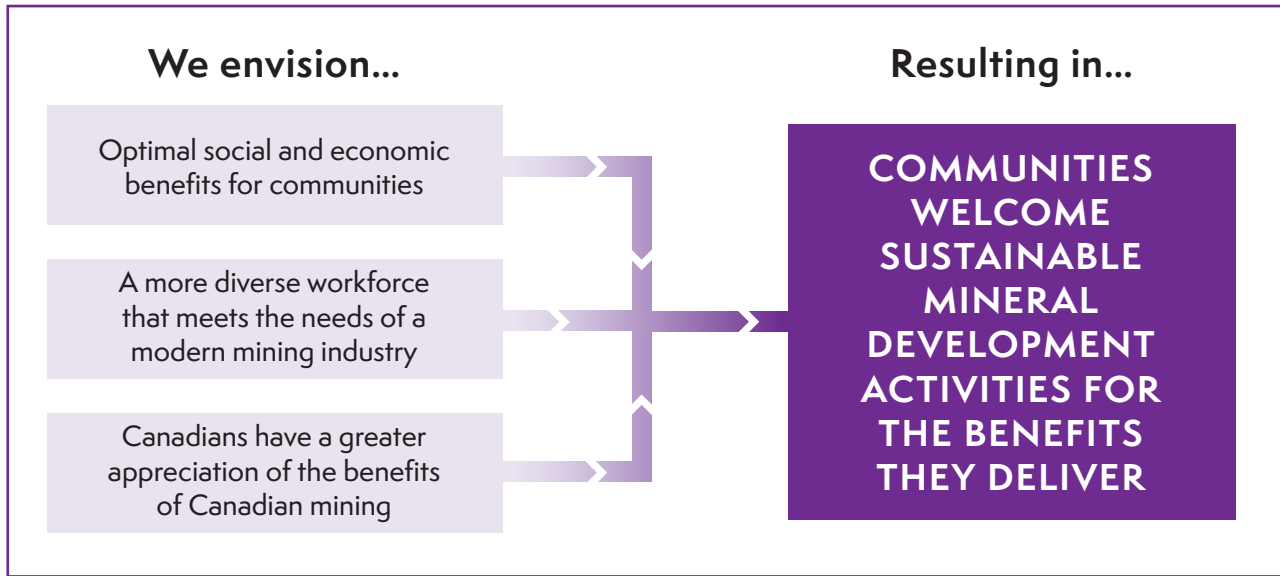
Other economies such as the United States, Luxembourg, and Australia are taking steps to establish themselves as early movers in space mining. This can help attract capital and talent, and facilitate the success of private companies in this new market.

Early action from Canada regarding mining new frontiers would demonstrate leadership, signal that Canada welcomes innovation and investment, and support the transfer of technology between sectors.





COMMUNITIES





AREAS FOR ACTION

COMMUNITY READINESS

Provincial and territorial governments and industry should consider ways to formally incorporate planning and engagement with communities at the early stages of project development.

The federal, provincial and territorial governments should help build capacity and support community readiness in areas such as governance, decision-making, employment and business readiness. Support should also mitigate the social impacts that mineral development activities have on communities.

MINERAL LITERACY

Industry, the federal, provincial and territorial governments and other stakeholders should develop and deliver an information campaign to: shine a light on Canada's sustainable, high-technology minerals industry; build community support for sustainable mineral development projects; and showcase mining as an excellent career choice.

HUMAN RESOURCES

The federal, provincial and territorial governments, with partners and stakeholders, should develop and deploy strategies to increase the diversity of the mining labour force to include more Indigenous Peoples, women, and immigrants.

The federal, provincial and territorial governments, with partners and stakeholders, should collaborate to develop strategies to address structural human resources challenges. This could include efforts to attract new workers, re-skill and re-train existing workers for an increasingly high-technology industry, and develop strategies to retain skilled labour during economic downturns.





TODAY

Mining projects often have a significant presence in communities and regions. Their lifecycle can span decades from pre-exploration to mine closure, and they can cost upwards of a billion dollars to build and operate. Often situated close to Indigenous, northern, remote, and isolated communities, these projects can drive community development by bringing socio-economic benefits such as employment, training, procurement and business and infrastructure development.

Communities that host mineral development projects—including Indigenous communities—expect to share in the benefits, while having confidence that proper social and environmental protections are in place. As an integral part of the mineral development ecosystem, communities can actively participate with companies to improve and advance sustainable projects. When engaged by industry at an early stage, they can provide local knowledge and help plan solutions for the social and environmental impacts of development.

Good community relations help companies build public trust, which can help advance projects and mitigate risks associated with cost and reputation, while helping realize a return on investment.

Community readiness refers to the capacity of communities to take advantage of resource development opportunities. The ability of communities to make informed decisions and participate in the planning for the impacts of projects is critical. However, not all communities have the governance structures or the legal, technical and other expertise required to make informed decisions regarding sustainable mineral development. This, along with a lack of skills and education, business networks, and infrastructure can limit the ability of some communities to fully realize the benefits of local projects.

Mines have a defined life in terms of exploration, construction and operation. Proper planning can ensure that communities experience sustainable benefits long after production stops. For example, mine closure and reclamation activities require ongoing positions for engineers, technicians, trades people and site supervisors that can be filled by community members. Local companies that provide services and supplies to mining operations can diversify their offerings to serve other industries.

MINING JOBS ARE GOOD JOBS

Providing **incomes** that are **SIGNIFICANTLY HIGHER** than the all-industry average in Canada³³



The minerals sector **directly and indirectly** accounts for **634,000 JOBS** throughout the country

Indigenous Peoples account for **~12%** of the mining labour force (**7,600 jobs**)*. It is the **SECOND** highest **private sector employer** of Indigenous Peoples by proportion



*Excludes downstream activities

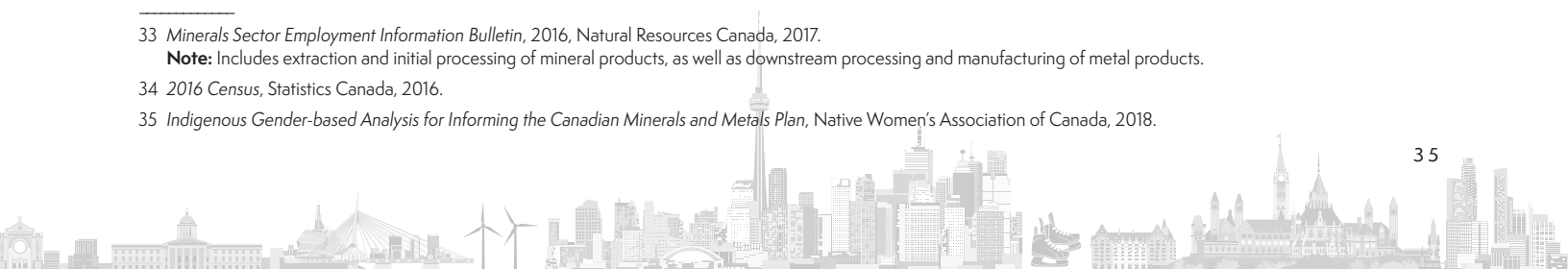
Canada's mining industry faces a **diversity challenge**. Women make up just 14% of the mining labour force (compared to 48% for all industries), and immigrants account for just 7% (compared to 23% for all industries).³⁴ Indigenous workers account for 12% of the mining labour force (compared to 4% of all industries), and research suggests that Indigenous women face additional barriers to participating in the industry.³⁵

³³ *Minerals Sector Employment Information Bulletin*, 2016, Natural Resources Canada, 2017.

Note: Includes extraction and initial processing of mineral products, as well as downstream processing and manufacturing of metal products.

³⁴ *2016 Census*, Statistics Canada, 2016.

³⁵ *Indigenous Gender-based Analysis for Informing the Canadian Minerals and Metals Plan*, Native Women's Association of Canada, 2018.





Women are underrepresented in the mining workforce, even compared to other predominantly male sectors such as utilities and manufacturing. In scientific, technical, engineering and mathematics-related fields, 21% of Canada's professional and physical science occupations are held by women; in the mining industry, women represent only 16%.³⁶

THE BUSINESS CASE FOR MORE WOMEN IN MINING

Increased gender diversity in organizations is linked to better business results. A study of almost 22,000 firms across the globe has shown that a company with 30% women leaders can add up to six percentage points to its net margin, compared to other companies in the same industry. Other studies show that companies with mixed gender boards of directors financially out-perform those with all-male boards,³⁷ and that gender balance on boards brings greater stability throughout market cycles.³⁸ Research also suggests that more women in mining jobs improves health and safety outcomes, and reduces wear and tear on equipment and related costs.³⁹

Companies that lack diversity miss out on hiring some of the best talent and building diverse organizational skills sets.

Increasing Indigenous employment can help close socio-economic gaps and increase their participation in natural resource development by acquiring new skills and business opportunities, earning higher incomes, and supporting more economically resilient communities.

Mining also faces significant labour supply challenges. The Mining Industry Human Resources Council projects that employers may need to hire up to 135,000 workers over the next 10 years.⁴⁰ Particular challenges exist for filling skilled, technical- and science-related positions. This is largely a result of an aging workforce, the

challenge of attracting workers to remote operations, and the fact that mining is a cyclical industry that is subject to commodity prices and other global economic factors.

Companies and workers need to continuously adapt to new conditions resulting from the adoption of innovation. New and emerging technologies such as AI and automation hold great promise for increasing mining efficiency and bridging the labour supply gap, but also raise questions about their effect on skills requirements, workers and communities.

³⁶ *Canadian Mining Labour Market Outlook 2019*, Mining Industry Human Resources Council, 2018.

³⁷ *Welcoming to Women: An Action Plan for Canada's Mining Employers*, Women in Mining Canada, 2016.

³⁸ Credit Suisse Research Institute, 2012.

³⁹ *Welcoming to Women: An Action Plan for Canada's Mining Employers*, Women in Mining Canada, 2016.

⁴⁰ *Canadian Mining Labour Market Outlook 2019*, Mining Industry Human Resources Council, 2018.





CASE STUDY NWT'S REDI PROGRAM



The Northwest Territories' Resources and Energy Development Information program (REDI) aims to increase understanding and awareness about the territories' resources and how they can be developed. It provides information related to mineral exploration and mining, geoscience, environmental protection, land claims, Indigenous affairs, and other areas.

The program is delivered at open-house events, online, and in classrooms for students.

REDI supports the Government of the Northwest Territories' commitment that residents have meaningful opportunities to participate in the assessment of potential benefits and risks associated with resource development.

"It is essential that residents have the information they need to be a part of the engagements that will ensure these resources are used safely and sustainably."

— WALLY SCHUMANN, MINISTER OF
INDUSTRY, TOURISM AND INVESTMENT

Greater awareness and understanding about mining—sometimes referred to as “mineral literacy”—can facilitate community support and community readiness, and attract investment and talent for mining-related jobs.

Research shows that Canadians across the country have a favourable impression of mining, and believe that it is good for the economy and provides opportunities for remote communities and young Canadians.⁴¹ Research also shows that Canadians are not aware of the strong safety and environmental standards, or the employment opportunities in the minerals sector.⁴²

Building mineral literacy would also underscore that Canadians rely on minerals and metals daily, and that they are key to our quality of life.

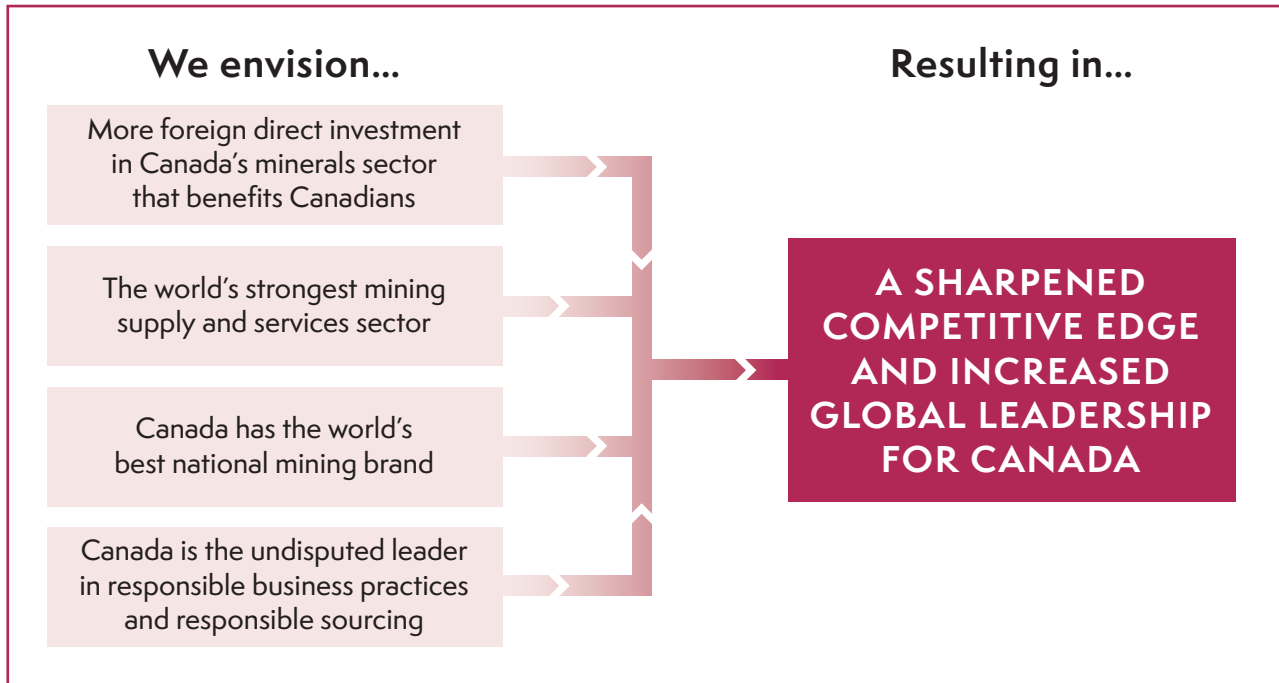
⁴¹ *Perceptions of Mining in Canada*; Bruce Anderson, Abacus Data, 2016.

⁴² *Barriers and Opportunities for Women's Employment in Natural Resources Industries in Canada*, Dr. Bipasha Baruah, 2018.





GLOBAL LEADERSHIP



Responsible resource governance solutions are promoted at home and abroad to build a more stable and predictable global mining environment

BY 2025

Canada's **minerals and metals brand** is unveiled

BY 2020

BY 2020

A joint government-industry **strategy to support the success of Canadian mining supply and services** companies is in place





AREAS FOR ACTION

CANADA BRAND FOR MINING

The federal, provincial and territorial governments, industry and partners should work together to establish a Canada Brand for Mining. This initiative should include clear guidance for stakeholders to use the brand, and strategies to leverage the brand at global trade and investment events.

INCREASING MINERALS TRADE AND INVESTMENT

The federal government should establish a minerals trade and investment office to support sector-wide minerals trade and investment. This would bring together expertise, align resources, realize synergies across existing federal, provincial and territorial programs and organizations, and increase the impact of promotional efforts.

RESPONSIBLE BUSINESS CONDUCT (RBC)

The federal, provincial and territorial governments, industry and non-governmental organizations (NGOs) should develop an RBC strategy for mining that advances Canadian leadership. It should be supported with tools and training for junior and mid-tier companies to help build their RBC capacity, as well as resources to help emerging mining jurisdictions strengthen governance regimes.

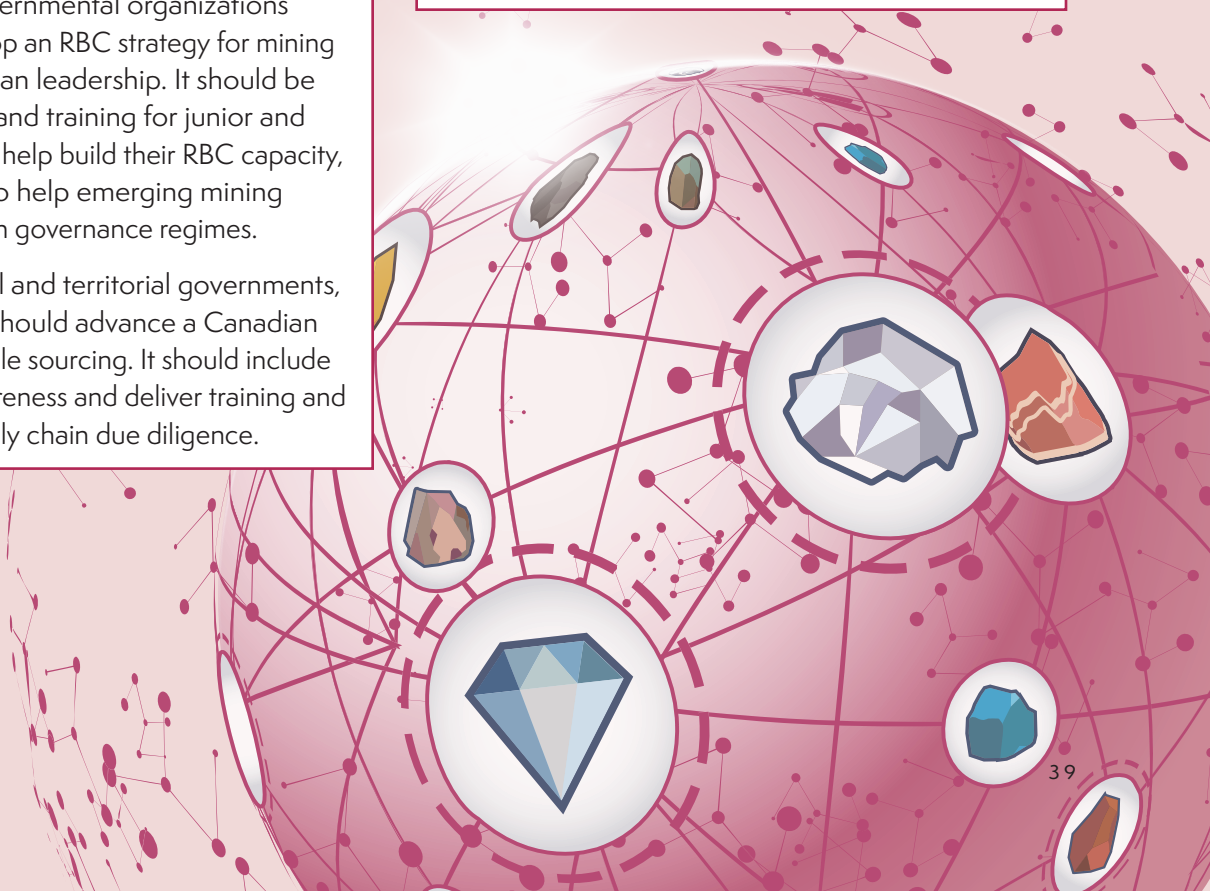
The federal, provincial and territorial governments, NGOs, and industry should advance a Canadian approach to responsible sourcing. It should include measures to raise awareness and deliver training and best practices on supply chain due diligence.

SUPPORTING THE SUCCESS OF THE MINING SUPPLY AND SERVICES SECTOR

Industry and federal, provincial and territorial export promotion agencies should develop new programs to help MSS companies create export strategies to penetrate global markets. This should include efforts to realize the potential of women-led and Indigenous businesses.

Industry and trade development and promotion agencies should leverage their respective expertise and resources to establish a unified front to help Canadian firms win new business. Efforts should include providing opportunities for business-to-business engagement and connecting companies with buyers.

Industry should cultivate and leverage linkages with complementary high-technology industrial hubs in areas such as AI, automation, and blockchain. Industry should continue to build on the Cleantech in Mining Action Plan, where proven cutting-edge Canadian cleantech companies are encouraged to pursue opportunities in the mining industry.





TODAY

Canadians can be proud of their global minerals industry that creates opportunities in more than 100 countries. Canada boasts the industry's best exploration firms and a capital market that is home to more than half of the world's publicly traded mining companies. A growing MSS sector with globally recognized innovation clusters in Sudbury, Val-d'Or, the Greater Toronto Area and elsewhere are exporting leading technologies that make mining greener, safer and more sustainable. These solutions and products are key for the evolving global economy.

Canada expects companies operating abroad to respect human rights and all applicable laws, and to ensure that their operations bring social, environmental and economic benefit to local communities. Canada is a global leader in RBC, and works internationally to promote sustainable mining and to contribute to international efforts to increase transparency and deter corruption in the extractives sector.

Canadian firms are industry leaders. The Mining Association of Canada's Towards Sustainable Mining protects the health and safety of employees, contractors and communities, and helps ensure that mining benefits local communities. The Prospectors and Developers Association of Canada's e3 Plus helps companies exploring for minerals improve their social, environmental, health and safety performance.

There is an opportunity to translate Canada's strong reputation for sustainable mining and RBC into increased investment and enhanced market access for Canadian products and goods and services.

CASE STUDY AUSTRALIA'S MINING BRAND



The Australian mining industry and government have built a mining brand that reflects a reputation for boldness, hardiness, and innovation—and which drives new trade and investment opportunities.

Company promotional campaigns, such as BHP Billiton's 'Think Big', reinforce the brand by highlighting mining's importance to the economy and communities.

Australia has also branded its world-class Mining Equipment, Technology and Services sector (METS) through Austmine (an industry association) and METS Ignited (an industry-led, government-funded, Growth Centre for the sector).

"Opportunities for the sector to band together and innovate are vital to the growth of the sector"

— METS IGNITED CEO RIC GROS

Foreign Direct Investment (FDI) is critical to the success of Canadian mining. It provides capital for natural resource projects and infrastructure; helps diffuse technology, knowledge and intellectual property; increases innovation through competition; and links domestic firms to global value chains.

Canada is a safe place for FDI. *The Mining Journal* ranks it as having the lowest investment risk,⁴³ and the global industry recognizes it for overall investment attractiveness. Canada is ripe for investment, with more than 100 major minerals and metals projects planned or in construction, representing \$72 billion in potential investment,⁴⁴ with projects covering a range of mineral commodities across the country.

⁴³ *World Risk Report*, Mining Journal, 2017.

⁴⁴ These projects are currently under construction or scheduled to begin construction by 2028.

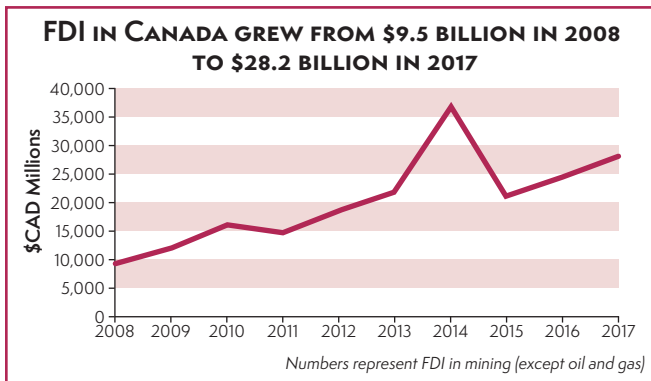
Source: *Major Projects Inventory*, Natural Resources Canada, 2018.





Information requests related to investing in Canada are fulfilled *ad hoc* across various orders of government. A lack of consistent data and coordination compounds a perception that Canada is a complex investment environment.

Canada has seen an upward trend in FDI; however, mining is a global, cyclical industry where capital is mobile. Competition among countries for investment dollars is fierce and other economies are continually looking for ways to attract more investment.



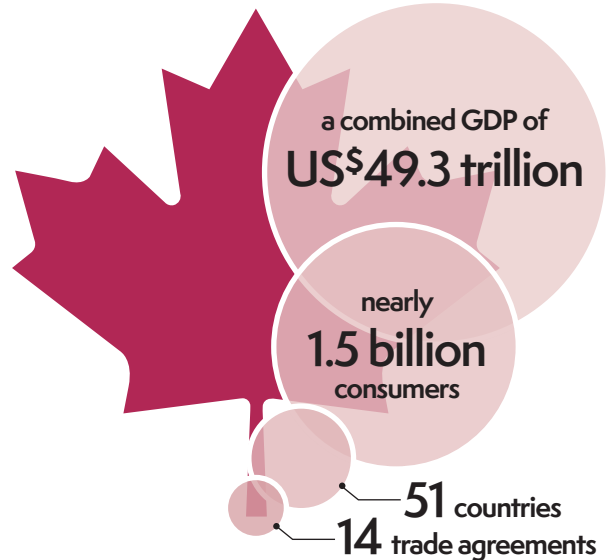
Source: Statistics Canada Table 36-10-0009-01, 2017.

Canada must take a multi-pronged approach to win investment that highlights its excellent public geoscience, exploration and MSS industries, innovation programs, financial measures, skilled workforce, and other advantages.

Market access is critical to establish Canada as a global supplier of choice for minerals and metals. Once the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) is in full force, Canada will be the only G7 nation with free trade access to the Americas, Europe and the Asia-Pacific region.

Establishing and leveraging new trade agreements is key to the success of Canadian companies. The U.S., European Union, Japan, and Korea have identified Canada as a strategic source of minerals and metals that are critical to their manufacturing sectors and national security.

After the CPTPP is in full force, Canada will have more preferential market access



Source: Canada's State of Trade: Trade and Investment Update, Global Affairs Canada, 2018.

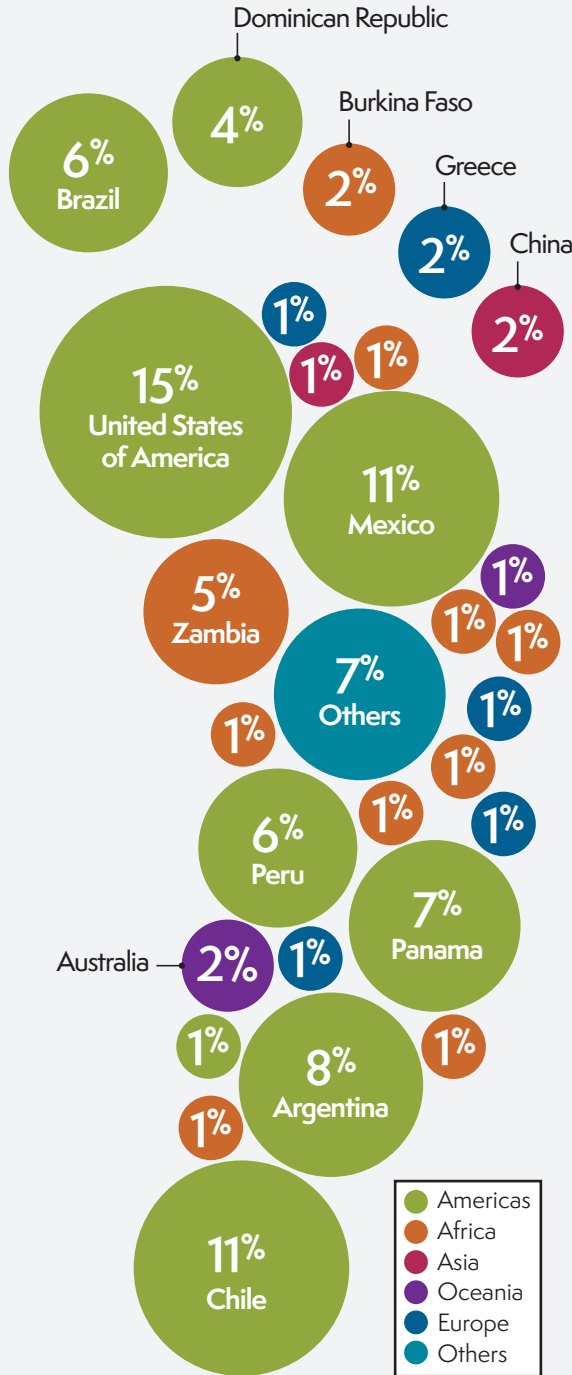
Canada's **MSS sector** includes mostly SMEs that support the entire mining supply chain. Industry looks to this sector to help explore, secure reliable power, reduce emissions, control costs, and build community support—among other reasons. Canadian firms are renowned in areas such as wastewater management, underground mining, and health and safety.





CANADIAN GLOBAL MINING FOOTPRINT

More than \$169B in mining assets in over 100 countries worldwide



Source: Natural Resources Canada, 2018.

MSS companies drive and benefit from disruptive technologies such as digitization, automation, AI, virtual reality, drone technology, and genomics. They are key to developing solutions that allow clients to add additional value for mining- and exploration-related activities.

The sector maintains a strong presence in countries where Canadian mining companies have significant assets, including the United States, Mexico, Chile, and Peru. Demand for Canadian expertise will rise as Canada’s mining presence grows in emerging markets.

The regional nature of the MSS sector and the fact that companies serve multiple industries (and may not consider themselves “mining” firms) makes it challenging to define its true size and impact. Estimates indicate that suppliers of goods and services to mining and primary processing firms directly employ 93,000 Canadians, generating up to \$13 billion in value-added GDP.⁴⁵

Stakeholders have described Canada’s MSS industry as fragmented and lacking the links to emerging technologies that could help solve global challenges. SMEs may lack resources to compete for financing and customers, penetrate global supply chains, or have the necessary networks and intellectual property protections to be globally competitive.

Some have suggested that participating in trade shows and other international events is insufficient to drive business. Instead of trying to penetrate new markets, many MSS firms follow projects and use existing relationships to secure contracts.

Canadian exploration, mining and MSS firms are often the face of Canada in emerging markets. How they operate in communities dictates the success of projects and shapes Canada’s reputation.

45 Canada’s Mining Supply and Services Ecosystem and Exports, PwC, 2019.





RBC includes taking steps to minimize and mitigate adverse effects on local communities and the environment. It includes ensuring that supply chains for minerals extraction, processing and trade respect human rights and labour relations—even in areas where these are poorly enforced.

CASE STUDY RBC = A CANADIAN ADVANTAGE



Cobalt is in increasing demand for its use in rechargeable batteries for electric vehicles and electronics. Canada—as the world’s fourth-largest producer—offers the advantage of providing the cobalt and expertise that results from RBC and a stable political environment.

For example, Vale has agreed to sell cobalt from its Voisey’s Bay mine in Newfoundland and Labrador to two Canadian companies seeking a stable supply—Wheaton Precious Metals and Cobalt 27.

Toronto-based Cobalt Blockchain and DLT Labs announced a joint venture to “develop and deploy a new platform based on international blockchain standards.” This will help companies trace the provenance and movement of minerals and metals through the entire supply chain, and demonstrate that their products are conflict-free and responsibly sourced.⁴⁶

Manufacturers and consumers increasingly expect businesses to demonstrate supply chain integrity and transparency, and Canadian firms are active participants in the international effort on responsible sourcing.

RBC is critical to Canada’s reputation for sustainable mining. The Canadian industry is a globally recognized leader in corporate social responsibility, but constant effort and due diligence are required. In particular, firms operating in fragile states or involving conflict minerals (e.g. cobalt, gold) can face additional challenges.

Canada’s national brand is the seventh most valuable in the world.⁴⁷ This global reputation serves as a competitive advantage for Canadian companies across industries.

Canada’s minerals and metals industry enjoys a hard-earned image as an honest broker, a producer of high-quality products, and a good place to invest. It is primed to meet growing demand for the minerals and metals required for clean technology applications—such as batteries for electric vehicles, solar panels, and wind turbines.

A Canada Brand for Mining that is built upon Canadian values and principles—in areas such as sustainable development, RBC, and partnership with communities and Indigenous Peoples, as well as its mineral endowment and expertise—could be more clearly defined and leveraged to increase Canadian competitiveness.

Such a brand could complement efforts that individual provinces and territories undertake to highlight the benefits of doing business in their respective jurisdictions.

⁴⁶ Mineral supply chain to be transformed by Cobalt Blockchain and DLT Labs, Cision, 2018.

⁴⁷ Nation Brands 2018, Brand Finance, 2018.





ANNEX A

CMMP – LIST OF ABBREVIATIONS

(in order of appearance)

GDP	Gross Domestic Product
AI	Artificial Intelligence
SME	Small- and Medium-Sized Enterprises
TSX	Toronto Stock Exchange
UN	United Nations
NOAMI	National Orphaned / Abandoned Mines Initiative
R&D	Research and Development
GHG	Greenhouse Gas
CIPEC	Canadian Industry Partnership for Energy Conservation
BC	British Columbia
SMR	Small Modular Reactor
CMIC	Canada Mining Innovation Council
CO₂	Carbon Dioxide
ICP	Institutional Control Program
G7	The Group of Seven
CEMI	Centre for Excellence in Mining Innovation
MSS	Mining Supply and Services
CSA	Canadian Space Agency
3D	Three-Dimensional
REDI	Resources and Energy Development Information
RBC	Responsible Business Conduct
NGO	Non-Governmental Organizations
METS	Mining Equipment, Technology and Services Sector
FDI	Foreign Direct Investment
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
MSPR	Mining Sector Performance Report





ANNEX B

MANDATE TO DEVELOP THE CANADIAN MINERALS AND METALS PLAN

In August 2017, Canada’s federal, provincial and territorial ministers responsible for mining called for a Canadian Minerals and Metals Plan to support industry competitiveness, solidify Canada’s position as a global mining leader, and to lay the foundation for lasting success at home and abroad.

Ministers directed that the Plan should be a shared vision—developed with federal, provincial, and territorial ministers, Indigenous Peoples, industry and stakeholders, and that it include an investment strategy for Canada’s minerals and metals industry.

The Energy and Mines Ministers’ Conference is an annual gathering of federal, provincial and territorial ministers responsible for energy and mining portfolios. At these meetings, ministers discuss shared priorities for collaborative action to advance energy and mining development across the country. Ministers may choose to use the Conference to review the Plan’s progress and consider additional actions.





ANNEX C

THE MINING SECTOR PERFORMANCE REPORT

The 2019 edition of the Mining Sector Performance Report (MSPR) will examine the economic, social, and environmental performance of the Canadian minerals and metals industry from 2008 to 2017. It will benefit from insight, review, and comments from a multi-stakeholder external advisory committee, the provinces and territories, industry associations, and industry members.

The MSPR is presented to federal, provincial, and territorial Mines Ministers every three years and has the following objectives:

1. To provide Canadians with a common understanding of the sector's performance based on credible and reliable data;
2. To identify areas where improvements have taken place and where progress is needed; and
3. To inform the development of priorities for collaborative work between federal-provincial/territorial governments.



