THE CANADIAN MINERALS AND METALS PLAN

Photo credit: Teck Resources

Mining Ideas for the Canadian Minerals and Metals Plan:

A Discussion Paper

Contents

A. PREFACE

Photo credit: Diavik Diamond Mines Inc., Rio Tinto PLC

This discussion paper was prepared by the Intergovernmental Working Group on the Mineral Industry on behalf of Canada's Ministers responsible for mining. Its purpose is to elicit public discussion and comments to assist federal-provincial/territorial officials in the preparation of a Canadian Minerals and Metals Plan (the Plan). The structure of this document and its contents—particularly the potential areas of focus—are not meant to reflect the final elements of the Plan, which will take into account comments received on this paper and feedback received through other engagement activities. The Plan will respect the roles and responsibilities of each government, as well as their priorities.

Members of the Intergovernmental Working Group on the Mineral Industry thank you for your interest in the future of the Canadian minerals and metals industry.

B. INTRODUCTION

Photo credit: Detour Gold Corporation

Canada needs mining

Minerals and metals contribute to Canadians' lives every day. They are the building blocks of our modern society and provide key ingredients for buildings, vehicles, transportation networks and food production. They are in countless consumer products that we rely upon—from toothpaste to bicycles to electronics. Clean technologies that are vital to a cleaner, more sustainable world, as well as computers, smartphones and medical instruments, all require minerals and metals.

Canada is a large landmass with a rich mineral endowment. Hundreds of thousands of Canadians from across the country have used their knowledge, skills and entrepreneurship to build an industry that is among the world's largest producers of minerals and metals. In 2016, some 200 mines and 7,000 quarries produced more than 60 minerals and metals worth $41 billion.[1]

Canada ranks in the top five producing countries for 13 major minerals and metals. We are:

- First in potash;
- Second in uranium and niobium;
- Third in nickel, cobalt, aluminum and platinum group metals; and
- Fifth in gold and diamonds.

Mining is a general term that encompasses a range of activities, including mineral exploration, mineral development, mine production, mineral processing, mine site reclamation and much more (see sidebar on page 6). These activities contribute socio-economic benefits—be they exploration and mining in northern, remote or isolated communities, or legal and financial transactions taking place in urban centres such as Vancouver, Toronto and Montreal.

We Want Your Ideas

Canada is a recognized leading mining nation with a strong domestic sector and a significant international presence. The minerals and metals industry is global, dynamic and highly competitive.

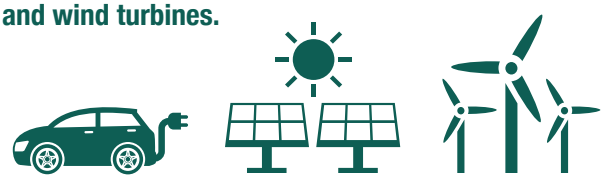
Canada must take steps to cement its status as a global mining leader, and to ensure that the industry continues to contribute to prosperity for Canadians.

Canada's federal, provincial and territorial governments need your ideas to inform a **Canadian Minerals and Metals Plan** that will help us achieve our goals (see page 13 for more details).

This discussion paper is a starting point. It provides context, possible areas of focus and asks questions on how we can strengthen the minerals and metals industry. So tell us what you think.

CLEAN ENERGY APPLICATIONS
Minerals are enablers

Canada is primed to respond to growing demand for commodities required in clean energy technologies. The country is a key global producer of copper, nickel, and cobalt, and hosts advanced mineral projects for rare earth elements, lithium, and graphite. These commodities are crucial in the production of solar cells, high-density batteries, and wind turbines.



[1] Data include mineral shipments by Canadian producers from Natural Resources Canada's Annual Census of Mines, Quarries and Sand Pits and Statistics Canada's Coal Monthly Survey, and reflect 2015 actual values and 2016 preliminary estimates in Canadian dollars.

A pan-Canadian Industry

If you took a mining tour of Canada, you could start in the Yukon to experience the latest gold rush, and then travel to the Northwest Territories where diamonds shine (it is the world's third largest producer of diamonds by value). In Nunavut, gold and iron ore mining provide a glimpse of the mineral potential of the territory. Heading to Newfoundland and Labrador, you would find significant iron ore and nickel. New Brunswick would highlight its smelting capacity, Prince Edward Island its quarrying operations, and Nova Scotia would reveal zinc and a resurgent gold mining industry. In Quebec you would see the most diversified mining industry in Canada, which includes products such as iron ore, zinc, gold and diamonds. Ontario—the largest minerals and metals producer in Canada—counts gold, copper and nickel as its main products, while Manitoba is the top Canadian producer of zinc. In Saskatchewan, you would enter a world-leading potash and uranium mining area, while Alberta produces metallurgical coal (an irreplaceable ingredient for steel making). The same "Met coal" is the top product of British Columbia, and the province is Canada's largest producer of copper.

Ports in British Columbia are a major gateway to get Canadian minerals and metals to and from Asian markets. Ports in Quebec and Atlantic Canada serve the same purpose for European and South American markets, and ports on the Great Lakes, railways and roads serve the U.S. market.

The Minerals and Metals Industry

The industry is more than just mines. It is a community of Canadians employed in a range of activities, such as:

- public geoscience
- exploration
- community engagement and consultation
- environmental permitting and monitoring
- health and safety
- land use planning
- financing and investment
- mine construction and operation
- technological innovation
- services and equipment supply
- the restoration of former mine sites
- processing and refining

Mining-related activity takes place across the country

British Columbia

- **Elk Valley** (metallurgical coal)
- **Kitimat** (aluminum)
- **Northern BC** (copper, gold, molybdenum, metallurgical coal)
- **Southern BC** (copper, gold, molybdenum)
- **Vancouver** (exploration, mine financing, allied industries)
- **Trail** (lead, zinc)

Alberta

- **Alberta** (coal)

Saskatchewan

- **Northern Saskatchewan** (uranium, gold)
- **Southern Saskatchewan** (potash, coal)

Manitoba

- **Northern Manitoba** (nickel, cobalt, gold)
- **Flin Flon** (copper, zinc, gold)

Ontario

- **Northern Ontario** (gold, palladium, platinum, copper, zinc, diamonds)
- **Sudbury** (nickel, copper, cobalt, allied industries)
- **Timmins** (gold, silver)
- **Toronto and southern Ontario** (salt, uranium refining, exploration and mine financing, allied industries)

Quebec

- **Abitibi and James Bay Region** (gold, copper, zinc, diamonds)
- **Rouyn-Norando and Val-d'Or** (gold, copper, silver, zinc)
- **Havre St. Pierre and Sorel-Tracy** (titanium)
- **Montreal and area** (metal smelting and refining, allied industries)
- **Northern Quebec** (nickel, copper, cobalt, platinum group metals)
- **Saguenay Region** (aluminum refining, niobium)
- **Schefferville and Fermont** (iron)

Newfoundland and Labrador

- **Labrador City and Wabush Area** (iron ore)
- **Voisey's Bay** (nickel, copper, cobalt))
- **Island of Newfoundland** (gold, nickel refining)

New Brunswick

- **NB** (zinc, lead, metal smelting)

Prince Edward Island

- **PEI** (peat, sand and gravel)

Nova Scotia

- **NS** (gypsum, gold, coal)

Yukon

- **Yukon** (copper, gold, silver)

Northwest Territories

- **NWT** (diamonds)

Nunavut

- **Nunavut** (gold, iron)

Source: *Facts and Figures of the Canadian Mining Industry 2016, Mining Association of Canada, 2016.*
**this map is for illustration purposes only*

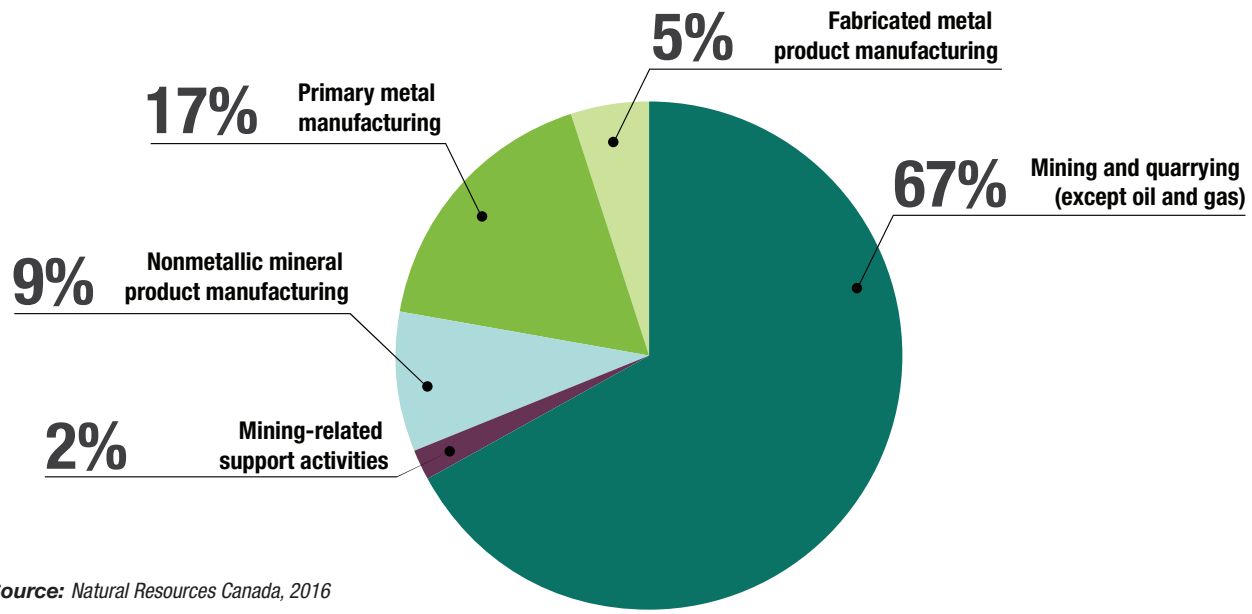
A key contributor to the economy

The minerals and metals industry is a major generator of wealth and employment for Canadians. In 2016, it directly or indirectly contributed $87 billion, or 3%, to Canada's gross domestic product.

In the same year, it provided 596,000 jobs (403,000 direct jobs) in urban, rural and remote regions of the country. This includes approximately 11,000 Indigenous workers, making it the industry with the highest proportion of Indigenous workforce in the private sector. Mining jobs are high-paying jobs. In 2016, total compensation per job in the mining and quarrying industry was $115,174—nearly double the Canadian all-industry average of $59,903.[2]

In 2016, the minerals sector invested $13.2 billion in new capital construction and in machinery and equipment, accounting for 6% of total non-residential capital investment in Canada. Two-thirds of this amount ($8.8 billion) went to mining and quarrying. Approximately one-third ($3.2 billion), went to "downstream" mineral-processing industries, including primary metal manufacturing, fabricated metal product manufacturing, and non-metallic mineral product manufacturing.

Capital expenditures for the minerals sector are spread across five sub-sectors



Source: *Natural Resources Canada, 2016*

[2] *Minerals Sector Employment Information Bulletin*, 2016, Natural Resources Canada, August 2017.
Note: Includes extraction and initial processing of mineral products, as well as downstream processing and manufacturing of metal products.

Smelting and refining are among the downstream mineral processing activities that add value to mined products. Canada counts 31 nonferrous smelters and refineries in Newfoundland and Labrador, New Brunswick, Quebec, Ontario, Manitoba, Alberta and British Columbia. They process a range of products, including nickel, copper, aluminum, gold, silver, cobalt, lead, bismuth, platinum group metals and others.

The Canadian minerals and metals industry is a global business, accounting for $89 billion—or 19%—of Canada's merchandise exports.[3] The U.S. accounts for 55% of this amount, followed by Europe at 22% and China at 5%. Publicly traded, Canadian-based companies have total mining and exploration assets of $256 billion at home and in more than 100 foreign countries across six continents.[4]

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 2016, more than $189 billion of mining equity was traded on these exchanges. Combined, the TSX and TSX Venture Exchange list more mining and mineral exploration companies than any other exchange in the world and account for the largest share of global mining equity financing.[5]

Mineral exploration companies invest heavily to discover new deposits and to advance mineral development projects. Their work focuses on "traditional" minerals and metals (gold, copper, nickel, etc.), as well those that support a greener economy, such as lithium, graphite and rare earth elements. These exploration activities leverage Canada's deep pool of expert service and equipment suppliers, including environmental consultants, community consultation advisors, and drilling contractors.[6] More than 700 exploration and mine development companies are headquartered in British Columbia alone.

Public Geoscience Supports Informed Decisions

Public geoscience broadly refers to: geological, geophysical, and geochemical data; maps; surveys; information; and knowledge provided by governments free of charge.

The availability of public geoscience data and analysis helps exploration companies make informed decisions regarding their exploration plans. These companies leverage government geoscience data to identify areas of favourable mineral potential.

Mineral exploration activities are not always successful. Having a better understanding of geological environments allows explorers to focus on areas of higher prospectivity, while reducing investment risk. The availability of public geoscience data enhances Canada's attractiveness as a destination for mineral exploration investment.

The geoscience activities of Canadian governments also generate information required for various public uses, such as studies related to land use and the environment, geohazards (e.g. earthquakes, landslides), public health, infrastructure planning, national defence, and sovereignty.

[3] Total exports include all goods leaving the country for a foreign destination. They consist of the sum of domestic exports and re-exports. Exports of imported merchandise that has been substantially enhanced in value are also included. Re-exports are goods that have previously entered Canada and are materially the same upon leaving.
[4] *Mineral Trade Information Bulletin*, 2016, Natural Resources Canada, August 2017.
[5] *TSX.com*, TMX, 2017.
[6] Natural Resources Canada based on *The Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures,* 2017.

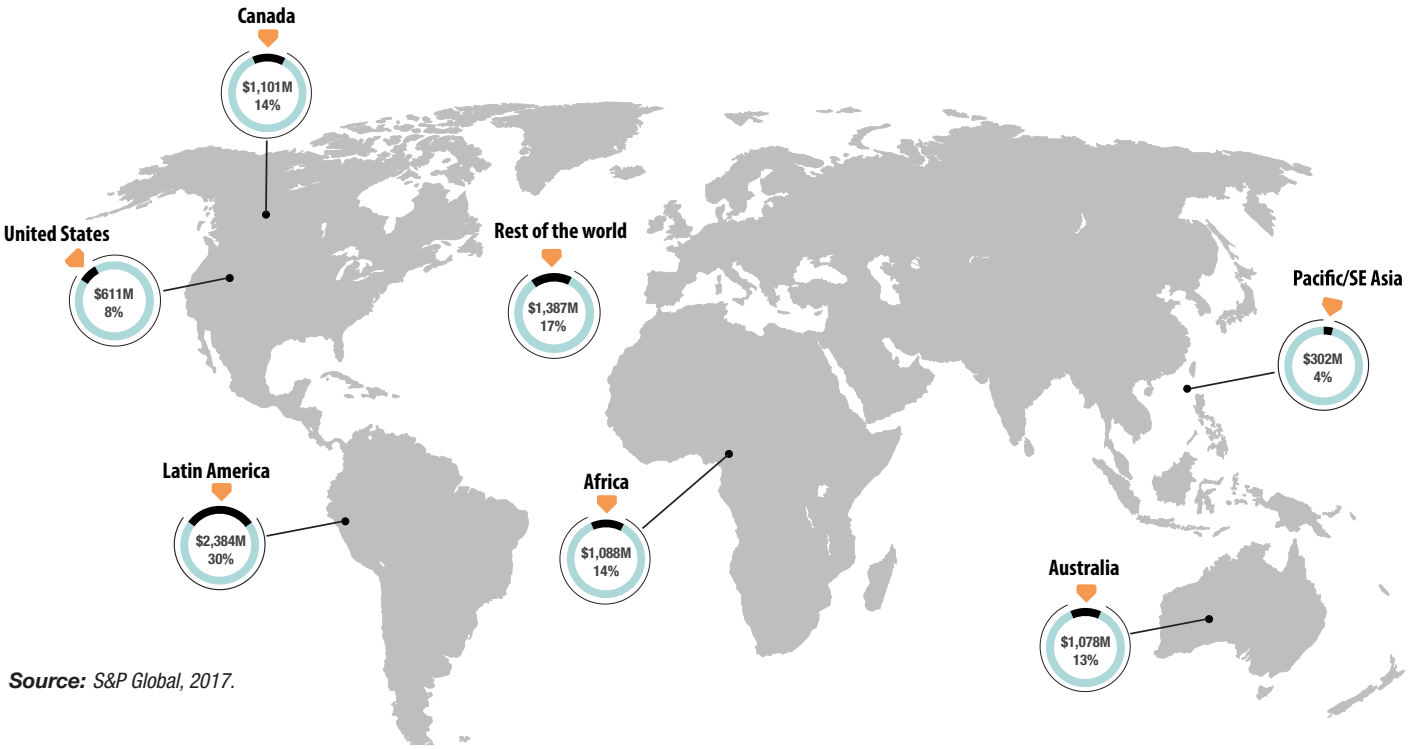
Canada's competitive position

Canada has a long and successful history of sustainable mineral development and a strong, well-earned reputation as a leading mining nation. For example, in 2016 it received the Best Country Award for international leadership in governance and for showing the most improvement in terms of attractiveness to investors.[7] It is recognized as the safest place to invest resource capital,[8] and Saskatchewan and Manitoba are ranked the top two most attractive jurisdictions for mining investment in the world, while Quebec is sixth.[9]

In the mining industry, comparisons are often made between Canada and Australia due to their similarities. Canada is ranked 10th for the size of its gross domestic product and Australia is ranked 14th.[10] Both countries have open economies with rich mineral endowments, strong public geoscience programs, and minerals and metals industries that remain a significant driver of economic activity. Both are home to a large junior mining sector, major mining companies, and mining service industries—all of which maintain a significant global presence. Geographic demand patterns for commodities including coal and iron have shifted towards Asia—and notably China. This favours Australia with its large-scale deposits near tidewater and its proximity to this key market.

The international investment community closely monitors developments in each country to determine the best location in which to allocate capital. Based on a compilation of publicly announced exploration budgets, Canada is the top destination for mineral exploration investment among countries. In 2017, Canada attracted 14% of the exploration budgets of firms, just ahead of Australia at 13%.

More mineral investment dollars come to Canada than any other country (1,525 companies budgeting $7.95 billion)



Source: *S&P Global, 2017.*

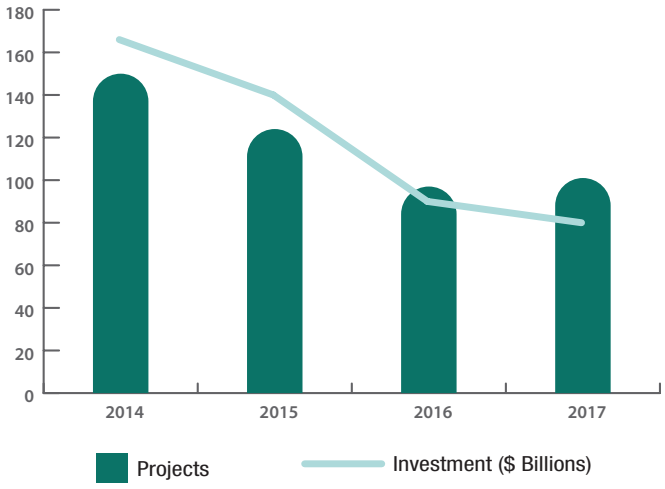
[7] *Mines and Money London*, 2016.
[8] *World Risk Report*, Mining Journal, 2017.
[9] *Annual Survey of Mining Companies: 2016*, Fraser Institute.
[10] *World Development Indicators database*, World Bank, April 2017.

But Australia is not our only competitor. A closer look reveals that while Canadian firms receive a greater share of exploration budgets than any other country, this share has declined in recent years. Over the same time, Australia's share has remained relatively flat, and the region of Latin America has gained the most.[11]

There are other indications that Canada's position as a destination for mineral investment is being eroded. For instance, Canadian reserves of selected metals have been trending downwards and the country has experienced a decline in the production volumes of key commodities.[12] The number of mining-related projects (mine constructions, redevelopments, expansions and processing facilities) planned and under construction dropped from 150 in 2014 to 101 in 2017. The value for such projects also decreased over the same time, from $166 billion to $80 billion.

There are numerous external factors that can explain changes to investment plans and project development timelines (e.g. market conditions and the overall economic outlook). Nonetheless, this trend underscores the need to foster a mineral investment environment that supports the competitiveness of the industry and Canada's ability to attract scarce investment dollars.

The number and value of major mining projects planned and under construction in Canada has decreased



[11] *Corporate Exploration Strategies 2017*, S&P Global, 2017.
[12] Natural Resources Canada, 2012.

The Canada Brand

Canada's leadership in mineral resource governance and sustainable development have helped build a "Canada Brand" that is recognized around the world. Leadership on social responsibility (including partnership with Indigenous peoples, relationships with local communities, and a commitment to environmental protection), unparalleled access to capital markets, innovation and expertise across the clean technology and mining services and supply chains, have all contributed to the brand.

Canada's brand is important to industry activity abroad and it supports international trade. A key component of the brand is corporate social responsibility (CSR) and the voluntary actions of companies that serve to integrate social, environmental and economic considerations into their activities. Canadian companies operating abroad are expected to respect human rights and all applicable local laws, and to meet or exceed recognized international standards for responsible business conduct.

Both the Mining Association of Canada (MAC) and the Prospectors and Developers Association of Canada (PDAC) have developed tools to help their members realize CSR abroad, and Canadian companies have demonstrated their commitment to do business responsibly (see sidebar).

Strong, trusted, and backed by a history of integrity and success, the Canada Brand provides a competitive advantage for the range of stakeholders participating in Canada's minerals and metals industry. It identifies Canada as a trusted partner and as an attractive destination for investment.

Canadian Industry Providing International Leadership

Towards Sustainable Mining is MAC's commitment to responsible mining. It is a set of tools and indicators to drive performance and ensure that key mining risks are managed responsibly at members' facilities.

The program was established in 2004 to enable mining companies to meet society's needs for minerals, metals and energy products in the most socially, economically and environmentally responsible way.

The program has been adopted by Finland, Argentina, Botswana and the Philippines. It was also included in Apple's Supplier Responsibility Standards.

PDAC's **e3 Plus** helps companies exploring for minerals improve their social, environmental, and health and safety performance. It was launched in 2009 by PDAC as its signature corporate social responsibility initiative.

The original incarnation of e3 Plus was simply e3, which stood for Excellence in Environmental Exploration. e3 was launched in 2003 and was quickly supplemented by the creation of toolkits designed to improve social and health and safety performance—the "plus" in e3 Plus.

C. THE CANADIAN MINERALS AND METALS PLAN

Photo credit: Dominion Diamond Corporation

Why do we need a national Plan?

In 1994, representatives from the federal, provincial and territorial governments, industry, Indigenous and environmental organizations, and labour signed the Whitehorse Mining Initiative (WMI). It was a common vision of a "socially, economically, and environmentally sustainable and prosperous mining industry, underpinned by political and community consensus." The WMI established Canada as the leader in sustainable mineral development.

In order to remain a global mining leader, Canada must adopt a new vision, as well as goals and actions, to foster the growth and contribution of the mining industry. It must reflect today's realities, where issues such as climate change, Indigenous participation, sustainable development, and social acceptability are key elements of a successful industry. Simply put—Canada cannot stand on past achievements. We must continually look for ways to improve our competitive position in the world and to communicate our competitive advantage to Canadians and potential partners.

This means leadership at home to promote sustainable resource development and to build and maintain a pipeline of projects. It also means leadership on the international stage to help shape global mining practices and promote Canadian values, such as sustainable development and corporate social responsibility. By building on our individual and collective success, the minerals and metals industry can make an even greater contribution to prosperity for Canadians. The Canadian Minerals and Metals Plan can help us achieve this.

What will the Plan do?

In August 2017, federal, provincial and territorial Ministers responsible for mining called for a Canadian Minerals and Metals Plan to solidify Canada's position as a global mining leader and to lay the foundation for lasting success at home and abroad. The Plan will be forward-looking. It will take into account the views of mining industry stakeholders, Indigenous partners and the public. It will recognize the sharing of responsibilities between orders of government, and it will allow each government to participate according to its needs and priorities. The Plan will include a series of specific and coordinated actions that can be pursued by federal, provincial and territorial governments to reach stated goals.

Who will contribute to the Plan?

This is a pan-Canadian plan being developed by federal, provincial and territorial governments in collaboration with partners and stakeholders, which will respect the roles of governments related to mineral resource development.

Resource ownership and management falls under the jurisdiction of the provinces and territories. Minerals, metals and other natural resources are owned and managed by the government of the province or territory where they are located. Most mining activities are regulated by the provinces or territories, and each jurisdiction has its own mining, environmental, and occupational health and safety legislation. The federal, provincial and territorial governments also have shared responsibility in a number of areas, such as taxation and the environment.

Resources on federal lands, in offshore waters and on the continental shelf are owned by the federal government, which is also responsible for uranium mining.

Some resources are located on Aboriginal treaty lands, for which modern treaty signatories have specific rights and jurisdictions related to lands and resources within those areas.

The provinces and territories have their own priorities, plans and strategies in support of their respective minerals and metals industries. The Canadian Minerals and Metals Plan will not supplant these efforts. Its aim is to encourage synergies and support existing provincial and territorial priorities, while bringing together resources from across Canada to address systemic challenges and take advantage of opportunities.

Industry will be counted on to play a key role, as will non-governmental organizations (including environmental and labour organizations), and municipalities.

Partnership with Indigenous peoples will be critical for this work. Meaningful engagement with Indigenous leaders and other representatives at workshops, roundtable events and other venues will be undertaken to capture their perspectives.

Where and when will we engage with stakeholders?

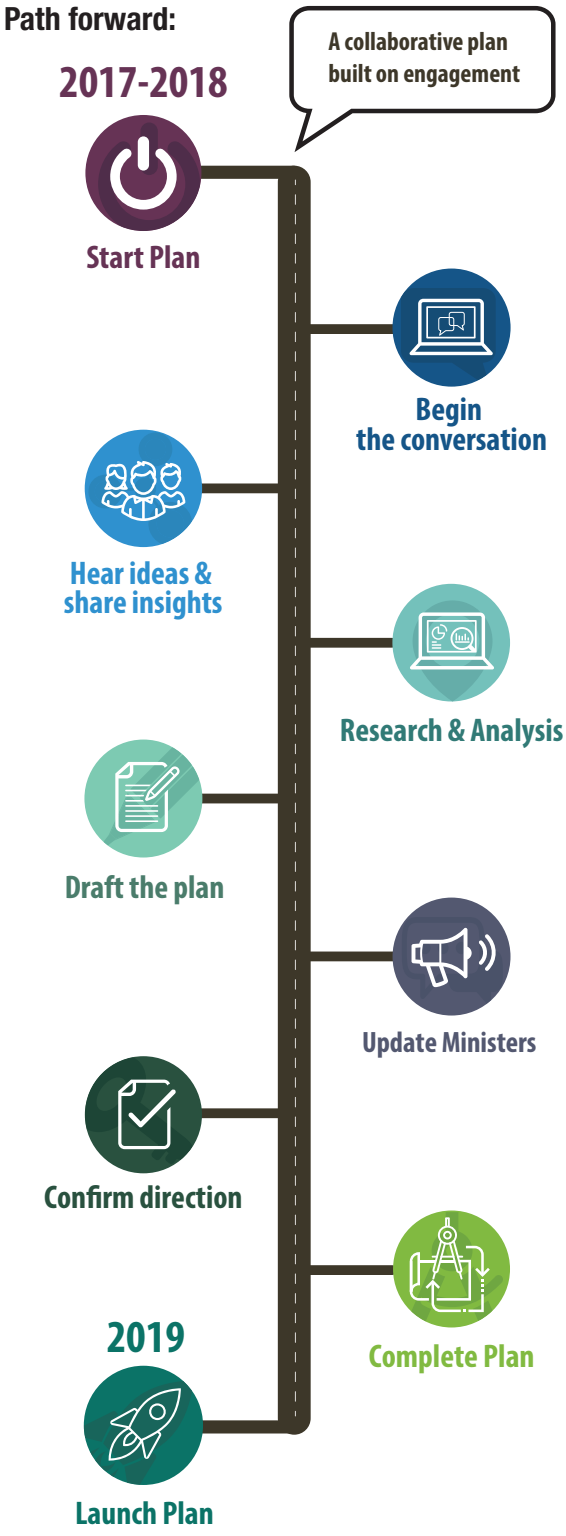
Engagement with Canadians and stakeholders is vital and we are using multiple channels to gather and share information. Each government will be able to engage with its stakeholders on a stand-alone basis or in collaboration with other governments. National and regional engagement events in all regions of the country will be considered. These could include face-to-face meetings, roundtable discussions and dedicated workshops.

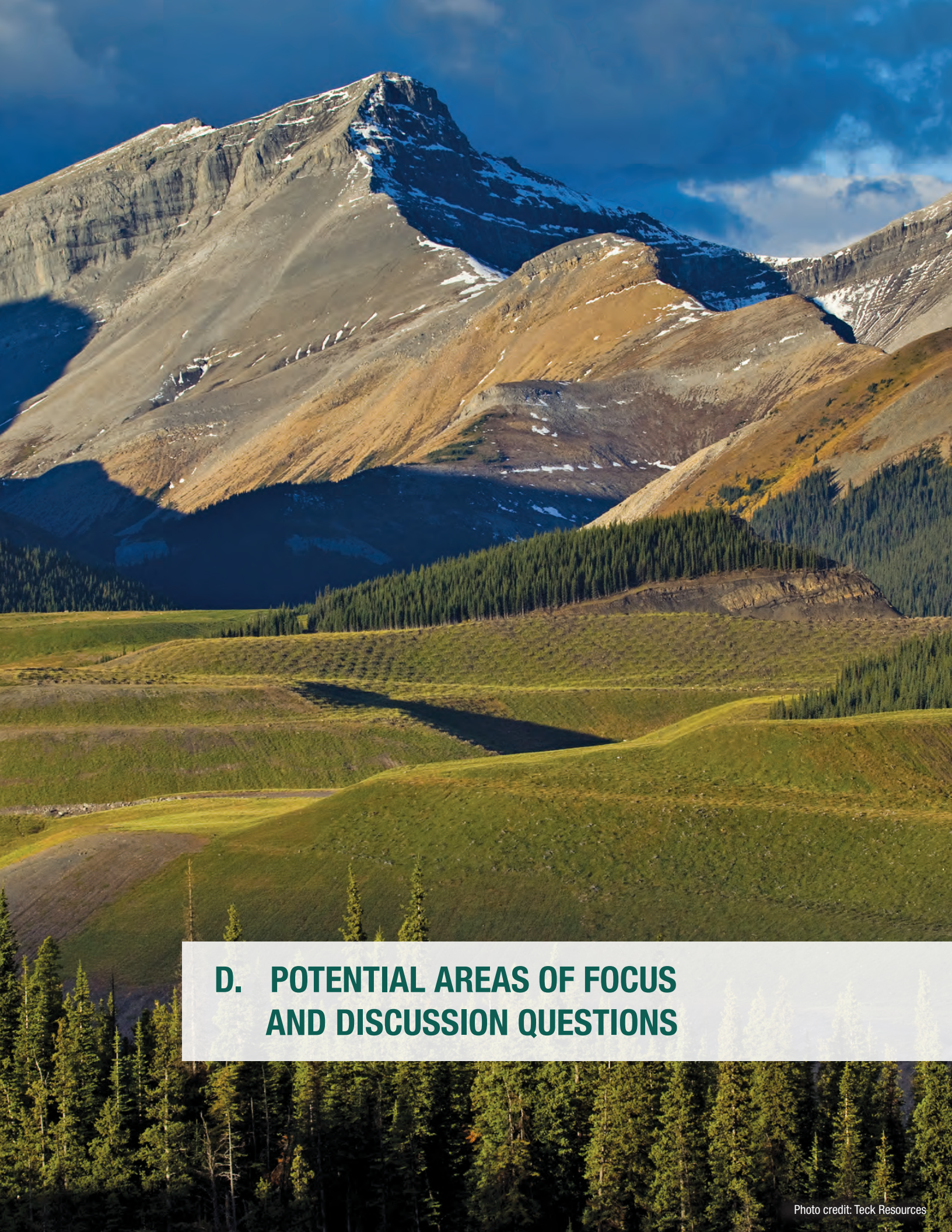
Individual Canadians and stakeholders are invited to participate through a web platform (minescanada.ca) that provides information about Canadian mining, solicits ideas for the Canadian Minerals and Metals Plan, and shows how the development of the Plan is progressing.

When will the Plan be ready?

Federal, provincial and territorial partners are seeking input from stakeholders, and this work will continue through 2018 and into 2019, when the final Plan will be released.

Path forward:





D. POTENTIAL AREAS OF FOCUS AND DISCUSSION QUESTIONS

Photo credit: Teck Resources

The goal of establishing Canada as the uncontested leading mining nation is both ambitious and achievable. To get there, we must capitalize on our advantages, such as rich and diversified mineral resources, a strong industry, world-class expertise in the public and private sectors, a focus on innovation, access to major markets, and a skilled and educated workforce.

We must also recognize areas where we can improve. Many of the challenges that Canada faces are similar to those encountered by our competitors. These include developing enabling infrastructure, innovation and clean technology adoption, providing clear and predictable regulatory regimes, community acceptance, advancing the participation of Indigenous people in natural resource development, and enhancing our global reach. These challenges present opportunities for Canada. How well we meet them will largely determine our success going forward.

We need your help

We need your ideas to inform a comprehensive Canadian Minerals and Metals Plan. We are inviting you to collaborate with us as we consider our vision and set a course to achieve it. This discussion paper is a starting point. It provides context, proposes areas of focus and asks questions on how we can strengthen the minerals and metals industry. So tell us what you think.

Yukon Resource Gateway Project

On September 2, 2017, the Government of Canada and the Yukon Government announced joint funding of $360 million for the Yukon Resource Gateway Project ($247.4 million in federal funds and $112.8 in territorial funds), with industry expected to contribute up to $108.6 million.

The Yukon Resource Gateway Project proposes upgrades to existing infrastructure in two areas of high mineral potential and active mining in Yukon.

The **Dawson Range** component of the project would include upgrades to four separate road systems. This will provide access to a significant area of mineralization in the central Yukon.

The **Nahanni Range** component involves upgrades to the existing Nahanni Range Road from its junction with the Campbell Highway to the Yukon/Northwest Territories border.

1. Potential Area of Focus: Unlocking Canada's Resource Potential

The mineral and metals industry contributes to prosperity for Canadians whether it be through mineral exploration in northern areas, mines that act as the economic engines for communities, or mineral processing facilities (smelters and refineries) that add value to mine production and provide socio-economic benefits for the communities in which they operate. That said, its full potential has not been realized. Large areas, particularly in the North, contain a diverse range of mineral deposits, but these areas are under-explored and under-developed.

Exploration is key to sustaining current and future mineral production. This activity: discovers new deposits; identifies areas for further exploration; advances existing projects; creates jobs; supports the development of communities and regions; and attracts partners, investors or buyers that enable projects to move towards production.

Mineral exploration is often conducted by small firms called "junior mining companies." In fact, Canada hosts the largest junior mining sector in the world. These companies act as project generators for larger producing companies and help fill the pipeline of future mineral production.

Governments in Canada support programs and policies that promote a competitive exploration sector. Public geoscience provides information that is made widely available for the exploration industry and others. Investments in public geoscience reduce investment risk by allowing explorers to focus their work on the areas with the highest probability of success. Federal, provincial and territorial governments invest in geoscience in their respective jurisdictions and work together to increase the overall effectiveness of geological survey efforts.

Land access for mining-related activities is an issue that directly relates to Canada's competitive position, as the availability of prospective land influences investment decisions by private companies. However, governments may decide to withdraw areas from potential mining activity for reasons related to ecological and cultural protection, or Indigenous land claim negotiations.

Federal, provincial and territorial governments leverage financial mechanisms to further support the competitiveness of the exploration industry. For example, junior mining companies do not have internally generated revenue and must rely on equity markets to raise funds. Governments provide tax credits and tax deductions to help them attract investment to finance their activities.

Infrastructure is a key element of a vibrant mining industry. It allows workers and supplies to reach production sites, delivers products to market (road, rail, port), enables communications (high-speed telecommunications), powers mines and other facilities (transmission lines), and supports local communities (all of the above).

Infrastructure also brings other socio-economic benefits, particularly in remote, isolated and northern areas. These include reducing the costs of delivering supplies, improving the viability of local businesses, strengthening partnerships with Indigenous groups, and attracting other natural resource development opportunities. However, there is a lack of infrastructure, particularly in northern, remote and isolated communities, that could enable further mineral development. This is sometimes referred to as an "infrastructure gap," and it is seen as a drag on Canada's competitiveness as a mining nation.

Closures of Canadian smelting and refining facilities over the past decades has meant that much of the value created from processing Canadian products is being captured by other economies. Further, decreased domestic processing capacity can place additional pressure on Canadian mining operations, who would benefit from a domestic processing facility purchasing its products. This may impact the business case for mining in Canada.

Challenges

Government programs and policies that support the competitiveness of mining require public funds. These resources are scarce and there are competing priorities.

Canada's mineral development potential can be dampened if promising areas are withdrawn from the land available for possible development. Clarity with regard to land access and land tenure is needed to reduce risk to investment.

Infrastructure is a high-cost asset with a lengthy return on investment. Infrastructure projects also face challenges such as securing land access, addressing stakeholder concerns, mitigating environmental impacts, and access to skilled labour—all of which can act as a disincentive to public and private investment. Increasingly, different orders of government (including Indigenous) and the private sector are pursuing public-private partnerships to share risk and the cost of infrastructure development (see sidebar on page 17).

Canada's mineral processing industry operates in a globally competitive market that is largely driven by Asian metal consumption. Proximity to domestic mines, access to scrap materials, efficient infrastructure and access to competitively priced energy sources are competitive advantages for such plants. But challenges exist. These include: changes in global demand patterns; fluctuating commodity prices; long distances and high transportation costs; and increased smelting and refining capacity by Asian and other countries who also compete for sources of mineral concentrates and scrap for recycling.

Discussion questions:

- What are the biggest challenges facing the exploration industry ?
- What else can be done to encourage mineral discoveries and advance promising projects?
- How can we mobilize public and private funds to close the "infrastructure gap" and support mineral development projects?
- What can be done to support a competitive and sustainable mineral processing industry to help ensure that benefits from value-added processing activities remain in Canada?

2. Potential Area of Focus: Igniting Innovation

Innovation is a key ingredient to the success of the mineral and metals industry. Mining involves complicated processes, the use of large, expensive machinery and equipment, and exploring extensive areas of land. Applying innovation in these areas can enhance efficiency, lower costs, and maximize extraction.

Although Canada has abundant mineral resources, producing ore bodies are depleting and mining companies are looking to increasingly remote locations and deeper deposits. Further, unlocking Canada's mineral potential requires research, development and investment in technologies suitable for cold climates. Innovation can help meet these challenges, while reducing the footprint of the industry.

Canada is a leader in mining innovation[13] and it has a number of advantages, such as a highly skilled workforce with expertise in extractive technologies and geological and biological sciences. Canada has a strong research and development system—including centres of excellence housed in universities—that provides innovative ideas and knowledge relevant to the natural resource sector, an open investment climate, and the second lowest marginal tax rate on new business investment in the G7.[14]

Innovation can include the development and adoption of clean technologies. These can be defined as products, processes or services designed to remediate or prevent environmental impacts, or that are less polluting or more resource-efficient than equivalent "normal products." Mining companies adopt clean technologies to improve efficiencies and reduce the environmental impact of mining-related activities.[15] For example, fossil fuels—particularly diesel—are the primary fuel for mining operations. The transition to cleaner diesel equipment and the adoption of electric and battery-powered equipment can improve energy efficiency, be less polluting, and result in lower maintenance costs.

Industry is Leading the Way

- Rio Tinto's Diavik Diamond Mine in the Northwest Territories is the world's largest wind-diesel hybrid power facility.
- Glencore operates a 3 megawatt wind turbine and cutting-edge storage capabilities at its Raglan nickel mine in Northern Quebec.
- SunMine in British Columbia is turning one of the world's largest lead and zinc mines into Western Canada's most significant solar project.

Artificial Intelligence (AI) is another example of innovation that has implications for mining. AI includes "machine learning," where mining equipment can perform increasingly complex tasks, including difficult and hazardous processing activities. It also involves the management and transmission of large amounts of data, and real-time business and operation decision-making.

Challenges

Mining companies face pressure to create shareholder value in the short-term, while the benefits of innovation can take a longer time to realize. Further, the costs associated with investing in innovation are significant. A single piece of machinery can cost upwards of $1 million, mining operations rely on thousands of pieces of equipment and often run 24 hours a day, and new ways of doing business require resources for skills and training. Securing financing for new or untested equipment can also be difficult. As such, mining companies may be cautious to invest in innovation.

[13] *Supporting Canada to Become a Leader in Global Mining Innovation*, the Canadian Chamber of Commerce, 2015.
[14] *Clean Technologies in Canada's Natural Resource Sectors: A Discussion Paper*, Natural Resources Canada, 2016.
[15] Ibid.

Another challenge relates to the fragmentation of the innovation ecosystem. The Canadian Chamber of Commerce estimates that there are more than 4,000 research, development and innovation programs and some 40 mining research organizations in Canada.[16] Collaboration across such a wide range of programs and stakeholders is difficult, which dampens the collective effort to develop and adopt innovative products and processes.

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

Establishing carbon pricing mechanisms, such as a carbon tax or a cap and trade program, can serve as an incentive to reduce emissions and drive innovation. However, some have raised concerns that the Canadian mining industry, considered "emissions-intensive and trade exposed," will be subject to additional costs resulting from a carbon pricing mechanism, and that operations in northern climates that rely on diesel will be disproportionately affected.

AI in Action

Goldcorp's Red Lake mine in Ontario is using IBM's Watson cognitive analytics to analyze and synthesize large amounts of information.

Watson combines geological and drilling data, drilling reports, surveys, historical information, and internal data contained in process logs, reports, and studies. Watson then integrates this data with field knowledge from geologists and engineers to determine the exploration targets most likely to be successful.

As a next stage, Goldcorp is hoping to create Canada's first all-electric underground mine by 2019 in Borden, Ontario.

Discussion questions:

- How can mining companies, research laboratories, innovation hubs, universities, government and non-governmental organizations best work together to drive innovation in the sector?
- What can industry and government do to help the mining sector invest in and adopt clean technology and innovation?
- How do we balance the benefits that emerging technologies such as AI and automation can deliver, with their potential impacts on skills requirements, workers and communities?
- How can Canada leverage its expertise in clean technology to become a world leader in sustainable mining?

[16] Supporting Canada to Become a Leader in Global Mining Innovation, the Canadian Chamber of Commerce, 2015.

3. Potential Area of Focus: Providing Regulatory Certainty

Federal, provincial and territorial environmental and regulatory regimes for mining must safeguard the interests of Canadians and have the confidence of the public. At the same time, regulatory regimes that are efficient, transparent and predictable serve as a competitive advantage that facilitate sound project planning, investment decisions and Canada's ability to get resources to market.

As per jurisdictional roles, most mining projects are subject to both federal and provincial/territorial environmental assessment (EA) processes and regulatory approvals. The federal government and the provinces and territories work together provide timely and effective assessment and regulatory approval processes that enables both orders of government to ensure their legal requirements are met.

Research shows that Canada tops its competitors (Australia, the U.S., Scandinavia and Chile) in terms of the speed of its permitting process for exploration and mining activities. Research also shows that Canada trails its competitors in terms of the transparency of its process.[17] [18] While the existing environmental and regulatory regime has protected our natural environment, continual improvements in terms of harmonization, transparency and efficiency can help unlock Canada's mineral potential.

Proposed new rules for major projects and the environment

In February 2018, the Government of Canada announced proposed legislative changes that aim to improve the rules for major projects to protect the environment, fish and waterways, and build public trust in how decisions around resource development are made.

One of the key proposed changes aims to provide greater clarity and consistency by establishing the Impact Assessment Agency of Canada (currently the Canadian Environmental Assessment Agency) to lead all federal reviews of major projects, in cooperation with provinces and territories and Indigenous jurisdictions.

Proposed changes would include:

- More transparency and certainty that decisions will be based on robust science, evidence and Indigenous traditional knowledge;
- More and earlier opportunities for meaningful participation by Indigenous peoples and the Canadian public;
- More Indigenous leadership opportunities and partnership in project review;
- Impact assessment would look at all of a project's impacts to foster sustainability, rather than only considering environmental factors;
- More coordination with provinces to support "one project one assessment" and avoid duplication; and
- More predictable and consistent timelines.

As of March 2018, the proposed Impact Assessment Act is undergoing review by Parliament. Until the proposed legislation comes into effect, existing laws and interim principles will continue to apply to projects under review.

[17] *Permit Times for Mining Exploration in 2016*, the Fraser Institute, February 2017.
[18] *2014 Ranking of Countries for Mining Investment*, Behre Dolbear, 2015.

Challenges

The regulatory framework for mining-related activities is complex and continually evolving (see sidebar on page 22). Projects require numerous permits, authorizations, and/or licences from federal and provincial/territorial institutions, and in some cases, from Indigenous-led bodies. They are required for: Indigenous land claims; land use; exploration; fiscal matters (e.g. bonding for reclamation); labour; transportation; environmental considerations; and others.

Additional challenges exist, including the ability of our regulatory regime to respond to emerging technologies and processes that can improve environmental and economic performance; ensuring that evidence-based decisions reflect the best available science and Indigenous knowledge; and creating a path for projects to proceed in partnership with Indigenous peoples and communities.

Discussion question:

- How can provinces, territories and the federal government work together to streamline a regulatory environment that supports sustainable natural resource development, while safeguarding the rights and interests of Canadians?
- How do we build a policy and regulatory framework that allows us to capitalize on opportunities such as investing in innovation?

4. Potential Area of Focus: Realizing Community Benefits and Supporting a Diverse Workforce

Mining projects are large projects with a significant presence in communities and regions. Their lifecycle can span decades from pre-exploration to closure, and they cost hundreds of millions of dollars or more to build and operate. Often situated close to northern, remote, isolated and Indigenous 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 expect to share in the benefits, while having confidence that proper social and environmental protections are in place. Good community relations can help companies build public trust, which can facilitate project development and mitigate risks associated with cost and reputation, while helping them realize a return on investment.

Modern mining operations require a range of skills. Developing and mastering these skills positions people to pursue high quality, high paying jobs and business opportunities across the natural resource and other sectors.

Mining companies can face fierce competition for employees to work at their remote operations. In situations where there is shortage of workers in surrounding communities, companies may choose to employ "fly-in/fly-out" commuters. Given that mining operations often schedule employees for two weeks on, two weeks off (or similar timeframes), they may be challenged to attract fly-in/fly-out workers who do not wish to leave their families and resident communities.

In situations where these commuters are employed by remote operations, such workers are fed and housed by mining companies, and therefore do not fully contribute to local economic development. Yet these workers have full access to local services—including social services—which may apply pressures on those communities.[19]

Restor-Action Nunavik Fund

Many former mineral exploration sites located in northern Quebec were left in need of cleanup and reclamation. This situation created an opportunity to establish partnerships with regional stakeholders so the cleanup work could go ahead and, at the same time, it created employment opportunities for the local population. The Restor-Action Nunavik Fund was thus created through funding from the Government of Quebec and the financial contributions of participating mining companies.

This initiative, which also involves the Kativik Regional Government, was instrumental in the reclamation of several mine sites and in the creation of jobs in the local communities. The Fund contributes to community readiness by reinforcing the capacities of local populations.

The participation of local communities in the cleanup of abandoned mine sites also helps foster confidence among the community in the development of mineral resources. The Fund has become a reference point in the rehabilitation of abandoned mine sites in Canada and has inspired similar initiatives in other regions of Quebec and in other provinces.

Research shows that Canadians across the country have a generally favourable impression of mining and believe that the industry is managed to higher standards of safety, environmental care and social responsibility. They also believe that mining is good for the economy and that it provides economic opportunities for remote communities and young Canadians.[20]

[19] *Strategic Vision for Mining Development in Quebec*, Government of Quebec, 2016.
[20] Perceptions of Mining in Canada; Bruce Anderson, Abacus Data, 2016.

Challenges

Achieving broad-based support for natural resources projects is a challenge. This is largely due to the sheer number of communities across Canada, the differences of opinion within communities, and the capacity of individual communities to participate in planning and regulatory processes. There are numerous stakeholders involved with decisions around mineral development who may have different interests.

Mining remains an industry that predominantly employs men, with women representing just 14% of the mining labour force.[21] Immigrants account for 13% of the mining workforce, compared to 25% of the total Canadian workforce.[22] Indigenous workers make up 5% of the mining labour force, compared to 3% in all industries.[23] Increasing Indigenous employment can support efforts to close socio-economic gaps and increase their participation in natural resource development.

Discussion questions:

- What can communities, mining companies, and governments do to ensure that the benefits of sustainable mineral development are realized for public and private interests?
- What can be done to build a skilled workforce that includes more women, Indigenous people and immigrants?

5. Potential Area of Focus: Advancing the Participation of Indigenous Peoples

Advancing the participation of Indigenous peoples in natural resource development should be based on cooperation and partnership as governments and industry work to recognize and respect their rights and interests. This can build trust, lead to opportunities for Indigenous communities, and advance the process of reconciliation.

Their increased participation will also support a sustainable and competitive minerals and metals industry. For example, companies can benefit from traditional knowledge and local sources of information that improve the design of projects and provide greater certainty around access to land. More Indigenous-owned businesses can provide products and services to mineral projects or pursue or partner in mineral exploration and development themselves. Their involvement in the supply chain can help build capacity in the sector and deliver benefits for Indigenous communities.

Governments work with Indigenous peoples to improve community well-being and help individuals acquire the skills and training needed to participate in mineral development. This includes disseminating information to increase awareness and mineral literacy to help communities make informed decisions about their level of participation.

Industry also plays a major role. For example, Impact Benefit Agreements and other agreements have proven successful in securing benefits for some Indigenous communities, while establishing engagement protocols. These are contracts specific to projects or communities and define the obligations of each party in areas such as engagement, employment, training, business opportunities, environmental monitoring and management, and funding arrangements. Nearly 500 mining agreements have been signed between the mining industry and Indigenous peoples in Canada since 1974, with more than 350 signed in the past decade.[24]

[21] *National Household Survey,* 2016. Data Tables - Labour; 212 Mining and quarrying (except oil and gas). Catalogue 98-400-X2016290, Census 2016, Statistics Canada.
[22] *National Household Survey*, 2016. Data Tables – Labour; 21 Mining, quarrying, and oil and gas. Catalogue 98-400-X2016304, 98-400-X2016092 and 98-400-X2016286, Census 2016, Statistics Canada.
[23] *Strengthening Mining's Talent Alloy: Exploring Aboriginal Inclusion*, Mining Industry Human Resources Council, 2016.
[24] *Mining Sector Performance Report 2006-2015*, Natural Resources Canada, 2016.

Challenges

Some Indigenous groups and communities require support to build capacity to review and assess resource development proposals, participate in decision-making, and fairly represent their interests. This "community readiness" also relates to individuals having the skills and training to be able to take advantage of opportunities that arise from mineral development projects, such as jobs, business creation and other economic spinoffs.

There are a variety of approaches used by jurisdictions across Canada to engage with Indigenous communities. It is important to understand promising practices or drawbacks of various approaches related to participation, timing, structure of engagement, and other areas.

There are differences across jurisdictions in terms of the role of industry in Indigenous consultation and accommodation in regulatory processes to ensure that the Crown's legal obligations are met.

Indigenous Rights Framework

The Government of Canada is committed to transforming the relationship with Indigenous peoples based on recognition, respect, cooperation, and partnership. This includes creating a new Framework to support the recognition and implementation of Indigenous rights, and to realign the relationship between the Government of Canada and Indigenous peoples based on the *United Nations Declaration on the Rights of Indigenous Peoples*. The new Framework aims to contribute to greater clarity and predictability for the development and use of lands and resources.

The federal government, working with First Nations, Inuit and Métis partners, will create new federal legislation and policies to formalize the recognition of Indigenous peoples' rights, including the inherent right to self-government and self-determination. This will also include engagement with other partners, including provincial and territorial governments, industry, academics and the general public.

The new Framework is intended to be introduced in 2018 and implemented before October 2019.

Discussion questions:

- How can federal, provincial and territorial governments help advance the participation of Indigenous peoples in the minerals and metals industry?
- What are best practices for industry to actively engage with Indigenous communities?
- What can governments do to help industry build relationships and advance projects with Indigenous partners?

6. Potential Area of Focus: Capitalizing on Canadian Leadership in a Global Market

A strong Canadian mining industry is about successful, sustainable mining and associated activities taking place on Canadian soil. It is also about the global competitiveness and leadership of Canadian companies operating abroad.

Canadian mining has a socio-economic impact around the world. In 2015, publicly traded, Canadian-based companies had total mining and exploration assets of $171 billion spread across more than 100 foreign countries. Top destinations for Canadian mining assets are the United States (15%), Mexico (11%), and Chile (11%).

The Mining Association of Canada reports that its member companies spent US$10.7 billion in host countries, and employed more than 53,000 people at international operations.[25]

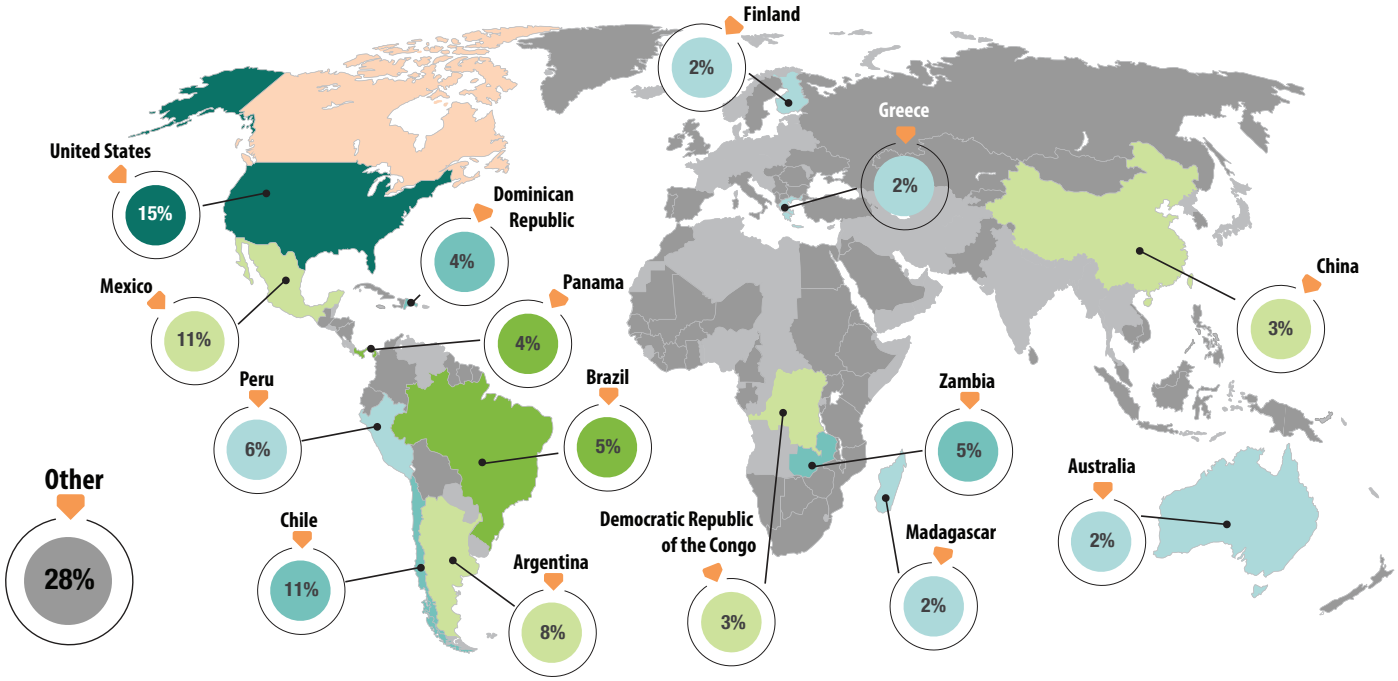
Canada's international trade agreements expand opportunities for the Canadian industry, and Canada works with partner governments to build capacity in mineral resource governance and to promote the conditions that support Canadian investors.

Canada is a global leader in the provision of mining services and the development of innovative technologies for the industry. More than 3,000 companies provide technical, legal, financial, accounting, environmental, and other expertise, and many of these companies have a global presence.

Canada's Brand is important for attracting foreign direct investment (FDI) for mining at home, where it creates employment and business opportunities. As noted, mineral exploration and mine construction and operation are long-term, high cost activities requiring significant capital. FDI can help realize new mining projects, support infrastructure development, and drive innovation.

Canadian mining assets are located around the world

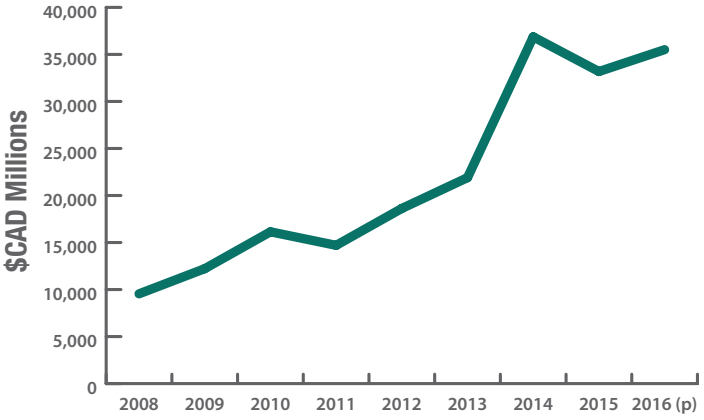
Percentage of CMAA by Country, 2015



Source: *Natural Resources Canada*

[25] *Mining Day on the Hill, Harnessing Canada's Mining Advantage*, Mining Association of Canada, November 2017.

FDI in Canada grew from $9.5 billion in 2008 to $35.5 billion (projected) in 2016



Challenges

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 our competitors are continually looking for ways to attract more investment.

Canadian companies operating abroad are subject to the laws and regulations of host countries, which can be difficult to navigate in certain regions. Other issues such as security and public confidence can act as barriers to entry and operation for Canadian investors. Companies must also strike a balance in their commitments to both local communities and shareholders.

In terms of the destination for Canadian minerals and metals, Canada has taken advantage of opportunities to diversify the markets it serves, but the United States remains the largest buyer and accounts for 55% of Canada's merchandise exports. Greater market diversity for Canada's minerals and metals industry would mitigate risks associated with competitive pressures, fluctuating commodity prices, exchange rate volatility and other economic factors.

Other countries pursuing mineral development projects may not have Canada's regulatory rigour, requirements for consultations, or expectations for how mining companies should operate. As such, it may be easier for companies to establish operations in other countries that do not share Canada's commitment to high standards.

As global demand for innovative, low-carbon technologies for the mining sector grows, Canada's service and technology providers will need to compete in an increasingly dynamic global marketplace.

Discussion questions:

- What are the greatest barriers to attracting foreign direct investment in Canada's minerals and metals industry? What can we do to overcome these barriers?
- How can we strengthen the Canada Brand, while respecting the unique advantages and investment attraction activities of individual provinces and territories?
- What can we do to better support the success of Canadian companies—including equipment and services suppliers, as well as clean technology companies—operating abroad?

E. NEXT STEPS

Photo credit: Teck Resources

Developing the Canadian Minerals and Metals Plan is an opportunity to take stock of Canada's mining industry, to consider where it is heading—and together—to put plans in place to establish Canada as the uncontested global mining leader.

Discussion questions

- What does success for the Canadian mining industry look like?
- Are there important issues or areas of focus that are not reflected in this discussion paper?

We welcome your responses and insights on the questions we have presented in this discussion paper and invite your views on Canada's minerals and metals industry—they will help inform the Canadian Minerals and Metals Plan.

Our website minescanada.ca can receive your input, provides up-to-date information, as well as facts and stories about the role that mining plays in our lives. You can also email us directly at nrcan.cmmp-pcmm.rncan@canada.ca, and follow us on Twitter @NRCan to see what industry, government and others are saying.

We thank you for your interest and encourage you to remain engaged as we shape the future of Canadian mining.