FACTS & FIGURES 2017

Facts and Figures of the Canadian Mining Industry

The Mining Association of Canada

ADVOCACY STEWARDSHIP COLLABORATION

THE MINING ASSOCIATION OF CANADA

The Mining Association of Canada (MAC) is the national organization of the Canadian mining industry. We represent companies involved in mineral exploration, mining, smelting, refining and semi-fabrication. Our member companies account for most of Canada's output of metals and minerals.

MAC's functions include advocacy, stewardship and collaboration. Our goals are to promote the industry's interests nationally and internationally, to work with governments on policies affecting minerals, to inform the public and to encourage member firms to cooperate to solve common problems. We work closely with provincial and territorial mining associations, other industries, and environmental and community groups in Canada and around the world.

DATA AND SOURCES

This annual report reflects currently available data, the majority from 2016, though some from prior years and some from 2017. Dollar amounts are expressed in Canadian dollars unless noted otherwise.

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STATE OF THE INDUSTRY AND KEY ISSUES

THE YEAR 2017 BROUGHT WITH IT UPWARD PRESSURE ON MINERAL AND METAL PRICES, RETURNING A CAUTIOUS OPTIMISM TO THE GLOBAL MINING INDUSTRY. HEALTHIER COMMODITY PRICES ARE SENDING A POWERFUL SIGNAL THAT THE DOWNTURN OF THE LAST FEW YEARS HAS ENDED AND THE NEXT UPSWING IS ON THE HORIZON.

However, the upward pressure was not felt uniformly across all commodities and volatility in the market persists. With the prospect of the next upswing on the horizon, industry and governments need to be thinking about, and planning for, the opportunities to come. In certain key respects, Canada's competitiveness as a global destination for mineral investment has flagged in recent years. Addressing key challenges will be a major determinant of Canada's ability to take advantage of a return to stronger commodity prices.

ECONOMIC CONTRIBUTION

The mining industry has contributed greatly to Canada's economic strength. The industry directly employs more than 403,000 workers across the country in mineral extraction, smelting, fabrication and manufacturing, and indirectly employs an additional 193,000. Proportionally, the mining industry is also the largest private sector employer of Indigenous peoples in Canada and employment is poised to increase. The industry's $57.6 billion contribution to Canada's gross domestic product in 2016 included $24.5 billion in mineral extraction, and $32 billion in mineral processing and manufacturing.

Internationally, Canada is one of the leading mining countries and one of the largest producers of minerals and metals. The industry accounted for 19% of the value of Canadian goods exports in 2016, selling a diversified array of minerals abroad. Together, the top 10 minerals and metals represented $34.5 billion (85%) of Canada's total mineral production value in 2016.

Canada remained the world's top destination for non-ferrous exploration spending in 2016, but experienced a 20% decrease in allocations year-over-year. This marks the fifth consecutive year that Canada's share of international exploration investment has fallen. This is indicative of the fierce competition for global mineral investment, and the financing challenges junior companies are facing.

While mining is important to Canada at the local community level, it also contributes to the economies of large cities. Toronto, for example, is the global hub for mining finance. The Toronto Stock Exchange (TSX) and TSX Venture Exchange accounted for 57% of the global mining equity raised in 2016. Vancouver features the world's leading cluster of exploration companies, while Montreal is home to major aluminum and iron ore firms. Edmonton has become a global centre for oil sands expertise and Saskatoon for uranium and potash.

Other evidence of the industry's vast economic reach is that mining accounts for over one-half of all rail-freight revenues of Canada's major railways, CN and CP. As well, more than 3,700 suppliers provide expertise to the industry, making significant indirect economic contributions across Canada. On this last measure, however, Canada was recently displaced by Australia as host to the second largest mining supply sector globally.

The average annual pay for a mining worker in 2016 exceeded $100,000, which surpassed the average annual earnings of workers in the forestry, manufacturing, finance and construction sectors respectively.

A STATE OF TRANSITION

Canada has long been the dominant global mining nation—in mineral production, mining finance, mining services and supplies, and sustainability and safety. However, there are signs that this leadership position is slipping, which has the potential to jeopardize Canada's ability to seize new opportunities for growth.

- The number of active mineral projects in Canada is down by almost one-half from the 2011 peak of 2,700 projects.
- Only two new mining projects were submitted for federal environmental assessment in 2016 – an historic low.
- Over the last five years, Canada has dropped ranks for seven out of the 13 products for which it is a top-five global producer.
- Australia's mining supply sector surpassed Canada's in recent years.
- Mining innovation dollars are steadily flowing out of Canada to countries such as Australia, Germany and South Africa.

The effect can be seen in the drop in current and potential investment in major mining-related projects identified by Natural Resources Canada in its report, *Natural Resources: Major Projects Planned and Under Construction – 2017 to 2027*.

The report indicates that total projects planned and under construction have reduced by one-third (49 projects) in number and by over 50% ($86 billion) in value from June 2014 to June 2017.

Metal mines experienced the single largest drop, accounting for 81% of the suspended projects and 79% of the suspended investments.

FEDERAL POLICIES AND CANADIAN MINING COMPETITIVENESS

From reviews of federal environmental legislation, to the pan-Canadian climate change policy, to long-standing transportation and infrastructure challenges, to trade developments, the policy landscape in Canada is currently full of uncertainty. The Canadian mining industry is awaiting the outcomes of major government decisions on policy areas of concern – all of which are critically important to our competitiveness. MAC and its members urge the federal government to:

- **Improve the federal project review process:** The process should be effective and timely, from pre-environmental assessment (EA) to post-EA permitting, with meaningful consultation with Indigenous communities.
- **Invest in critical infrastructure in remote and northern regions:** Ensure the new Canada Infrastructure Bank has a strong economic development focus for northern Canada.

ArcelorMittal, Port-Cartier Complex, Quebec

- **Improve Canada's Transportation Network:** Improvements should be made to more efficiently move mineral and metal products to market, including by enhancing data transparency in the rail freight market.
- **Address climate change while protecting Canadian businesses:** Adopt policies that lead to meaningful greenhouse gas emissions reductions while protecting emissions intensive and trade-exposed industries (EITE), such as mining. Failing to protect EITE sectors will result in "carbon leakage"—the shifting of production and the associated economic benefits from countries that are taking action on climate to those that are not. Policies should also be sensitive to the unique circumstances faced by remote and northern regions, demonstrate complementarity, and take into account cumulative effects and costs.
- **Improve access to trade:** Defend Canadian trade interests in the NAFTA negotiations with the United States, the Canadian mining industry's largest market. Additionally, expand access to new and important markets, such as China, India, Japan and the TPP jurisdictions, where common ground was recently found.
- **Help expedite industry innovation:** Support the mining industry's innovation supercluster proposal, CLEER, which will help Canada become the leading supplier of sustainably-sourced minerals and metals the world needs, and the technologies the world needs to best extract them.
- **Support mining's contributions to Indigenous reconciliation:** All of the above will determine whether and the extent to which the mining industry can continue to grow its contributions to Indigenous communities through economic reconciliation.

Given the scale of the mining industry in Canada, significant changes to any of these policy areas independent of the others have the potential to affect our sector. Given the synergistic relationship between several of these policy areas, the potential for unintended consequences is high. Vigilant interdepartmental coordination across government is needed.

Strategic public policies that encourage sustainable mining development in Canada will enable our sector to expand its already significant contributions to communities across the country. They will also allow the industry to further its role as a powerful partner in growing the economy, reconciling with Canada's Indigenous peoples, addressing climate change, advancing innovation, and much more. A sound and effective policy environment is critical to enabling Canada's mining sector to meet the growing global demand for minerals and metals, today and in a low carbon future, which will only serve to increase the demand for mining products. ■

Goldcorp, Tele-Remote Operators, Red Lake Gold Mines, Ontario

MINING

ONE INDUSTRY, MANY APPLICATIONS

THE MINING INDUSTRY IS CRUCIAL TO THE EVERYDAY LIFE OF ALL CANADIANS. WE NEED MINING TO BUILD THE PRODUCTS WE RELY ON IN OUR DAILY LIVES, AND FOR THE TECHNOLOGIES AND INFRASTRUCTURE REQUIRED IN A LOW CARBON FUTURE.

The mining and mineral manufacturing sector – covering metal, non-metal and coal mines; oil sands mining operations; and manufacturing in the form of smelters, refineries and fabrication facilities – is generically known as the "mining industry."

MINING AND ITS ROLE IN A LOW CARBON FUTURE

There is a natural synergy between mining and clean technology. Raw materials are transformed into technology that, having gone full circle, assists mining operations in reducing environmental footprints and enhancing efficiency and reliability. These same raw materials also enable the world to transition to a low carbon future.

Clean energy and "green" products require metals and minerals as building blocks. Water purification systems rely on nickel and a host of rare earth elements. Hybrid cars draw energy from nickel hydride batteries and use far more copper than traditional vehicles. Efficient, lightweight vehicles and aircraft need aluminum as well as lighter composites and alloys involving nickel and other metals to improve efficiency. Clean energy sources such as nuclear, solar, wind and hydrogen use a range of minerals and metals in their equipment and processes.

Because the mining industry is vital to daily life and Canada's future, its opportunities, challenges, investments and needs are inseparable from those of broader society. Historically, thanks to the industry's innovation and investment and the strategic support of governments, Canada has benefited from low-cost mineral and metal products, good jobs, and significant wealth development opportunities.

During this time, company best practices have resulted in the recognition of the Canadian mining industry as a leader in corporate social responsibility and environmental stewardship. Looking forward, as global competition for mineral investment increases, Canada must adapt to preserve its leadership. ■

PRODUCTS THAT RELY ON MINING

- **Batteries** (nickel, cadmium, lithium, cobalt)
- **Circuitry** (gold, copper, aluminum, steel, lithium, titanium, silver, cobalt, tin, lead, zinc)
- **Display screens** (silicon, boron, lead, barium, strontium, phosphorus, indium)
- **Electric cars** (copper, lithium, aluminum, nickel, cadmium, cobalt and zinc)
- **Musical instruments** (copper, silver, steel, nickel, brass, cobalt, copper, iron, aluminum)
- **Sports equipment** (graphite, aluminum, titanium, calcium carbonate, sulphur)
- **Wind turbines** (steelmaking coal, iron ore, copper, nickel)
- **Energy** (coal, uranium, oil sands)

— SECTION 1 —

MINING AND THE CANADIAN ECONOMY

MINING CONTRIBUTES SIGNIFICANTLY TO THE CANADIAN ECONOMY. BEYOND ITS DIRECT ECONOMIC IMPACT, THE INDUSTRY ALSO SUPPORTS MANY FIRMS AND SECTORS THAT SUPPLY MINING WITH THE GOODS AND SERVICES IT NEEDS TO FUNCTION.

Like our nation's economy, the Canadian mining industry is not immune to global economic trends. The profitability of companies depends in part on the performance of commodity prices, which are subject to market volatility and driven by global supply and demand. In turn, the extent to which mining companies contribute to the Canadian economy, be it through direct and indirect employment or taxes and royalties, depends on their ability to operate profitably. Economic forecasts help companies plan their business activities.

GLOBAL ECONOMIC TRENDS

According to the International Monetary Fund (IMF), global economic activity is picking up with a long-awaited recovery in investment, manufacturing and trade. Following several years of volatility and modest forecasts, which were frequently revised downward, world economic growth is anticipated to increase from 3.1% in 2016 to 3.5% in 2017 and 3.6% in 2018. Stronger sentiment and indicators suggest greater staying power in this forecast than in recent years.

Emerging Economies

The IMF forecasts that GDP growth from emerging markets and developing economies will increase from 4.3% in 2016 to 4.6% and 4.8% in 2017 and 2018, respectively. Behind much of this anticipated growth are expectations that, in 2017, Russia and Brazil will reverse consecutive year-over-year negative GDP growth, and will expand modestly through 2018. Meanwhile, India's economic growth has been strong but volatile, dropping nearly 1% year-over-year in 2016, but is forecast to grow by 7.7% in 2018.

Finally, China's growth (albeit over a much larger base than in previous years) is forecast to continue moderating, persisting at 6.7% growth in 2017, and dropping to 6.4% growth in 2018. While this transition from rapid industrial growth presents some uncertainty over the anticipated strength of global demand for raw materials, China's demand for mining products is anticipated to remain robust in years to come.

Developments in Advanced Economies

Economic activity in advanced economies is forecast to accelerate in 2017 to 2%, moderating slightly in 2018 to 1.9%. Developments, such as inward-looking economic policies in certain countries, could disrupt the drive towards increasing global economic integration, which has underpinned world economic growth in the post-war era.

According to the IMF, such developments could disrupt global supply chains, lower global productivity, and drive up the cost of tradable consumer goods. Protectionist measures also have the potential to prevent short-term global economic growth prospects from being fully realized – a factor accounted for in the above forecast.

Commodity Price Trends

The year 2017 brought with it upward pressure on mineral and metal prices, returning a cautious optimism to the global mining industry. Healthier commodity prices are sending a powerful signal that the downturn of the last few years has ended and the next upswing is upon us. However, the upward pressure was not felt uniformly across all commodities and volatility in the market persists.

Syncrude, Oil Sands Facility near Fort McMurray, Alberta

On the base metal side, while up slightly on the pound, nickel prices were only marginally higher than they were a year ago at the time of writing. As of October 2017, the price per tonne of iron ore was up nearly $20, while zinc and copper were up over $0.40 per pound (45%) and $0.80 per pound, respectively.

Precious metals have fluctuated. The price of gold, for example, dropped nearly $300 to $1,127 per ounce in the final months of 2016, only to reverse trends and peak at $1,346 per ounce in August 2017 before trending downward again. As of September 2017, the metal was selling for approximately $1,280 per ounce. On a comparable trajectory, the price of silver rose from an eight-year low of $15.70 per ounce to a peak of $19.52 per ounce in August 2016, landing at $17.05 per ounce at the time of writing.

China's spring 2016 domestic policy reforms propelled metallurgical coal prices from lows of $81 per tonne in May to record highs of $308 per tonne in November. As prices were moderating, weather-related supply disruptions in spring 2017 rocketed prices from $150 per tonne to another record high of $330 per tonne. These temporary factors made premium steelmaking coal a major performer for much of 2017, though prices moderated to more sustainable levels as the year progressed.

Other commodities remain stubbornly low. Uranium dropped from a monthly high of $65 per pound in February 2011 to $18 per pound in November 2016. Hope for continued recovery, with prices elevating to $24.50 per pound in January 2017, were quickly dashed as prices dropped to $17.50 per pound in September 2017. Potash fell from over $483 per tonne in February 2012 to roughly $220 per tonne in August 2016, where it has persisted since.

Canadian Mining Industry Outlook

Looking forward, the Canadian mining industry's economic prospects are strong over the long term. The prevailing view is that the longer-term fundamentals are solid. As the middle classes of the world's most populous countries continue to emerge, and as their consumption patterns more closely resemble those of western industrialized countries, growth is poised to return.

Another significant growth opportunity for the mining sector is the global transition to a low carbon future. Minerals and metals are the building blocks of low carbon technologies, and a 2017 *World Bank* report concluded that the increased use of wind, solar and energy storage technologies will increase the demand for mining products.

Another recent report by *Clean Energy Canada* highlights the opportunity that a low carbon economy presents to Canada and its mining industry, noting that Canada has rich deposits in many of the minerals and metals needed in renewable energy technologies. For example, Canada is home to 14 of the 19 metals and minerals needed to make a solar PV panel. Clean Energy Canada encourages Canada to become the world's leading supplier of the mining products integral to a low carbon economy. In its report, the think tank points to the Canadian mining industry's sustainability standards, including *MAC's Towards Sustainable Mining®* initiative, and the fact that it operates some of the lowest carbon-intensive mines in the world thanks to Canada's energy mix and company adoption of low emission technologies at their sites.

However, these growth opportunities cannot be taken for granted. Healthier market conditions and projected increased demand for mining products do not guarantee a bright future for the Canadian mining industry. The policy environment that mining companies operate in plays a decisive factor in determining whether the Canadian mining industry can seize growth opportunities. Failing to improve Canada's attractiveness as a mining jurisdiction will result in an acceleration of much-needed investments flowing offshore to other countries that are better positioned to capitalize on this next upswing.

In Canada, the policy environment for mining is characterized by uncertainty. Impending decisions about environmental, Indigenous, transportation, tax and other mineral policies will influence Canada's ability to capitalize on and benefit from these opportunities.

MINING'S CONTRIBUTION TO THE CANADIAN ECONOMY

Mining contributes significantly to the Canadian economy. The direct and indirect wages and employment of approximately 596,000 people across the country (of which 403,000 are direct jobs), taxes and royalties collected by governments, and the capital expenditures required for project development and operation are only some examples of its significant contributions. Beyond its direct economic impact, the industry also supports many firms and sectors that supply mining with the goods and services it needs to function.

Contribution to Canada's GDP

Historically, the value of minerals and metals to Canada's economy has ranged between 2.7% and 4.5% of the country's GDP. In 2016, the industry's contribution remained within this range at 3.4%.

2016 Contribution

The extractive industry, which combines mineral extraction with oil and gas extraction, contributed $124.8 billion, or 7.5%, to Canada's GDP in 2016 (see *Figure 1*).

By this measure, the extractive industry is the fourth largest of Canada's 18 industries, surpassed only by the services, real estate and manufacturing sectors, which rank first, second and third, respectively.

The mining industry as a whole goes beyond extraction to include mineral manufacturing. The mining industry's 2016 contribution to GDP is detailed in *Figure 2*, which divides industry activity into four stages:

- **Stage 1**, extraction of minerals (metals, non-metals and coal): $25.5 billion
- **Stage 2**, primary metal manufacturing (smelting, refining, rolling, extruding, alloying and casting of primary metals): $13.8 billion
- **Stage 3**, non-metallic mineral product manufacturing (abrasives, lime, cement, glass, ceramics): $5.6 billion
- **Stage 4**, fabricated metal product manufacturing (forging, stamping and heat-treating to produce reinforcing bars, fabricated wire, cutlery, tools, hardware): $12.6 billion

Rio Tinto, Iron Ore Company of Canada, Newfoundland and Labrador

The output of these four stages in 2016 totalled $57.6 billion. By comparison, according to Statistics Canada, the oil and gas extraction sector contributed $99.5 billion to GDP. The Canadian Association of Petroleum Producers indicated that on a barrel-per-day basis, approximately 47% of oil sands extraction in 2016 was from mining, the process for which is essentially surface mining. Indirect mining, mining-related support activities and mineral processing augment this sum by $13 billion.

MINING IN THE PROVINCES AND TERRITORIES

Year-over-year, mineral production values were projected to increase for 2016 in five of Canada's 13 provinces and territories. The production values for five jurisdictions were projected to decrease and three remained roughly consistent. Quebec and British Columbia posted the largest gains in absolute value, exceeding $400 million each, with Nunavut increasing by approximately $200 million year-over-year. Saskatchewan experienced the single largest absolute drop in production value year-over-year, falling from $8.5 billion to $5.5 billion, largely driven by low uranium and potash prices. Overall, total production value is down 4.7%, or approximately $2 billion, to similar levels seen in 2007. However, it is anticipated that 2017 mineral production values will see an increase across Canada thanks to the upward pressure many commodities experienced throughout the year.

Regional Distribution of Mining

Figure 3 illustrates the geographical location of Canada's mining clusters and active mineral development regions (details in *Annex 1*). The Northwest Territories is the country's dominant source of diamonds. Leading in the production of gold are Ontario and Quebec. Saskatchewan produces all of Canada's uranium and has world-class potash reserves. British Columbia is prominent in steelmaking coal production. Newfoundland and Labrador and Quebec produce virtually all of Canada's iron ore. Several provinces have strong copper and nickel production. (For detailed mineral production by province and territory, *see Annex 2* and *Annex 3*.)

CANADIAN MINES IN 2016

Total mining establishments: 1,201
Metals: 65
Non-metals: 1,136

PROVINCES WITH THE MOST METAL MINES

Quebec: 20
Ontario: 18
British Columbia: 8

MAIN TYPES OF NON-METAL MINES

Sand and gravel quarries: 735
Stone quarries: 285
Peat mines: 68

Mining also has significant ties to Canada's major cities. Some of the largest Canadian and international mining companies are headquartered or have a significant presence in urban centres such as Vancouver (Goldcorp, Teck Resources Limited), Saskatoon (Cameco Corporation, PotashCorp), Toronto (Barrick Gold Corporation, Vale, Glencore) and Montreal (ArcelorMittal, Iron Ore Company of Canada, Rio Tinto Alcan).

Vancouver is the global centre of expertise for mineral exploration. Some 700 exploration companies are located in British Columbia, most of which are in the greater Vancouver area.

Toronto is the global centre for mining finance. The Toronto Stock Exchange has the most listed mining companies globally, and the city itself is home to several dozen mining company head offices, as well as several hundred mining suppliers, consulting firms and service providers.

As home to Rio Tinto Alcan, and to significant mining research and education facilities, Montreal holds considerable global expertise in aluminum smelting.

The global emergence of the oil sands over the past two decades has transformed Edmonton and Calgary into centres of expertise in this area, and Saskatoon has risen to the forefront of the uranium and potash sectors.

Regional Value of Mining

The value of Canadian mineral production declined by 4.7% in 2016, falling approximately $2 billion from 2015 levels.

VALUE OF MINING IN 2016

Canada-wide: $40.8 billion

TOP 4 PROVINCES

1. Ontario: $10.5 billion

2. Quebec: $8.6 billion

3. British Columbia: $6.3 billion

4. Saskatchewan: $5.5 billion

A decade ago, the global mining super-cycle was reaching its first peak, and mineral production in 2007 – a record year – reflects this. Looking at projected mineral production numbers for 2016, with few exceptions, the Canadian mining industry looks remarkably similar (see *Figure 4*). Ontario (26%), British Columbia (15%) and Saskatchewan (13%) still account for the same share of Canada's overall value, while Quebec's share has grown by nearly a third (20%).

A correlation exists between production values and expenditures on resource development. The top four provinces by production value in 2016 – Saskatchewan, Ontario, Quebec and British Columbia – also led in expenditures on mineral resource development (see *Figure 5*). Of the $8.5 billion invested in mine complex development in Canada, combined spending across these four provinces exceeded $6.8 billion (81% of the total) and ranged from $938 million to $2.3 billion, with Saskatchewan leading in expenditure. This suggests that these four provinces will remain vital to Canada's mineral production well into the future.

The three territories together received 20% ($359 million) of total 2016 Canadian spending on exploration and deposit appraisal (the first two columns of *Figure 5*).

This amount, more than three times the territories' share of production value (6%), reflects global interest in Canada's northern mineral potential. On certain measures, this interest is materializing into wealth development as the territories also accounted for 11% ($970 million) of total mine complex development expenditure. The majority of this investment (75%) went to the Northwest Territories, where De Beers recently opened its newest mine, Gahcho Kué, and Dominion Diamond is expanding its Ekati mine. Despite such interest, however, overall territorial exploration and deposit appraisal investment has decreased significantly in recent years, and recent 2017 spending intentions indicate a continuation of this trend:

- $64.4 million in the Northwest Territories, down from $100.2 million in 2015
- $163.6 million in Nunavut, down from $215.1 million in 2015
- $94.1 million in Yukon, a modest increase from $92.2 million in 2015

This fifth consecutive annual decrease in spending in Nunavut and the Northwest Territories reflects market realities and ongoing regulatory challenges, and has implications for both junior mining firms in those regions as well as for territorial economies.

TAXES AND OTHER PAYMENTS TO GOVERNMENTS

Each year, Canadian governments receive considerable taxes and royalties as a result of mining activity. Specifically, these payments come from the first three stages of activity – extraction, smelting and processing (see Figure 2).

Payments to Governments

Canada's payment disclosure legislation, the *Extractive Sector Transparency Measures Act*, which came into force in July 2015, requires companies to disclose the payments they make to governments that exceed a $100,000 threshold. Ultimately, this creates greater transparency of the taxes, royalties and other forms of disbursement that companies pay to governments, at home and abroad. Although the legislation came into force in 2015, the publication of tax payments began in 2017.

While analysis of the new data is not yet complete, thus far in 2017, extractive sector companies have reported payments totalling more than $7.1 billion to Canadian governments. These payments, to Indigenous, municipal, provincial and federal governments, are generally royalty or tax payments sourced from over 1,800 projects across the country.

EXTRACTIVE SECTOR PAYMENTS TO CANADIAN GOVERNMENTS TOTALLED MORE THAN $7.1 BILLION IN 2017.

INDIRECT CONTRIBUTIONS TO MINING INDUSTRY SUPPLIERS

The mining industry's economic impact goes far beyond its direct contribution to GDP. For instance, mining accounts for approximately half of Canada's rail-freight revenues and tonnage annually, typically exceeding $6 billion in expenditure (details in Section 2). Organizations such as CN Rail, CP Rail, and the Ports of Montreal, Quebec and Vancouver depend on a vibrant mining industry.

Supply relationships like these create mutual synergies. For instance, supplier companies play a crucial role in introducing and spreading innovative technologies and ideas within the mining industry.

InfoMine, a mining database, reported in 2017 that more than 3,700 firms provide technical, legal, financial, accounting, environmental and other expertise to the Canadian mining industry. Most of these suppliers are located in Ontario and British Columbia, followed by Alberta, Quebec, Saskatchewan and Manitoba. In 2016, InfoMine reported that Australia's identified mining supply sector surpassed that of Canada's, bumping Canada to third place. In 2017, this gap expanded with Australia adding more than 200 firms to its list, while Canada added 31. This is one of many indicators suggesting that Canada's attractiveness as a destination for mineral investment is eroding. (See Section 3 of this report for more discussion on investment trends.)

NUMBER OF MINING SUPPLIERS IN LEADING COUNTRIES

United States: 5,992

Australia: 4,551

Canada: 3,768

Brazil: 3,650

Chile: 1,827

Source: InfoMine

Tax Policy

The Canadian mining industry supports the federal government's reduction of the federal corporate tax rate to 15%, the lowest corporate tax rate in the G7, which increases Canada's global attractiveness as a business destination.

Industry welcomed the extension of both the Mineral Exploration Tax Credit and the super-flow-through share provision in the 2017 federal budget. Both measures are essential to assisting financing and exploration efforts in these challenging financial times, and are key to addressing Canada's declining base metal reserves.

Other recent federal mining tax reforms, however, will make it more costly for companies to develop projects and operate, particularly in remote and northern regions, and might push investment to more competitive jurisdictions. The 2012 and 2013 federal budgets initiated a trend in reduced government tax support to the Canadian mining industry as result of the following actions:

- The elimination of the corporate Mineral Exploration and Development Tax Credit
- The elimination of the Atlantic Investment Tax Credit for resources
- The elimination of the Accelerated Cost of Capital Allowance
- The reduction of the Scientific Research and Experimental Development Tax Incentive Program
- The rendering of pre-production expenses ineligible for Canadian Exploration Expenses deductions

Against the backdrop of a volatile commodities market, and given the already heightened exploration, development and operational costs in remote and northern regions, these measures have pushed development further away for some projects. In mining, profit tax represents a large share of earnings, and includes corporate income taxes, mining taxes and royalties, ranging between 32% and 48%. Additional levies not only reduce Canada's attractiveness, but they also make the playing field uneven compared to other jurisdictions. MAC believes that the government should review tax policies that negatively impact mining company profitability and Canada's overall attractiveness as a mining jurisdiction, including mining tax deductability provisions and, more recently, proposed rules to address tax planning by private corporations. Having tax policies and rates that are more competitive with international mining jurisdictions can contribute to the government's objective of increasing foreign direct investment into Canada. ■

Vale, Totten Mine, Ontario

FIGURE 1

CANADA'S REAL GROSS DOMESTIC PRODUCT, BY INDUSTRY, 2007-2016

Return to text

($ millions)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
All industries	1,468,927	1,478,592	1,429,913	1,476,176	1,524,395	1,552,003	1,589,454	1,631,228	1,649,263	1,673,141
Agriculture	16,619	18,083	17,592	17,291	17,637	17,813	20,938	19,900	20,637	21,482
Forestry and logging	4,457	4,165	3,286	3,794	4,173	4,093	4,209	3,963	4,254	4,287
Fishing, hunting and trapping	1,064	1,103	1,074	1,141	1,121	1,138	1,159	1,283	1,340	1,278
Mining (including milling) and quarrying, and oil and gas extraction	**112,438**	**108,866**	**100,068**	**104,795**	**111,115**	**108,281**	**113,901**	**120,482**	**122,751**	**124,871**
Support activities for mining and oil and gas extraction	10,669	11,471	8,314	10,290	12,204	12,445	12,581	13,964	8,989	6,472
Electric power, gas and water utilities	35,753	37,068	34,888	35,375	36,476	36,124	36,127	36,174	35,946	36,123
Construction	102,098	104,738	98,211	105,559	109,208	117,567	122,475	125,225	120,114	116,739
Manufacturing	187,791	177,371	152,564	159,596	165,154	167,793	166,662	172,316	172,563	174,033
Trade, wholesale	79,666	78,942	73,615	79,144	85,194	87,920	91,657	95,269	96,164	97,247
Trade, retail	77,269	79,656	77,683	80,009	80,843	81,119	85,637	88,805	90,591	92,957
Transportation and warehousing	62,645	62,619	60,198	62,620	65,077	65,915	67,177	69,614	72,334	74,814
Information and cultural industries	48,668	49,025	48,302	49,327	49,954	50,350	49,893	50,010	49,965	50,211
Finance and insurance	97,528	96,050	95,249	97,260	100,546	102,164	106,052	109,211	114,972	120,350
Real estate and rental and leasing	168,568	172,618	177,200	182,930	188,680	194,632	200,043	206,041	212,994	219,389
Community, business and personal services	199,343	203,556	199,763	199,209	204,847	210,206	215,497	220,704	223,354	224,694
Public administration	92,264	96,296	101,505	104,310	106,165	105,283	104,876	105,578	105,930	107,375
Health care and social assistance	96,254	98,424	100,702	102,232	103,998	105,614	105,712	107,270	109,478	112,507
Educational services	75,833	78,541	79,699	81,294	82,003	83,546	84,858	85,419	86,887	88,312

Source: Statistics Canada, CANSIM Table 379-0031.
Note: Values at Basic Prices in 2007 Constant Dollars.

FIGURE 2

CANADA'S REAL GROSS DOMESTIC PRODUCT, MINING, MINERAL MANUFACTURING, AND OIL AND GAS, 2007-2016

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($ millions)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Metal mines	16,630	17,153	13,316	13,805	16,158	16,249	17,566	18,456	19,161	19,448
Non-metal mines	5,329	5,035	3,436	4,439	4,759	4,206	4,284	4,486	4,698	4,591
Coal mines	1,632	1,719	1,438	1,631	1,594	1,620	1,760	1,669	1,455	1,473
Total Mining	**23,591**	**23,907**	**18,190**	**19,875**	**22,511**	**22,075**	**23,610**	**24,611**	**25,314**	**25,512**
Primary metal manufacturing	15,602	15,248	11,483	12,836	13,598	13,466	13,001	13,868	12,943	13,884
Fabricated metal product manufacturing	14,361	13,102	11,141	11,592	12,547	13,466	13,783	14,042	13,559	12,591
Non-metallic mineral product manufacturing	6,504	6,235	5,287	5,417	5,524	5,648	5,544	5,827	5,689	5,634
Total Mineral Manufacturing	**36,467**	**34,585**	**27,911**	**29,845**	**31,669**	**32,580**	**32,328**	**33,737**	**32,191**	**32,109**
Oil and gas extraction	88,847	84,959	81,878	84,920	88,604	86,206	90,291	95,871	97,437	99,359
Petroleum and coal products manufacturing	7,155	7,036	7,468	7,044	6,728	6,782	6,741	6,666	6,620	6,513
Support activities for mining and oil and gas	10,669	11,471	8,314	10,290	12,204	12,445	12,581	13,964	8,989	6,472
Total Oil and Gas and Associated Manufacturing	**106,671**	**103,466**	**97,660**	**102,254**	**107,536**	**105,433**	**109,613**	**116,501**	**113,046**	**112,344**

Source: Statistics Canada, CANSIM Table 379-0031.
Note: Values at Basic Prices in 2007 Constant Dollars.

FIGURE 3
CANADIAN MINING INDUSTRY CLUSTERS

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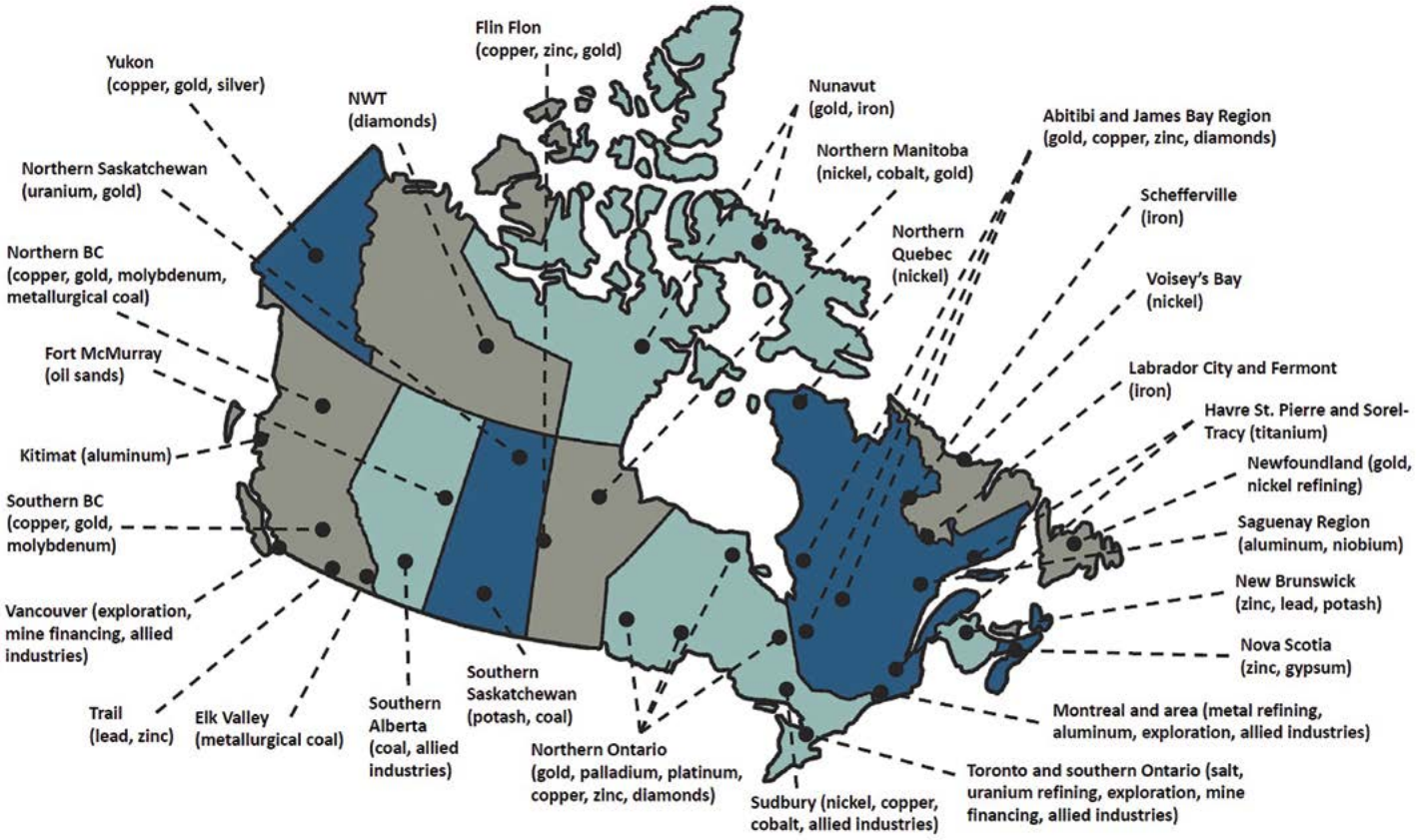

Source: The Mining Association of Canada.

FIGURE 4

VALUE OF CANADIAN MINERAL PRODUCTION BY PROVINCE AND TERRITORY, 2007 AND 2016[P]

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	2007			2016[P]		
Province/Territory	**($ current millions)**	**(%)**	**RANK**	**($ current millions)**	**(%)**	**RANK**
Ontario	10,855.6	26.8	1	10,580.5	26.0	1
Quebec	5,540.1	13.7	3	8,295.4	20.4	2
British Columbia	5,611.4	13.8	2	6,331.6	15.5	3
Saskatchewan	5,511.1	13.6	4	5,531.6	13.6	4
Alberta	1,812.0	4.5	8	3,037.8	7.5	5
Newfoundland and Labrador	4,949.4	12.2	5	2,723.4	6.7	6
Manitoba	2,479.6	6.1	6	1,319.0	3.2	7
Northwest Territories	1,830.9	4.5	7	1,276.2	3.1	8
Nunavut	34.8	0.1	12	733.0	1.8	9
Yukon	74.0	0.2	11	409.1	1.0	10
New Brunswick	1,540.2	3.8	9	283.3	0.7	11
Nova Scotia	327.7	0.8	10	230.1	0.6	12
Prince Edward Island	4.1	…	13	6.6	…	13
Canada	**40,570.9**	**100.0**		**40,757.5**	**100.0**	

Sources: Natural Resources Canada; Statistics Canada.
[P] Preliminary; ... Amount too small to be expressed.
Notes: This table includes the production of coal but excludes the production of petroleum and natural gas. Numbers may not add to totals due to rounding.

FIGURE 5

TOTAL MINERAL DEVELOPMENT EXPENDITURES, BY STAGE AND PROVINCE AND TERRITORY, 2016[P]

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($ millions)

Province/Territory	Exploration	Deposit Appraisal	Mine Complex Development	Total
Newfoundland and Labrador	21.3	0.7	223.7	245.7
Nova Scotia	5.9	0.8	138.3	145.1
New Brunswick	9.1	0.6	15.9	25.6
Quebec	203.0	76.6	1,569.6	1,849.3
Ontario	281.4	89.7	2,042.3	2,413.4
Manitoba	37.0	4.9	167.1	208.9
Saskatchewan	196.3	35.6	2,344.7	2,576.6
Alberta	3.2	13.0	79.5	95.7
British Columbia	123.7	96.7	938.9	1,159.2
Yukon	49.6	38.2	2.2	90.1
Northwest Territories	48.6	17.9	725.7	792.2
Nunavut	108.6	96.5	242.9	448.0
Canada	**1,087.8**	**471.2**	**8,490.7**	**10,049.7**

Source: Natural Resources Canada, based on the Federal-Provincial-Territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.

[P] Preliminary.

Note: Includes on-mine-site and off-mine-site activities. Includes field work, overhead costs, engineering, economic, pre-feasibility, feasibility, and environmental studies, and land access costs. Expenditures for mine complex development include machinery and equipment and non-residential construction.

SECTION 2

THE ACTIVITIES: PRODUCTION, PROCESSING AND TRANSPORTATION

CANADA'S STRENGTH IN MINING RESTS ON THE ABILITY TO PRODUCE AND PROCESS MINERALS COMPETITIVELY AND TO TRANSPORT PRODUCTS EFFICIENTLY TO DOMESTIC AND INTERNATIONAL MARKETS. THESE PRODUCTION, PROCESSING AND TRANSPORTATION ACTIVITIES FORM THE BASE THAT ALLOWS THE INDUSTRY TO STAY GLOBALLY COMPETITIVE AND EXPAND ITS CANADIAN INVESTMENTS.

PRODUCTION OF KEY MINERALS

Richly endowed with natural resources, Canada ranks among the top five countries in the global production of 13 major minerals and metals (details in *Annex 4*):

- First in potash
- Second in uranium and niobium
- Third in nickel, gemstones, cobalt, aluminum and platinum group metals
- Fourth in indium and sulphur
- Fifth in diamonds, titanium and gold

While Canada produces some 60 different minerals and metals, its status as a top-five producer has slipped and shifted over the past 15 years. In 2001, for example, Canada was a top-five producer of 16 minerals and metals. Today, Canada no longer holds this position as a producer of copper, zinc, molybdenum, lead and cadmium, having been surpassed by other countries at different times. Over the past five years, Canada has lost ranking for seven out of 13 commodities for which it had been a top-five producer. Also notable is that Canada is third in the world for diamonds, according to value, despite being fifth in production.

Production Values

In 2016, the value of Canadian mineral production decreased for the third consecutive year, falling 4.7% to $40.8 billion.

This suggests a settling in contrast to the decline from a record high of $50.9 billion in 2011 (see *Figure 6*). Non-metal values accounted for the decline, falling by $2.5 billion year-over-year. Metal and coal values both increased, with coal leading the way with a 16% (or $500 million) increase year-over-year to $3.6 billion. Looking forward, and in light of recent price upturns for a host of commodities, production values are anticipated to be higher in 2017.

Canada's top 10 minerals and metals (see *Figure 7*) each had production values of more than $1.6 billion in 2016, with six (gold, potash, copper, diamonds, iron ore and coal) at more than $3 billion each. Values for five out of the 10 commodities increased in 2016, with gold leading the charge with a 14% (greater than $1 billion) increase year-over-year, followed closely by iron ore with nearly a $1 billion increase. Copper and coal were also up year-over-year, but five materials experienced decreases, with potash dropping the most. Production of the fertilizer decreased by nearly 50% (or $2.8 billion). Together, the top 10 minerals and metals represented $34.5 billion (85%) of Canada's total mineral production value in 2016. See *Annex 5* for a complete set of production volumes and values.

On the petroleum front, synthetic crude oil accounted for 24% of Canada's crude oil production volume in 2016, down slightly but comparable to 2015 (see *Figure 8*). Indicative of continued low oil prices, the absolute value of synthetic crude oil production decreased from $21.5 to $19.3 billion year-over-year, down from a decade high of $35.6 billion in 2014.

PROCESSING OF MINERALS

Canada has a large mineral-processing industry, with 33 non-ferrous metal smelters, refineries and conversion facilities in seven provinces (see *Figure 9*). Some of these facilities contain both a smelter and a refinery.

CANADA'S MINERAL-PROCESSING FACILITIES

New Brunswick: 1 smelter

Quebec: 9 smelters, 4 refineries, 2 secondary smelters

Ontario: 2 secondary smelters, 3 refineries, 3 smelter/refineries, 1 conversion facility

Manitoba: 1 smelter/refinery, 1 refinery

Alberta: 1 refinery

British Columbia: 1 smelter, 1 secondary smelter, 1 smelter/refinery, 1 processing plant

Newfoundland and Labrador: 1 refinery

Canada's integrated smelters and refineries were built in proximity to world-class mines, most located inland, without access to low-cost marine transport. As local ore reserves increasingly become depleted (discussed in Section 3) and the production of base metal concentrate declines, smelters and refineries are transitioning from integrated production to the more expensive custom treatment of concentrates imported from other countries. Additionally, they are also using more secondary raw materials and scrap feed.

The quantity and value of refined metal production in Canada have become irregular due to the depletion of reserves and greater dependence on imported concentrates. *Figure 10* shows that the production volumes for refined metals over the past 10 years have been mixed. Nickel, lead, cobalt, cadmium and aluminum have increased, while copper and zinc have decreased.

The competitiveness of Canada's mineral-processing industry depends largely on the ability to secure reliable sources of feedstock from domestic mines – a supply that, in recent years, has gone into decline. Importing feedstock from abroad greatly influences the cost and profitability of domestic refining and smelting operations. If the industry is to remain competitive, enhancing domestic levels of mineral production through requisite investment in exploration and development is essential.

Other factors also influence the competitiveness of Canada's mineral-processing industry. Canada's processing facilities operate in a global arena, where China and other countries are expanding their capacity and competing fiercely for raw materials. The cost of electricity is also a factor in some Canadian jurisdictions. Given the energy-intensive nature of these value-added processes, high-cost power jurisdictions dampen the competitiveness of existing operations and can deter future investment. Finally, the age of some Canadian operations, and their ability to meet potential regulatory requirements, also affects their viability.

In the face of these combined factors, the downstream Canadian mining industry risks being left behind. At stake are the benefits Canada has historically derived from a robust value-added mineral-processing and manufacturing sector, such as stable, long-term and high-paying employment. For example, primary metal manufacturing accounted for nearly 65,000 jobs in 2016. Adding non-metallic mineral product manufacturing increases that number by nearly 56,000 jobs. Both sectors combined account for almost one-third of the industry's overall employment for the year. While significant, these numbers have been in decline. Since 2007, employment in primary metal manufacturing has dropped by nearly 17,000 jobs.

ArcelorMittal, Quebec

TRANSPORTATION OF MINING PRODUCTS

Canada's logistics supply chain is critical to the flow of mined and refined products to both domestic and international markets. The mining industry is the largest industrial customer group of Canada's transportation sector, providing it with considerable tonnage, especially in select bulk commodities such as iron ore, coal, potash and sulphur.

Rail

As the largest shipper by both freight revenue and volume shipped, the mining industry is the Canadian rail system's most significant customer. In 2016, shipments of coal, iron ore and other minerals and metals represented 51.3% of total Canadian rail freight revenue (see *Figure 11*).

Canada's rail freight system operates primarily as a dual monopoly, shared by CN and CP – Canada's only Class I railways. Communities and businesses are often served by only one of these companies, which gives rail customers little or no competitive choice. Mining operations are frequently captive to only one railway given the remoteness of their locations.

In 2008, the *Canada Transportation Act* was amended to better protect shippers from potential abuse of market power by railways. The changes, supported by MAC and the Canadian mining industry, improved the balance between rail customers' interests (lower rates, better service) and those of rail companies (higher rates, more profit) by strengthening the ability to arbitrate disputes over rail fees and ancillary charges. While these measures were an improvement, challenges have persisted in the relationship between railways and rail customers.

As a follow-up to these legislative changes, the federal government launched the Rail Freight Service Review in 2010, aiming to identify service problems, examine best practices, and recommend remedies to improve service. Despite the resulting recommendations, the federal government's commitment to table legislation to enact a shipper's right to a service-level agreement fell short, as specific service provisions were not legislated in the *Fair Rail Freight Service Act*. The inadequacy of the Act resulted in continued rail service failures across all shipping sectors. The government responded with the *Fair Rail for Grain Farmers Act*, which enacted narrow grain-sector-specific legislative measures without any consultation. The scale of this issue garnered national media attention, and in June 2014, then-Minister of Transport, the Honourable Lisa Raitt, launched the 2015 statutory review of the *Canada Transportation Act* ahead of schedule.

At the time of writing, the government has extended the *Fair Rail for Grain Farmers Act* provisions for another year and is studying the measures. This fragmented approach to addressing a systemic issue is likely to further exacerbate long-standing service issues. As the largest single-customer group of Canada's Class I railways, and accounting for 19% of Canada's export value, mining companies require a reliable logistics supply chain to compete internationally.

Transportation Modernization Act

Most recently, in spring 2017, and building on *Transportation 2030: A Strategic Plan for the Future of Transportation in Canada*, the Minister of Transport, the Honourable Marc Garneau, tabled Bill C-49, the *Transportation Modernization Act*. At a high level, among other measures, Bill C-49 would mandate more data disclosure than what is currently required, introduce a long-haul interswitching mechanism with the goal of reducing shipper captivity to a single railroad, and more granularly define the term "suitable and adequate" service.

While the package of reforms is encouraging, MAC is concerned that some measures do not go far enough. Furthermore, some of the proposed changes contain structural limitations that may prevent the government from achieving its intended result through the legislation. For example, while Bill C-49 proposes positive measures to address service-level data deficiencies, MAC is concerned that, as written, certain transparency provisions will not lead to meaningful data on supply chain performance.

Trucking

Trucking plays a smaller yet important role in moving mining products. This, for the most part, has to do with the sheer volume of mined materials needing shipment, the remote location of many mining operations, and the factors that determine the economic viability of freight shipment by rail versus truck.

According to the federal government's report, *Transportation in Canada* (2016), trucks carried more than $223 billion in Canadian exports in 2016, 10% of which ($21.9 billion) were mining-related products. Trucks carried $295 billion in imports to Canada, 9% of which ($25 billion) were mining-related products. *Note there is no detailed information about domestic truck shipments by commodity.*

Another key role trucking plays in the mining industry is the delivery of mining supply inputs to mine sites, such as fuel for operations. Mining sites that do not have access to rail rely on truck and marine shipping for these materials.

Marine

Mining is also a leading customer of Canadian ports. In 2016, the Port of Montreal handled large volumes of iron ore and salt, as well as other mineral products such as fertilizer, ores, gypsum and scrap metal. Total mined products accounted for 3.1 million tonnes, or 47%, of the port's dry bulk cargo shipments for the year. Generally, these arrive by ship as inbound cargo and are then transported by rail or truck to the region's smelting and refining facilities.

Beyond Montreal, the mining industry is a major contributor to Canada's St. Lawrence Seaway. According to the 2016 *Traffic Report*, prepared jointly by the Seaway's management and development corporations, shipments of iron ore, coke and coal represented 27.7% of total seaway traffic in 2016, with iron ore accounting for the single-largest share of any commodity shipped. Total mining products accounted for 39.9% of total volume.

Steelmaking coal accounted for 28% of the total volume handled at the Port of Vancouver in 2016, which moves shipments to China, Japan and other Asian markets. Fertilizer/potash represents another 11% of the port's volume, and minerals and ores another 13%. All told, mining products account for 54 million tonnes, or nearly 44%, of the port's volume.

Mining also accounts for a sizeable amount of the value of Canadian exports moved by ship to international markets. According to *Transportation in Canada* (2016), Canada transported $175.3 billion in industrial exports by ship to non-US countries in 2016. Of that, base metals ($13.6 billion), metallic ores ($8.9 billion), and non-metallic minerals, coal and stone ($7.3 billion) were the most valuable mining products.

Internationally, the International Maritime Organization (IMO) regulates pollution and safety practices at sea. Recent changes to the IMO's MARPOL Convention and the International Maritime Solid Bulk Cargoes Code will have implications for the way mining companies ship their products. (See Section 6 of this report for more discussion.)

Pipelines

The North American energy landscape is changing rapidly. Historically, Canadian oil companies shipped the majority of their product to the United States, which was reliant on imports to meet its oil demand. However, hydraulic fracturing to produce oil and gas from shale and tight rock formations is transforming the United States into a self-sufficient energy producer. Even in a low price environment, this development has drastically reduced the country's needs for imported oil. Meanwhile, growth in global oil demand has shifted to Asia, with China surpassing the United States as the world's largest oil importer.

This shift in demand is challenging Canadian oil companies because existing transportation infrastructure is impeding their ability to access global markets. It is important to note that there are costs associated with the inadequacy of Canada's existing pipeline network. Declining US demand, together with insufficient pipeline capacity and transportation bottlenecks in the US Midwest, are driving down the price for Canadian crude oils relative to other crude oils.

To address this situation, Canada must develop new pipeline and port infrastructure to reach markets in Asia, the US Gulf Coast, eastern Canada, and the US seaboard markets. The approval of the Kinder Morgan Trans Mountain Expansion project is an important step in this direction, and US approval of the Keystone XL pipeline is welcome. ■

FIGURE 6
VALUE OF CANADIAN MINERAL PRODUCTION, 1999–2016[P]

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$ billions	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016[P]
Metals	9.7	11.0	10.4	10.4	9.7	12.4	14.6	21.1	26.2	22.6	15.5	21.4	25.6	23.6	23.5	24.2	23.1	23.2
Non-metals	7.3	7.4	7.6	7.9	8.9	10.3	10.5	10.3	11.6	19.4	11.6	14.7	17.8	16.5	15.5	15.8	16.5	14
Coal	1.5	1.4	1.6	1.6	1.5	1.6	2.9	2.9	2.7	5.0	4.4	5.5	7.5	5.9	4.9	3.9	3.1	3.6
Total Mineral Production	**18.5**	**19.8**	**19.6**	**20.0**	**20.1**	**24.4**	**28.0**	**34.2**	**40.6**	**47.0**	**31.4**	**41.6**	**50.9**	**45.9**	**43.9**	**43.9**	**42.8**	**40.8**

Sources: Natural Resources Canada; Statistics Canada.
[P] Preliminary.
Notes: This table includes the production of coal but excludes the production of petroleum and natural gas. Numbers may not add to totals due to rounding.

FIGURE 7

CANADA'S TOP TEN METALLIC AND NON-METALLIC MINERAL PRODUCTS, BY VALUE OF PRODUCTION, 2006 AND 2016[P]

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	Unit of Measure	2006		2016[P]	
		Quantity ($ millions)	$ Value ($ millions)	Quantity ($ millions)	$ Value ($ millions)
Gold	000 kg	104	2,281	156	8,345
Potash (K_20)[1]	kt	8,518	2,241	10,154	3,889
Copper	000 t	586	4,470	702	4,455
Iron Ore	kt	33,543	2,530	47,083	3,754
Nickel	000 t	225	6,166	227	2,850
Coal	kt	65,895	2,886	60,502	3,555
Diamonds	000 ct	13,278	1,599	11,104	1,621
Sand and gravel	kt	238,515	1,276	315,588	2,713
Cement[2]	kt	14,586	1,673	12,243	1,690
Stone	kt	153,897	1,373	152,059	1,635

Sources: Natural Resources Canada; Statistics Canada.
[P] Preliminary.
Notes: [1] Shipments of potash to Canadian potassium sulphate plants are not included in this table. [2] Includes exported clinker minus imported clinker. Data include shipments by producers regardless of their industrial classification.

FIGURE 8

PRODUCTION OF SYNTHETIC CRUDE OIL BY OIL SANDS MINING PLANTS, ALBERTA AND CANADA, BY QUANTITY AND VALUE, 1998-2016

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	Synthetic Crude Oil (000's of m^3)	Total Crude Oil and Equivalents (000's of m^3)	Synthetic Crude as % of Total	Synthetic Crude Oil ($000)	Total Crude Oil and Equivalents ($000)	Synthetic Crude as % of Total
ALBERTA						
1998	17,870.8	94,676.2	18.9	2,313,518	9,734,475	23.8
1999	18,766.9	89,065.5	21.1	3,252,547	13,727,829	23.7
2000	18,608.0	89,136.1	20.9	5,188,916	21,687,681	23.9
2001	20,260.6	89,364.5	22.7	4,995,003	17,734,825	28.2
2002	25,494.6	89,885.1	28.4	6,455,743	19,778,759	32.6
2003	25,028.8	95,311.4	26.3	6,777,342	22,187,602	30.5
2004	26,661.9	101,007.0	26.4	8,570,468	27,767,704	30.9
2005	21,932.5	98,878.7	22.2	9,213,624	33,282,754	27.7
2006	28,764.2	106,017.8	27.1	14,831,145	38,498,843	38.5
2007	39,900.2	108,853.3	36.7	18,012,945	42,130,415	42.8
2008	38,020.7	108,322.4	35.1	25,214,415	62,941,690	40.1
2009	44,330.8	112,937.7	39.3	19,043,537	43,934,049	43.3
2010	46,110.5	119,559.3	38.6	23,473,269	54,005,153	43.5
2011	49,375.1	129,183.4	38.2	30,518,182	69,033,911	44.2
2012	52,455.2	143,873.9	36.5	28,588,084	69,346,737	41.2
2013	54,328.1	154,324.2	35.2	34,382,129	79,535,264	43.2
2014	55,345.9	168,971.7	32.8	35,467,401	94,140,139	37.7
2015	56,646.4	179,262.9	31.6	21,512,827	57,544,954	37.4
2016	54,072.0	179,200.3	30.2	19,276,126	51,960,053	37.1
CANADA						
1998	17,870.8	128,400.3	13.9	2,313,518	12,940,149	17.9
1999	18,766.9	122,287.0	15.3	3,252,547	18,698,282	17.4
2000	18,608.0	127,769.2	14.6	5,188,916	30,523,595	17
2001	20,260.7	128,951.0	15.7	4,995,003	24,911,953	20.1
2002	25,494.6	136,969.8	18.6	6,455,743	29,956,080	21.6
2003	25,028.8	144,813.2	17.3	6,777,342	33,610,498	20.2
2004	26,661.9	149,159.6	17.9	8,570,468	40,639,940	21.1
2005	21,932.5	146,207.9	15.0	9,213,624	49,159,801	18.7
2006	28,764.2	161,434.0	17.8	14,831,145	63,649,683	23.3
2007	39,900.2	160,448.3	24.9	18,012,945	62,919,592	28.6
2008	38,020.7	158,950.4	23.9	25,214,415	91,757,005	27.5
2009	44,330.8	158,100.4	28.0	19,043,537	61,558,676	30.9
2010	46,110.5	165,335.3	27.9	23,473,269	75,174,373	31.2
2011	49,375.1	175,312.1	28.5	30,518,182	95,496,704	32.3
2012	52,455.2	189,133.7	27.7	28,588,084	94,076,834	30.4
2013	54,328.1	202,292.6	26.9	34,382,129	106,507,173	32.3
2014	55,345.9	218,050.8	25.4	35,467,401	122,128,728	29.0
2015	56,646.4	224,148.7	25.3	21,512,827	72,078,786	29.8
2016	54,072.0	225,128.2	24.0	19,276,126	65,425,673	29.5

Sources: Natural Resources Canada; Statistics Canada.

FIGURE 9
NON-FERROUS SMELTERS AND REFINERIES IN CANADA, 2016

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Owner/Operator	Operation	Type of facility	Location	Outputs
Newfoundland and Labrador				
Vale Newfoundland and Labrador Limited	Long Harbour	(Ref.)	Long Harbour	Ni, Cu, Co
New Brunswick				
Glencore Canada Corporation	Brunswick	(Sm.)	Belledune	Pb, Ag, Bi
Quebec				
Rio Tinto Aluminum Inc./Aluminium Austria Metall Québec/Hydro Aluminium a.s./Société générale de financement du Québec/Marubeni Québec Inc.	Alouette	(Sm.)	Sept-Îles	Al
Alcoa Inc.	Baie-Comeau	(Sm.)	Baie-Comeau	Al
Rio Tinto Aluminum Inc.	Grande-Baie	(Sm.)	Grande-Baie	Al
Rio Tinto Aluminum Inc.	Laterrière	(Sm.)	Laterrière	Al
Rio Tinto Aluminum Inc.	Vaudreuil Works	(Ref.)	Jonquière	Alumina
Rio Tinto Aluminum Inc.	Arvida	(Sm.)	Arvida	Al
Rio Tinto Aluminum Inc.	Alma	(Sm.)	Alma	Al
Alcoa Inc.	Deschambault	(Sm.)	Deschambault	Al
Alcoa Inc./Rio Tinto Aluminum Inc.	Bécancour	(Sm.)	Bécancour	Al
Glencore Canada Corporation	CCR	(Ref.)	Montréal-Est	Cu, Au, Ag, Se, Te, Ni, PGM
Terrapure Environmental	Sainte-Catherine	(Ref.), (Sec. Sm.)	Sainte-Catherine	Recycled Pb
Glencore Canada Corporation	General Smelting Company of Canada	(Sec. Sm.)	Lachine	Recycled Pb
Glencore Canada Corporation/Noranda Income Fund	Canadian Electrolytic Zinc Limited (CEZinc)	(Ref.)	Valleyfield	Zn, Cd, S*
Glencore Canada Corporation	Horne	(Sm.)	Rouyn-Noranda	Cu, Au, Ag

Source: Natural Resources Canada.
Notes: Included are operations that produced in 2014.
(Sm.) Smelter.
(Ref.) Refinery.
(Sec. Sm.) Secondary smelter.
(Pl.) Plant.
(Con. Fac) Conversion facility.
S Sulphuric acid.*

FIGURE 9 CONTINUED
NON-FERROUS SMELTERS AND REFINERIES IN CANADA, 2016

Owner/Operator	Operation	Type of facility	Location	Outputs
Ontario				
Royal Canadian Mint	Ottawa	(Ref.)	Ottawa	Au, Ag, Cu, PGM
Cameco Corporation	Port Hope	(Con. Fac.)	Port Hope	U
Vale Canada Limited	Port Colborne	(Ref.)	Port Colborne	Electrolytic Co, PGM, Co oxide
Tonolli Canada Ltd.	Mississauga	(Sec. Sm.)	Mississauga	Recycled Pb
Real Alloy Canada Ltd.	Mississauga	(Sec. Sm.)	Mississauga	Recycled Zn
Asahi Refining Canada Ltd.	Brampton	(Sm.), (Ref.)	Brampton	Au, Ag, Recycled Pb
Glencore Canada Corporation	Sudbury	(Sm.), (Pl.)	Sudbury	Ni, Cu, Co, Au, Ag, PGM
Vale Canada Limited	Copper Cliff Complex	(Sm.), (Ref.), (Pl.)	Sudbury	Ni, Au, Ag, Se, Te, PGM, S*
Cameco Corporation	Blind River	(Ref.)	Blind River	U
Manitoba				
Vale Canada Limited	Thompson	(Sm.), (Ref.)	Thompson	Ni, Cu, Co
HudBay Minerals Inc.	Flin Flon	(Ref.)	Flin Flon	Zn
Alberta				
Sherritt International Corporation/General Nickel Company S.A. (The Cobalt Refinery Company Inc.)	The Cobalt Refinery Company Inc.	(Ref.)	Fort Saskatchewan	Ni, Co, Cu sulphide, ammonium sulphate
British Columbia				
Teck Resources Limited	Trail	(Sm.), (Ref.), (Pl.)	Trail	Zn, Pb, Bi, Cd, In, Ge, Au, Ag, S*
Metalex Products Ltd.	Richmond	(Sec. Sm.)	Burnaby	Recycled Pb
Rio Tinto Alcan Inc.	Kitimat	(Sm.)	Kitimat	Al

Source: Natural Resources Canada.
Notes: Included are operations that produced in 2014.
(Sm.) Smelter.
(Ref.) Refinery.
(Sec. Sm.) Secondary smelter.
(Pl.) Plant.
(Con. Fac) Conversion facility.
S Sulphuric acid.*

FIGURE 10

CANADIAN PRODUCTION OF SELECTED REFINED METALS, 2004-2016[P]

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Metals	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016[P]
Aluminum	2,592,160	2,894,204	3,051,128	3,082,625	3,120,148	3,030,269	2,963,210	2,987,964	2,780,556	2,967,364	2,858,238	2,880,035	3,208,707
Cadmium	1,880	1,727	2,090	1,388	1,409	1,299	1,357	1,240	1,286	1,313	1,187	1,159	2,305
Cobalt	4,673	4,618	4,555	4,883	4,899	4,358	4,145	5,317	5,322	4,012	4,527	5,504	5,584
Copper	526,955	515,223	500,463	453,453	442,050	335,896	319,618	273,761	275,990	321,511	325,352	330,902	314,074
Lead	241,169	230,237	250,464	236,688	259,094	258,854	273,017	282,589	279,150	281,781	281,456	262,396	273,299
Nickel	151,518	139,683	146,899	153,647	167,732	116,909	105,413	142,445	139,800	137,410	149,486	106,039	158,381
Zinc	805,438	724,035	824,464	802,103	764,310	685,504	693,014	662,151	648619 r	651,638	649,217	683,118	685,409

Sources: Natural Resources Canada; Statistics Canada.
[P] Preliminary.

FIGURE 11

CRUDE MINERALS AND PROCESSED MINERAL PRODUCTS TRANSPORTED BY CANADIAN RAILWAYS, 2004-2016[P]

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(million tonnes)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Freight Volume [1]	251.2	260.7	258.7	255.7	244.4	212.9	235.4	250.8	253.5	268.0	277.9	287.3	281.7
Total Crude Minerals	111.9	118.1	113.4	117.5	117.4	87.4	112.4	114.9	107.7	115.9	116.5	127.3	124.3
Total Processed Mineral Products	17.0	17.0	17.9	17.6	17.5	14.9	15.4	16.8	18.6	20.4	19.9	20.3	20.3
Total Crude and Processed Minerals	**128.9**	**135.1**	**131.3**	**135.2**	**134.8**	**102.4**	**127.8**	**131.7**	**126.3**	**136.3**	**136.5**	**147.6**	**144.6**
Crude Minerals and Processed Mineral Products as a Percentage of Total Freight Volume	51.3	51.8	50.7	52.9	55.2	48.1	54.3	52.5	49.8	50.9	49.1	51.4	51.3

Sources: Natural Resources Canada; Statistics Canada.
[P] Preliminary.
Notes: [1] Total freight volume reflects revenue freight, which refers to a local or interline shipment from which earnings accrue to a carrier. Total crude minerals include coal, but not oil and gas. Totals may not add due to rounding. Values for 2004 to 2014 have been revised.

— SECTION 3 —

THE MONEY: RESERVES, PRICES, FINANCING, EXPLORATION AND INVESTMENT

THE FINANCIAL HEALTH OF THE MINERAL EXPLORATION AND MINING SECTOR CAN BE MEASURED BY EXPLORATION AND DEPOSIT APPRAISAL AND BY CAPITAL SPENDING, BOTH OF WHICH ARE FACTORS IN MINERAL AND METAL PRICES. GAUGING SPENDING LEVELS ALSO HELPS TO PREDICT THE FUTURE OF CANADA'S MINERAL PRODUCTION.

CANADIAN RESERVES

The past 30 years have seen marked declines in proven and probable Canadian mineral reserves in all major base metals (see *Figure 12* and *Annex 6*). Since 1980, the most dramatic declines have been in lead (99%), zinc (89%) and silver (84%) reserves, while copper (40%) and nickel (67%) reserves have fallen significantly as well.

Recent years have shown fluctuating growth for certain commodities. Since 2009, gold, silver and copper reserves have fluctuated, with gold at historic highs and copper at heights not seen since the early 1990s. Zinc, lead and nickel, on the other hand, have ebbed downward, with current levels suggesting continued decline.

Consistent investment over time and access to large tracks of land to explore are needed to reverse the long-term decline in proven and probable reserves. To ensure the Canadian mining industry maintains its competitive advantage in this crucial area, the federal and provincial governments should continue to invest in geoscience and strengthen policies that provide incentives for exploration spending within Canada's borders.

MINERAL AND METAL PRICES

Mineral and metal prices are affected daily by global economic events. Prices for mined products are driven largely by the strength and performance of major economies. China, in particular, buys approximately 50% of the world's base metals, up from just 5% in the 1980s. Additionally, as a means of controlling exports of key commodities, China stockpiles iron ore, aluminum, copper, nickel, tin, zinc and oil when prices are low, making it difficult for analysts to forecast prices for minerals.

Figure 13 illustrates the strong growth, on an annual basis, in mineral prices from 2000 to 2007, the dramatic decline for most metals in late 2008, the robust rebound of prices through 2011, and the subsequent downward pressure on many minerals and metals during the recent downturn. Most recently, however, upward momentum has occurred across a number of minerals and metals, including aluminum, copper, nickel and zinc (see *Figure 14*). This suggests that the bottom of the recent downturn has been reached, and global demand for mining products is once again on the rise.

The general consensus is that demand for mineral and metal products should be favourable over the medium to long term. Rising incomes and increased prosperity in developing countries due to industrialization and urbanization will continue to drive global demand, as will the transition to a lower carbon future. With the gradual emergence of India and its demand for minerals and metals – which some speculate will overtake China by 2050 – the mining industry should enjoy favourable commodity prices despite anticipated periods of market volatility.

FINANCING

Canada is the leading global centre for mining finance. The Toronto Stock Exchange (TSX) and TSX Venture Exchange (TSX-V) list 57% of the world's publicly traded mining companies. As of September 30, 2017, 225 of the firms listed on the TSX are mining companies.

Together, they have a combined market value of $271.3 billion and account for $3 billion of the total equity raised. TSX-listed mining companies mainly deal in gold, uranium, copper, silver, nickel, iron ore, zinc and molybdenum.

The TSX-V gives emerging companies efficient access to capital while offering investors a regulated market for venture investments. As of September 30, 2017, the 989 mining companies listed on the TSX-V have a combined quoted market value of $21.3 billion and raised $2.5 billion in equity capital year-to-date – roughly a $1 billion increase from the same time last year. While a positive indicator, junior mining companies continue to face challenges in raising capital, which is further discussed below.

TSX-LISTED MINING COMPANIES (SEPTEMBER 2017)

On the TSX: 1,214

- **Senior TSX companies:** 225
- **TSX-V companies:** 989

Global Financing

The global mining industry raised $22.7 billion in equity in 2016, up nearly $3 billion from the previous year. As *Figure 15* shows, while this level of equity is substantially lower than during peak levels of the super-cycle, it has increased consecutively over the past two years, and also represents a seven-fold increase over the $3.1 billion raised in 2000.

In 2016, 57% of all global mining equity financings were done on the two exchanges, representing over 40% of the equity capital raised globally for the same year. Also noteworthy is that the TSX and TSX-V's share of global mining equity raised in 2016 ($9.4 billion) represents a one-third increase year-over-year.

The large proportion of public financings conducted on the TSX reflects the exchange's appeal to both junior and senior companies. The TSX-V's unique ability to efficiently handle equity financings in the $1 million to $5 million range is one reason why Canadian companies lead the exploration business.

TSX-listed mining companies also have a strong global focus. As of January 2017, TSX and TSX-V companies were involved in 6,418 mineral projects worldwide (see *Figure 16*), with more than half of them in Canada.

Most of the projects involve exploration, and very few will turn into operating mines. However, the locations do illustrate the prime areas of mining interest.

EXPLORATION

The goal of exploration is to locate large, high-grade reserves with minimal disturbance to the ground and the environment. Technological advances, including GPS surveying, airborne technologies and down-hole seismic imaging, have enabled companies to locate new deposits previously beyond discovery using traditional methods. Like research and development, exploration requires healthy levels of investment over the long term for success.

Exploration and subsequent mine development are required to maintain healthy reserve levels. If this does not happen, the value-added aspects of Canada's mining industry – such as smelting, refining and manufacturing – will diminish over time, and national and regional economies that benefit from strength in sectors such as manufacturing will weaken.

Exploration and Deposit Appraisal in Canada

The financial health of the mineral exploration sector can be measured by spending on exploration and deposit appraisal. Gauging spending levels also assists in predicting the future of Canada's mineral production. Natural Resources Canada (NRCan), which provides the numbers below, defines the two kinds of spending as follows:

- **Exploration expenditures.** Spending on activities up to and including the first delineation of a previously unknown mineral deposit.
- **Deposit appraisal expenditures.** Spending on activities that bring a delineated deposit to the stage of detailed knowledge required for a production feasibility study.

The two expenditures combined are generically called "exploration spending."

In 2016, exploration spending fell for the fifth consecutive year, by 15% to $1.6 billion, which is well below the low experienced during the financial crisis in 2009 (see *Figure 17*). From the all-time high of $4.2 billion in 2011, this marks a 63% drop. Spending intentions for 2017 anticipate that investment levels will increase by 18% to $1.8 billion, marking a much welcomed turnaround. Actual spending may exceed these intentions, however, in light of improved price performance across a number of commodities over the course of 2016.

Financing for the Junior Mining Sector

A major issue for junior mining companies is the persistent challenge of raising capital, especially since financing for mineral exploration has fallen so dramatically. SNL Metals & Mining recently calculated that the minerals and metals industry's total budget for non-ferrous metals exploration was US$6.88 billion in 2016, down 21% over 2015 levels and approaching less than one-third of the record high of $20.5 billion in 2012.

Indicative of this dampened financial investment climate is the reversal in exploration and deposit appraisal expenditures. For example, in 2007, junior companies accounted for the majority (67%) of expenditure on these activities, with majors accounting for the balance (see *Figure 18*). From 2007 until 2016, juniors accounted for less each year, and the majors' share grew to 63%. However, 2017 intentions mark the first year in a decade where juniors' share of exploration and deposit appraisal has increased.

Allocation of Investment by Minerals and Metals

Precious metals attracted the lion's share of Canadian exploration spending again in 2016, accounting for 60% overall (see *Figure 19*). In 2016, spending intentions were $928.4 million, a 20% increase year-over-year. This positive trend reflects the renewed confidence in the global economic outlook and upticks in precious metal prices.

Base metal exploration's share of total investment dropped significantly year-over-year, slipping from 19% in 2015 to 13% in 2016. Unfortunately, this development is consistent with a longer-term trend of reduced investment in base metal exploration over the last decade. This trend correlates to and reinforces the ongoing depletion of Canadian base metal reserves, the replenishment of which is not keeping pace with global demand for these highly important metals. Without sustained and effective exploration, Canadian base metal production will outstrip reserve additions, reducing the competitiveness of our smelters and refineries.

Also noteworthy is a significant drop in diamond exploration – by roughly two-thirds – over the last decade. This will have profound implications for the communities and people who benefit from the economic opportunities the industry directly and indirectly generates, especially in remote and northern regions where alternative opportunities are limited.

International Exploration

Globally, Canada has been a top destination for mineral exploration investment for the past 36 years.

Canada dropped to second place in 1992 for non-ferrous exploration budgets, surpassed by Australia. In 2004, however, Canada regained the top position where it has remained since. In 2016, Canada attracted 14% of global non-ferrous exploration budgets (see *Figure 20*).

Based on data from nearly 1,580 companies, SNL Metals & Mining determined that worldwide exploration investment in 2016 fell to US$6.89 billion for non-ferrous metals. This is a 20% decrease year-over-year, and a 66% drop from the all-time record high of US$20.53 billion in 2012.

Exploration figures for iron ore are excluded from the above figures, but in the past have increased the total significantly. For example, in 2015, the inclusion of iron ore increased the total budget by nearly $1 billion.

When exploration budgets factor in iron ore, SNL data indicate that Canada no longer attracts the single-largest share of total global mineral exploration budgets, conceding first place to Australia. Australia's attractiveness as a destination for investment has increased recently with its introduction of a flow-through share mechanism to bolster investment in early stage exploration. This should sound a warning for Canadian policy makers: Canada's attractiveness as a destination for mineral exploration investment is waning.

Only a handful of major discoveries and projects will come into production within the next five years, and many new developments will be smaller scale. The industry is still paying for the period of low exploration spending in the 1990s and early 2000s when the last super-cycle began. The dramatic rise in this spending during the 2000s, in tandem with rising metal prices, was offset to some extent by the rising costs of drilling, assaying, geosciences expertise, fuel and other inputs. As well, regulatory and infrastructure challenges are lengthening the time it takes for new discoveries to develop into producing mines. The decrease in global exploration spending in recent years will further decrease the rate at which major discoveries are made.

INVESTMENT

Capital Spending

Capital spending is a barometer of how confident managers and investors are about current production capacity and future demand. Capital spending enables improvements such as:

- New mine construction and increases to existing mine capacity
- Process and technology improvements

- Modernization and expansion of smelters and refineries
- New product lines
- Mill improvements
- Energy retrofits
- Environmental improvements

Government and business capital spending also open up new regions for development. The extension of the Highway 37 transmission line in northeastern British Columbia is a good example of a long-term strategic infrastructure investment. Notably, this capital cost of $400 million will enhance the economics of an estimated $15 billion in mineral projects, with one project already built – the $450 million, 300-person Red Chris mine owned by Imperial Metals. Similarly, the extension of the Monts Otish Highway in northern Quebec will improve future prospects for the development of gold, diamond and copper projects in the surrounding region.

Most recently, the federal government announced $155 million for the T'licho Road in the Northwest Territories, and $360 million for the Yukon Resource Gateway to expand several road networks in the territory.

These projects will enhance the economics of several mining projects, such as Fortune Minerals' Nico project in the Northwest Territories, Goldcorp's Kaminak Gold project, and Western Copper and Gold's Casino project in the Yukon. In addition, the infrastructure will reduce exploration costs, improving land access.

The above investments are part of the current federal government's transformative infrastructure plan, which also includes the establishment of the Canada Infrastructure Bank. Capitalized at $35 billion, the institution is intended to leverage private sector investment to deliver on $200 billion worth of infrastructure investment. This presents significant opportunities for partnership in the development of wealth-generating and trade-enabling infrastructure. (See Section 4 of this report for more details.)

Mining Industry Capital Investment

In 2016, capital spending in the Canadian mining industry accounted for 5.4% of Canada's total at $12.9 billion. This amount is down 15% from the previous year, and marks the fourth consecutive year that capital spending has fallen (see *Figure 21*). For 2017, capital investment is projected to be $11 billion.

Although capital spending covers all four stages of the industry, some 90% is typically invested in the first two stages, extraction (Stage 1) and smelting/refining (Stage 2).

Within Stage 1, approximately two-thirds of capital spending goes towards construction and one-third towards machinery and equipment. Within Stage 2, the ratio is reversed, with about one-fifth of spending directed to construction and the rest to machinery and equipment.

Spending on repairs, most of which falls into the machinery and equipment category, is not included in Figure 21. These data lag behind capital expenditure data by one year. However, adding 2015 repair costs (about $4.1 billion) to 2016 capital ($12.9 billion) and exploration ($1.6 billion) spending produces roughly $19 billion in Canadian mineral development investment in 2016.

Figure 21 also shows capital investment in the oil sands, where spending was $23.2 billion in 2015 and is projected to fall to $13 billion in 2016. The substantial year-over-year projected drop reflects the sharp decline in oil price from $115 per barrel in June 2014 to around $45 per barrel, where it has hovered over the last 18 months.

Agnico Eagle Mines Limited, Goldex Mine, Quebec

Current and Future Investments

Healthier commodity prices have returned a cautious optimism to the global mining industry, which could lead mining companies to make new and significant investments. However, there are also recent indicators that Canada's competitiveness as a destination for mineral investment is eroding, just as an upturn in the industry is underway:

- Capital investment in the mining sector has declined each year since 2012, with investment intentions for 2017 in line with this trend.
- Only two new mining projects were submitted to the federal environmental assessment registry under the *Canadian Environmental Assessment Act* (CEAA 2012) in 2016 – an historic low.
- Australia's mining supply sector surpassed Canada's in 2015.
- Canada has lost ground over the past five years, losing its ranking for seven out of 13 commodities for which it had been a top-five producer.

Beyond the above quantitative metrics, qualitative indicators from MAC member companies suggest that Canada's competitiveness is declining compared to other jurisdictions. Mining companies are assessing these jurisdictions more closely as alternative destinations for developing projects.

A proxy indicator that is particularly concerning is the nine consecutive quarters of negative business growth in Canada, dating from Q4 2014.

A recent NRCan report, *Natural Resources: Major Projects Planned and Under Construction – 2017 to 2027*, presents a grim picture of major mining project investments in Canada in recent years. The report indicates that the total number of projects planned and under construction has declined by one-third (49 projects), dropping more than 50% ($86 billion) in value from June 2014 to June 2017.

Metal mines experienced the single-largest drop, accounting for 81% of the suspended projects and 79% of the suspended investments (see *Figure 22*).

Although mineral prices were in decline in recent years, they account for only part of the drop in mineral investment. In 2016, the year in which Canada's total mining project investment decreased by approximately $50 billion, Australia's capital expenditure rose for 18 consecutive months, according to the Minerals Council of Australia. This suggests that more than just mineral pricing determines where companies invest, and that they are increasingly more confident in Australia than in Canada as a destination for their investments.

Mining Industry Competitiveness and Federal Public Policy

MAC maintains that federal policies have dampened Canada's competitiveness as a destination for mineral investment. Reviews of federal environmental legislation, the pan-Canadian climate change policy, long-standing transportation challenges, tax competitiveness concerns, and trade developments all contribute to the uncertain policy landscape in Canada. The Canadian mining industry is awaiting the outcomes of major government decisions in policy areas of concern – all of which are critically important to our maintaining our competitiveness.

At risk is a key sector of the Canadian economy and our position as a world leader in sustainable mining practices. Mining is a significant engine of the Canadian economy, and supports many other important sectors of the Canadian economy, such as construction, manufacturing and transportation. While Canada remains one of the top mining countries, its leadership in this arena is not guaranteed. If Canada loses its competitiveness, this will translate into an increasing amount of exploration and mining investments flowing offshore, job losses, deteriorating trade balances and, overall, a weakening of our economic strength. ■

FIGURE 12
CANADIAN RESERVES OF SELECTED METALS, 1980 - 2015

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Metal Contained in Proven and Probable Mineable Ore[1] in Operating Mines[2] and Deposits Committed to Production[3]

Year	Copper (000 t)	Nickel (000 t)	Lead (000 t)	Zinc (000 t)	Molybdenum (000 t)	Silver (t)	Gold (t)
1980	16,714	8,348	9,637	27,742	551	33,804	826
1985	14,201	7,041	8,503	24,553	331	29,442	1,373
1990	11,261	5,776	5,643	17,847	198	20,102	1,542
1995	9,250	5,832	3,660	14,712	129	19,073	1,540
2000	7,419	4,782	1,315	8,876	97	13,919	1,142
2003	6,037	4,303	749	6,251	78	9,245	1,009
2004	5,546	3,846	667	5,299	80	6,568	787
2005	6,589	3,960	552	5,063	95	6,684	958
2006	6,923	3,940	737	6,055	101	6,873	1,032
2007	7,565	3,778	682	5,984	213	6,588	987
2008	7,456	3,605	534	5,005	222	5,665	947
2009	7,290	3,301	451	4,250	215	6,254	918
2010	10,747	3,074	400	4,133	254	6,916	1,473
2011	10,570	2,936	247	4,812	256	6,954	2,225
2012	10,364	2,617	126	4,163	256	5,598	2,148
2013[r]	10,777	2,682	116	3,532	145	5,013	2,140
2014[P]	10,214	2,287	88	2,972	121	5,498	2,070
2015[P]	9,937	2,725	83	3,009	101	5,345	1,984

Source: Natural Resources Canada, based on company reports and the federal-provincial/territorial survey of mines and concentrators.
[1] No allowance is made for losses in milling, smelting and refining. Excludes material classified as "resources."
[2] Includes metal in mines where production has been suspended temporarily.
[3] Excludes metal in placer deposits because reserves data are generally unavailable.
[r] revised. [P] Preliminary.
Note: One tonne (t) = 1.1023113 short tons = 32 150.746 troy oz.

FIGURE 13
METAL PRICES, 2001-2017

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Prices	Aluminum US ¢/lb	Copper US ¢/lb	Gold US $/tr. oz	Iron Ore[1] US $/DMT	Nickel US $/lb	Silver US ¢/tr. oz	Uranium US $/lb	Zinc US ¢/lb
2017 (Oct1-24)	$97.25	$307.82	$1,284.01	$61.25	$5.07	$1,698.48	$20.37	$147.97
2016 (Sept)	$72.12	$214.20	$1,326.03	$56.67	$4.62	$1,928.50	$23.00	$103.79
2015	$75.41	$249.52	$1,160.11	$55.21	$5.36	$1,571.67	$36.46	$81.50
2014	$84.62	$311.13	$1,266.12	$96.84	$7.65	$1,907.15	$33.21	$98.05
2013	$83.70	$332.29	$1,411.06	$135.36	$6.81	$2,385.81	$38.17	$86.64
2012	$91.59	$360.58	$1,668.81	$128.53	$7.89	$3,121.17	$48.40	$88.35
2011	$108.77	$400.10	$1,568.58	$167.79	$10.38	$3,526.42	$56.37	$99.47
2010	$98.55	$341.74	$1,224.66	$146.72	$9.89	$2,019.67	$46.84	$97.99
2009	$75.50	$233.67	$972.98	$79.99	$6.64	$1,469.43	$46.06	$75.06
2008	$116.68	$315.47	$871.67	$61.56	$9.57	$1,499.90	$61.71	$85.01
2007	$119.65	$322.83	$696.66	$36.63	$16.88	$1,341.47	$99.33	$147.03
2006	$116.55	$304.85	$604.34	$33.45	$11.00	$1,156.96	$49.61	$145.15
2005	$86.10	$166.84	$444.88	$28.11	$6.69	$733.96	$28.67	$62.66
2004	$77.82	$129.96	$409.21	$16.39	$6.27	$669.05	$18.60	$47.51
2003	$64.92	$80.68	$363.51	$13.82	$4.37	$491.07	$11.55	$37.75
2002	$61.23	$70.72	$309.97	$12.68	$3.07	$462.52	$9.88	$35.31
2001	$66.46	$72.74	$269.98	$12.99	$2.77	$441.43	$8.82	$41.27

Source: Market Insider
[1]April 2010 marked the end of the 40-year global benchmarking system for sale of iron ore under contract prices. Thus, new historical data based on U.S. $/dmt will have to be utilized.

FIGURE 14
MONTHLY METAL PRICES - 2017

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($ current)

	Aluminum US ¢/lb	Gold US $/tr. oz	Silver US $/tr. oz	Copper US $/lb	Nickel US $/lb	Zinc US $/lb	Iron Ore[1] US $/DMT	Uranium US $/lb
Jan-17	$81.05	$1,190.84	$16.93	$2.61	$4.53	$1.23	$78.62	$22.77
Feb-17	$84.85	$1,235.96	$17.93	$2.69	$4.83	$1.29	$84.77	$25.15
Mar-17	$86.74	$1,232.37	$17.61	$2.64	$4.63	$1.26	$87.88	$25.00
Apr-17	$87.70	$1,270.07	$18.02	$2.58	$4.36	$1.19	$73.51	$23.21
May-17	$86.96	$1,245.50	$16.80	$2.54	$4.15	$1.18	$62.56	$21.62
Jun-17	$85.83	$1,261.46	$16.93	$2.59	$4.05	$1.17	$55.04	$19.92
Jul-17	$87.14	$1,237.45	$16.17	$2.63	$4.30	$1.26	$64.83	$20.45
Aug-17	$92.35	$1,282.73	$16.94	$2.94	$4.93	$1.35	$74.17	$20.47
Sep-17	$96.28	$1,316.49	$17.47	$2.98	$5.09	$1.41	$73.35	$20.49
Oct-17	$97.25	$1,284.01	$16.98	$3.08	$5.07	$1.48	$61.25	$20.37
Nov-17	-	-	-	-	-	-	-	-
Dec-17	-	-	-	-	-	-	-	-
% Change-to-date	19.99%	7.82%	0.31%	17.93%	12.09%	20.35%	-22.10%	-10.55%

Sources: Natural Resources Canada; Index Mundi.
Note: [1]April 2010 marked the end of the 40-year global benchmarking system for sale of iron ore under contract prices. Thus, new historical data based on U.S. $/dmt will have to be utilized.

FIGURE 15
MINING EQUITY RAISED - ROLE OF TORONTO STOCK EXCHANGE, 2000–2016

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(US$ billions)

Equity Raised	2000	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Worldwide	3.1	50.3	46.6	65.9	29.6	31.7	14.8	15	14.40	19.8	22.7
TSX exchanges	1.1	17.6	8.3	22.2	17.8	12.5	10.3	6.9	8.9	6.8	9.4
% of worldwide total on TSX and TSXV	36	35	18	34	60	39	70	46	62	34	41

Source: Gamah International, compiled by Toronto Stock Exchange.
Note: All values as at December 31, 2015.

FIGURE 16

GEOGRAPHIC REACH OF TSX-LISTED COMPANIES, JANUARY 2017

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Location of Mineral Projects	Number	Percent
Canada	3,401	53
Latin America	1,133	18
United States	749	12
Africa	477	7
Asia/Russia/Middle East	263	4
Australia/Oceanie	201	3
United Kingdom and Europe	194	3
Total	**6,418**	**100**

Source: InfoMine, TSX/TSXV Market Intelligence Group, compiled by the Toronto Stock Exchange.

FIGURE 17

MINERAL EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, BY PROVINCE AND TERRITORY, 2006 - 2017[i]

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($ millions) Province/Territory	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016[P]	2017[i]	% Change from 2016 to 2017
Newfoundland and Labrador	100.8	148.0	146.7	54.9	105.2	156.8	199.9	117.2	80.7	47.4	22.0	32.6	32.52%
Nova Scotia	11.0	23.5	21.4	9.0	16.7	13.7	14.6	12.3	7.0	10.1	6.8	14.0	51.43%
New Brunswick	13.4	35.8	32.7	8.1	17.1	27.1	28.0	27.6	29.0	8.6	9.7	14.9	34.90%
Quebec	295.1	476.4	526.1	379.3	511.6	833.9	620.7	381.8	317.4	259.5	279.6	456.7	38.78%
Ontario	346.5	571.7	799.3	536.2	853.4	1,067.7	961.5	562.0	468.1	440.2	371.1	485.6	23.58%
Manitoba	52.9	102.6	152.1	97.8	83.5	140.0	105.6	61.4	28.0	46.9	41.9	55.5	24.50%
Saskatchewan	235.6	314.0	430.7	311.0	299.4	334.6	411.1	221.7	245.2	257.0	231.9	194.0	-19.54%
Alberta	18.7	11.8	20.8	8.3	15.2	47.3	35.2	38.9	26.1	18.5	16.2	31.8	49.06%
British Columbia	344.2	470.6	435.4	217.1	374.4	645.1	734.1	493.0	448.9	346.3	220.4	237.4	7.16%
Yukon	106.4	144.7	134.0	90.9	156.9	331.7	233.2	100.6	107.1	92.2	87.9	94.1	6.59%
Northwest Territories	176.2	193.7	147.7	44.1	81.7	93.8	108.7	77.9	101.7	100.9	66.5	64.4	-3.26%
Nunavut	210.6	338.0	432.6	187.6	256.7	535.7	422.5	257.6	158.0	215.0	205.1	163.6	-25.37%
Total	**1,911.5**	**2,830.8**	**3,279.5**	**1,944.4**	**2,771.9**	**4,227.4**	**3,875.1**	**2,352.0**	**2,017.4**	**1,842.4**	**1,559.0**	**1,844.5**	**15.48%**

Source: Natural Resources Canada, based on the Federal-Provincial/Territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
[P] Preliminary.; [i] Intentions.
Notes: Includes on-mine-site and off-mine-site activities. Includes field work, overhead costs, engineering, economic and pre- or production feasibility studies, environment, and land access costs. Numbers may not add to totals due to rounding.

FIGURE 18

MINERAL EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, BY COMPANY TYPE, 2006 - 2017[i]

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Type of Company	2006	%	2007	%	2008	%	2009	%	2010	%	2011	%
Junior	1,238.0	64.8	1,904.4	67.3	2,117.8	64.6	1,110.7	57.1	1,547.0	55.8	2,049.1	48.5
Senior	673.5	35.2	926.5	32.7	1,161.7	35.4	833.7	42.9	1,224.9	44.2	2,178.3	51.5
Total	**1,911.5**		**2,830.8**		**3,279.5**		**1,944.4**		**2,771.9**		**4,227.4**	

Type of Company	2012	%	2013	%	2014	%	2015	%	2016[p]	%	2017[i]	%
Junior	1,847.0	47.7	963.6	41.0	814.3	40.4	577.7	31.4	582.5	37.4	786.5	42.6
Senior	2,028.1	52.3	1,388.4	59.0	1,203.2	59.6	1,264.7	68.6	976.6	62.6	1,058.0	57.4
Total	**3,875.1**		**2,352.0**		**2,017.4**		**1,842.4**		**1,559.0**		**1,844.5**	

Source: Natural Resources Canada, based on the Federal-Provincial-Territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
[p] Preliminary; [i] Intentions.
Notes: Includes on-mine-site and off-mine-site activities. Includes field work, overhead costs, engineering, economic and pre- or production feasibility studies, environment, and land access costs.
Totals may not add due to rounding.

FIGURE 19

MINERAL EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, BY TARGET, 2007 AND 2016[p]

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	2007		2016[p]	
	$ millions	% of Total	$ millions	% of Total
Precious metals	1,025.2	36.2	928.4	59.55
Base metals	711.5	25.1	209.7	13.45
Uranium	413.3	14.6	173.9	11.16
Coal	34.2	1.2	46.9	3.01
Non-metals (excluding diamonds)	31.1	1.1	75.0	4.81
Other metals	175.3	6.2	45.4	2.91
Diamonds	321.6	11.4	72.3	4.63
Iron ore	118.6	4.2	7.6	0.49
Total	**2,830.8**	**100.0**	**1,559.0**	**100.0**

Source: Natural Resources Canada, based on the Federal-Provincial/Territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures.
[p] Preliminary.
Notes: Includes on-mine site and off-mine site activities. Includes field work, overhead costs, engineering, economic and pre- or production feasibility studies, environment, and land access costs. Totals may not add due to rounding.

FIGURE 20

TOP COUNTRIES/REGIONS BY NON-FERROUS EXPLORATION BUDGETS, 2016

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Country/Region	%
Canada	14
Australia	12
United States	8
Chile	7
Other Latin America	7
Mexico	6
Peru	6
China	6
Pacific Islands/South East Asia	5
West Africa	5
Russia	5
Europe	5
Southern Africa	4
Brazil	3
DRC	2
East Africa	1
Former Soviet Union	1
Rest of the world	3
Total	100

Source: Metals Economic Group.

FIGURE 21

CAPITAL EXPENDITURES IN THE CANADIAN MINING INDUSTRY, 2008 - 2017[i]

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($ millions)	2008	2009	2010	2011	2012	2013	2014	2015	2016[P]	2017[i]
Stage 1 - Total Mineral Extraction	7,349	6,194	9,054	12,163	16,916	15,086	11,115	10,188	8,755	7,379
Metal ore mineral extraction	4,373	3,537	5,504	8,108	11,020	9,174	5,298	4,881	4,937	4,446
Non-metallic mineral extraction	2,248	2,297	2,853	3,083	4,812	5,243	5,433	5,078	3,613	2,588
Coal mining	728	361	697	972	1,085	668	384	230	205	345
Stage 2 - Primary Metal Manufacturing	1,629	948	1,823	2,936	3,864	3,458	3,332	3,219	2,257	2,175
Stage 3 - Non-Metallic Mineral Product Manufacturing	691	581	765	672	572	459	976	1,136	1,189	634
Stage 4 - Fabricated Metal Product Manufacturing	734	750	608	729	536	574	640	735	721	836
Total Mining and Mineral Processing	10,403	8,473	12,250	16,500	21,888	19,577	16,062	15,278	12,922	11,025
Non-conventional oil extraction (oil sands)	20,619	10,249	17,113	22,163	26,246	29,029	35,711	23,420	16,596	12,045

Source: Statistics Canada, CANSIM Table 029-0046.

[P] Preliminary; [i] Intentions.

Notes: Includes capital construction and machinery and equipment. As of 2014, capital expenditures on non-residential construction and on machinery and equipment exclude expenditures related to intellectual property, including mineral exploration activities. Historical values have been revised to reflect these methodological changes. Totals may not add due to rounding.

FIGURE 22

MAJOR MINING PROJECT INVESTMENT IN CANADA, 2014-2017

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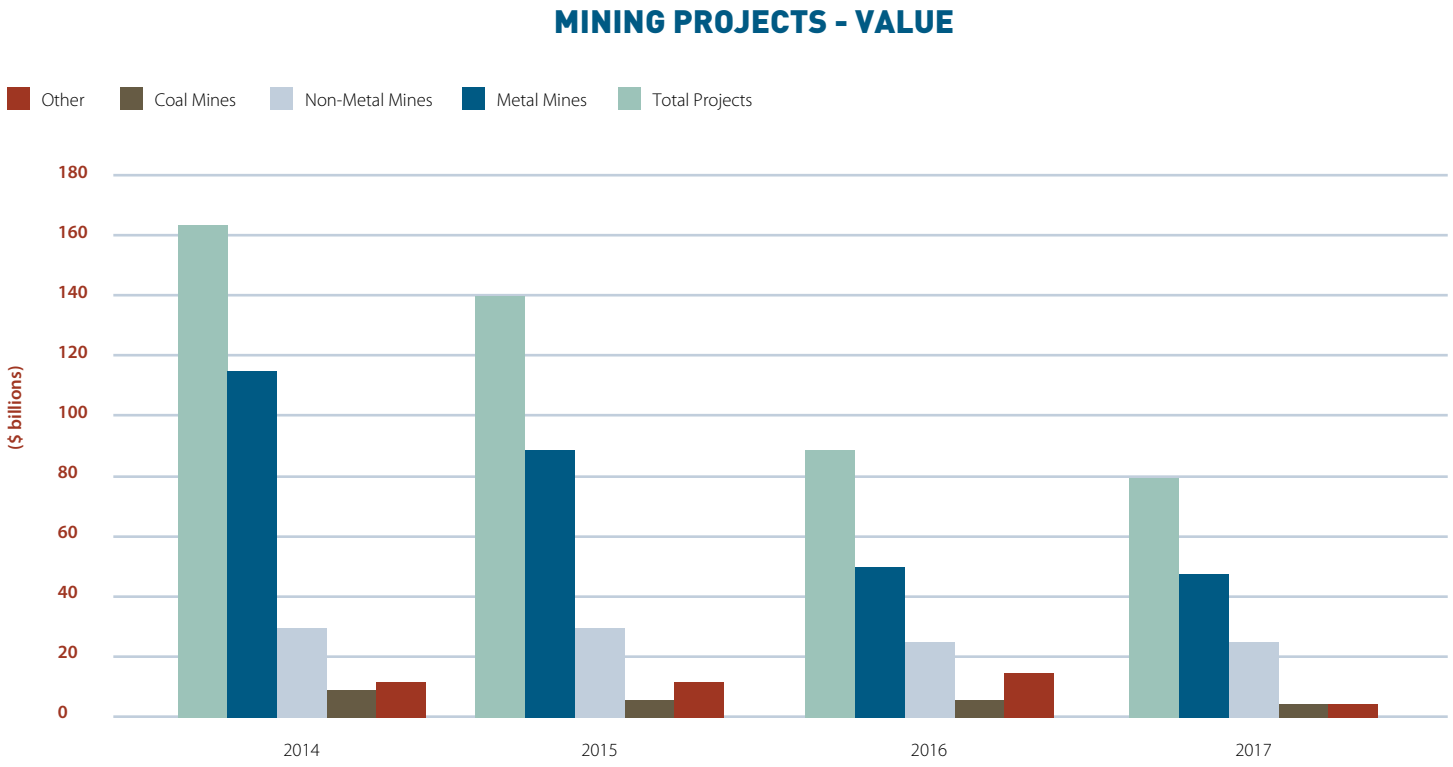
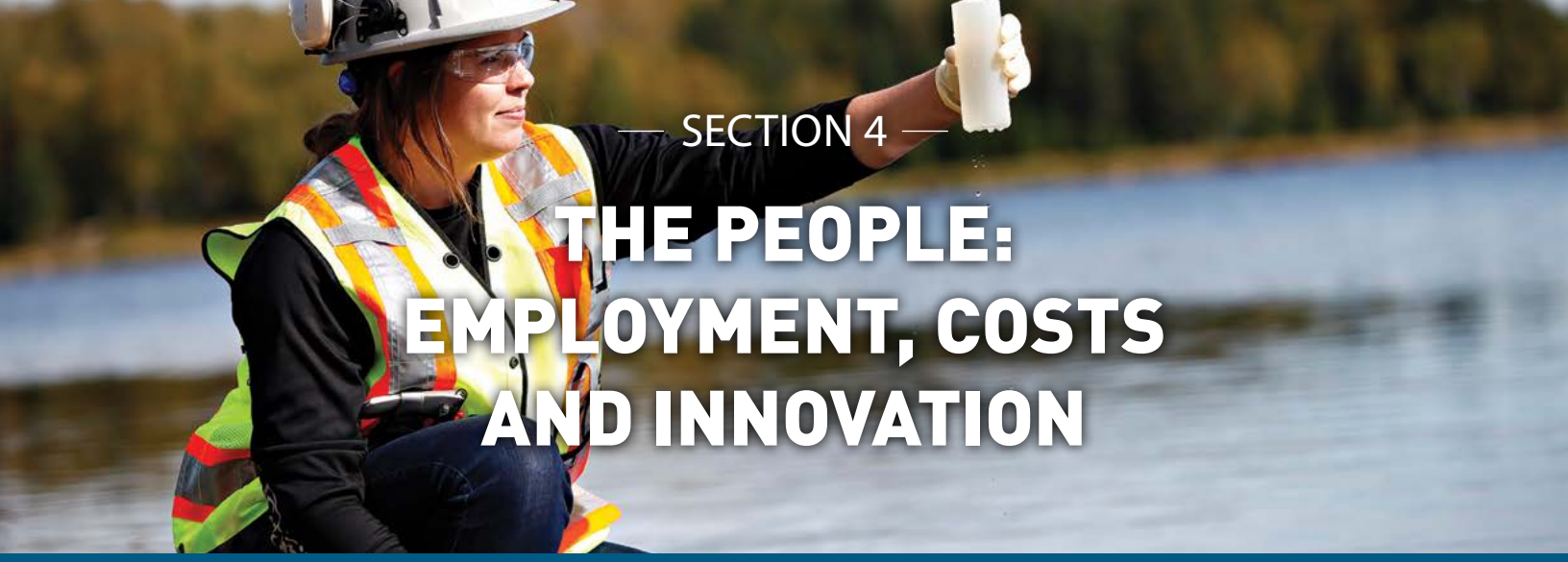


Source: Natural Resources Canada.



SECTION 4

THE PEOPLE: EMPLOYMENT, COSTS AND INNOVATION

THE CANADIAN MINING INDUSTRY ACCOUNTS FOR ONE IN EVERY 45 JOBS ACROSS THE COUNTRY AND, PROPORTIONALLY, IS THE LARGEST EMPLOYER OF ABORIGINAL CANADIANS.

MINING INDUSTRY EMPLOYMENT

According to Statistics Canada data, the mining industry directly employed 403,000 people in 2016, accounting for roughly one in every 45 Canadian jobs (see *Figure 23*). When indirect jobs are included, the industry's employment reach increases significantly. According to Natural Resources Canada estimates, the mining industry indirectly employed an additional 193,000 individuals in 2016. Together, the industry's direct and indirect employment exceeds 596,000 jobs.

Overall Employment Numbers

In 2016, 93,000 (23%) of those directly employed in mining worked in Stage 1, mineral extraction (see Figure 23). This includes approximately 40,500 workers in metal mining, 25,600 workers in non-metal mining and 5,200 workers in coal mining (see Figure 23), with services accounting for the balance. Overall, total direct mining employment in 2016 is comparable to 2015 levels.

In the oil sands extraction sector (not shown in Figure 23 or *Figure 24*), recent data show that Suncor and Syncrude directly employ approximately 14,000 and 5,000 people, respectively, in mining and oil and gas activities. These figures do not include indirect employees, which number in the thousands. Other oil sands mining companies, such as Canadian Natural Resources Limited and Imperial, increase these numbers further.

Employment statistics for mining and oil sands can change rapidly because of the cyclical reality of commodity markets and fluctuating prices, globalization and other trends. Recent mergers and acquisitions have changed the landscape of Canadian mining.

ACCORDING TO NATURAL RESOURCES CANADA, THE MINING INDUSTRY INDIRECTLY EMPLOYED AN ADDITIONAL 193,000 INDIVIDUALS IN 2016, BRINGING TOTAL EMPLOYMENT TO 596,000 JOBS.

Some companies have been acquired or no longer report separate employment figures. Other companies report global figures without disaggregating for the Canadian component of their operations.

Women in Mining

A 2016 report by the Mining Industry Human Resources (MiHR) Council found that while female participation in mining grew by 70% from 1996 to 2011, women accounted for only 17% of the mining workforce, or roughly 38,600 positions based on MiHR's definitions (see *Figure 25*). These numbers are well below women's current labour force participation rate, which is 48%.

When mining is compared with other industries for the representation of women in broad occupational categories, gender disparity is prevalent. According to MiHR research, in the mining industry, women are under-represented in occupational categories that are more traditionally associated with a higher proportion of women, such as human resources and financial professionals. Furthermore, even in occupations in which women traditionally have been under-represented, MiHR found that the mining industry is still not attracting a representative proportion of women compared to other industries.

Finally, MiHR research demonstrates that as a particular occupation becomes more specific to the mining industry, there is a general tendency for women to be under-represented in that occupation.

Part of the reason may be that the perception of gender-based challenges deters interest at the educational level from moving into certain trades. For example, in 2011, women accounted for only 14% of registered apprentices and were concentrated in certain trades. Women accounted for only 2% of carpentry apprentices, 1.9% of plumbing apprentices, and 1.5% of heavy equipment apprentices. Overall, according to Status of Women Canada, women represent roughly 5% of all skilled trades workers in Canada – a percentage well below women's participation rate in the mining industry, and significantly below women's labour force participation rate overall.

Concerted efforts by both industry and government are underway to attract and retain talented women in the mining industry. MiHR, with support from Status of Women Canada, is currently working on a program called Addressing Systemic Barriers for Gender Equity in Mining. The program aims to identify and work to mitigate the systemic barriers to women's participation and advancement in the mining industry in Canada. It is hoped that the project's outcomes identify how to better engage, attract and improve gender balance across the industry's labour force.

Employment of Aboriginal People

Proportionally, the mining industry is the largest private sector employer of Aboriginal Canadians. According to MiHR research, the proportion of Aboriginal workers in the mining industry (5%) is well above that of Aboriginal workers in the Canadian workforce (3%), and exceeds the proportion of Aboriginal people in the Canadian population (see *Figure 25*).

According to Statistics Canada, Indigenous employment in the mineral industry increased 12% from 2007 to 2015. MiHR research indicates that approximately 12,700 Aboriginal people were working in the mining industry in 2015, and that mining surpasses all other industries in the engagement of Aboriginal workers in occupations that tend to be specific to mine sites.

Potential for increased Aboriginal employment remains strong. Most Aboriginal communities are located within 200 kilometres of some 180 producing mines and more than 2,500 exploration properties. Also, many mines and projects are located on traditional lands. Aboriginal people across the country are, therefore, ideally situated to access employment opportunities (and other benefits) in the mining industry.

THE PROPORTION OF ABORIGINAL WORKERS IN THE MINING INDUSTRY IS WELL ABOVE THAT OF ABORIGINAL WORKERS IN THE CANADIAN WORKFORCE.

Furthermore, approximately half of all Aboriginal people are under the age of 25, meaning a large segment of Indigenous peoples are fast approaching workforce entry.

A critical challenge is to ensure that this new cohort of Aboriginal Canadians has the opportunity to participate meaningfully in the Canadian workforce, and is provided with training and educational opportunities. Approximately one in four Aboriginal people of working age are not participating in the labour force. Since attaining an appropriate level of education is an important factor in labour force participation, training to develop the requisite skills for meaningful participation in the labour force is critical for accessing well-paying mining jobs.

Beyond direct and indirect employment, progress in increasing Aboriginal participation in the mining industry is being made. For example, in September 2016, Suncor and Fort McKay First Nation announced their equity partnership in the East Tank Farm Development. In October 2016, Suncor and the Mikisew Cree First Nation (MCFN) announced their equity partnership in the same project. The combined equity interest of Fort McKay First Nation and MCFN in Suncor's East Tank Farm Development is 49%.

Immigrant Workers

New and recent immigrants to Canada are another demographic with increasing importance to the Canadian mining industry. Like the participation of women and Aboriginal Canadians in the mining workforce, the participation of immigrants does not match their overall participation in the general labour force, and their proportion of the Canadian population. The proportion of immigrants in the mining workforce lags behind that of their participation in the Canadian labour force by nearly 10%. Given an aging Canadian population, the need for new immigrants is increasing. Thus, appealing to this demographic is important to the medium- and longer-term sustainability of the mining sector workforce.

Need for Workers and Skills

The mining industry, both in Canada and abroad, faces a number of human resources challenges.

MiHR's 2017 report, *Canadian Mining Labour Market Outlook*, estimates that the Canadian mining industry will need to hire 87,830 new workers over the next decade to 2027. These new hires are required to replace retirees and fill new positions to meet baseline production targets (see *Figure 26*). In its report, MiHR also forecasts contractionary and expansionary hiring scenarios. Notably, even in a contractionary scenario, the hiring forecast predicts that new hires will be necessary to meet labour demand.

This workforce shortage is compounded by the wave of the industry's skilled core of workers who are retiring. By 2027, MiHR forecasts more than 52,000 employees will retire from the sector, which represents over 25% of the industry's current workforce by MiHR definitions. This will result in a significant loss of industry knowledge and experience.

Updated data from Statistics Canada's 2011 National Household Survey indicate that the mining industry's workforce is attracting an increased share of young professionals. For example, the 25 to 34 age group makes up approximately 25% of the mining workforce compared to only 20% in the Canadian workforce. This shift in demographics will lead to an entirely new set of challenges, with relatively inexperienced workers replacing seasoned workers, particularly in the high turnover trades and production occupations. This places an additional onus on industry to work collaboratively with government and educational institutions to ensure that new entrants to the industry have the skills required for high-demand jobs within mining. In addition, companies need to ensure that new employees have opportunities to learn from experienced employees during training programs and on the job to gain valuable workplace experience.

The mining industry comprises 70 core mining occupations, and needs new workers for all of them. Among those required are geoscientists, metallurgists, mining engineers and geologists, as well as workers skilled in computer technology, information management, mechanical repair, heavy equipment operation and other areas. Because today's mining industry relies on advanced technologies, much of the demand is for highly skilled workers.

It is also important to note that competition for skilled workers is fierce both within Canada and globally. In fact, companies in other countries are actively recruiting Canadian graduates and workers, making retention challenging and recruitment highly competitive.

Various actions have been proposed to address the mining skills shortage in Canada:

- Promote the industry to women, youth, Aboriginal people and non-traditional worker groups.
- Develop programs that bring back retired workers, retain older workers and increase mentoring.
- Improve educational programs and employer-provided training.
- Introduce standards for key occupations to facilitate domestic worker mobility and skills recognition.

The federal government has taken some steps to help address this problem, such as the expansion of the Youth Employment Strategy, the proposed Post-Secondary Industry Partnership and Co-operative Placement Initiative, and continued funding for the Aboriginal Skills and Employment Training Strategy (ASETS), which the government has reviewed with the aim of improving outcomes. MAC supports an expansion of this program, which has proved to be a valuable source of funding for Aboriginal skills training initiatives.

In addition to the funding from Status of Women Canada mentioned above, Employment and Social Development Canada (ESDC) provided $3.5 million to MiHR to enhance its Labour Market Information program, which tracks the industry's hiring needs.

More recently, MiHR secured government funding for other important programs, including:

- $1.9 million in funding from ESDC, a portion of which will be used to enhance and update Mining Essentials, a work readiness and training program for Aboriginal job seekers, delivered in partnership with the Assembly of First Nations. The funding will help ensure the program remains current and relevant and meets mining industry requirements. The program will also be customized for Innu people to increase the potential for their participation in the mining industry.
- $1.76 million in funding from Natural Resources Canada for the Green Internship program. The program will provide 120 wage subsidies to eligible mining employers that provide internships focused on sustainability to recent graduates from Canadian post-secondary educational institutions. Successful internship candidates will each receive up to $15,000.
- $4.7 million in funding from ESDC for the Gearing Up program, which will create 1,000 new work-integrated learning opportunities in the mining sector.

Ensuring that MiHR can continue to produce crucial research and deliver strategic programs is essential for supporting the industry's workforce needs and meeting its commitments to diversity.

WORKPLACE SAFETY AND HEALTH

In mining, safety comes first. As a core industry value and practice, Canadian mining companies invest significant time and effort in developing and maintaining a positive safety culture in all aspects of their operations, diligently working with their employees, contractors and communities to reach the goal of "zero harm."

All mine sites have on-site professionals dedicated to safety and health in the workplace. Larger mines have numerous specialized safety trainers on site; smaller mines often contract out safety training to specialist companies.

Labour unions and industry associations have played a key role in improving worker safety and health by encouraging the sharing of best practices, developing industry standards and providing third-party verification of safety programs. MAC members, through the *Towards Sustainable Mining® (TSM®)* initiative, for example, make commitments in both safety and health and crisis management and communications planning protocols. (See Section 5 of this report for more on *TSM*.)

The John T. Ryan Trophies

Mining Safety Appliances (MSA) Canada began sponsoring a mine safety trophy in 1941. Named the John T. Ryan Trophies in honour of the company's co-founder, the trophies have since become the most prestigious safety awards in the Canadian mining industry. They are still sponsored by MSA Canada and are presented nationally and regionally in three mining categories: metal mines, coal mines and select mines. The trophies are awarded annually by the Canadian Institute of Mining Metallurgy and Petroleum to the Canadian metalliferous mine, coal mine and select mines that had the lowest accident frequency per 200,000 hours worked during the previous year.

Mining safety statistics can be an invaluable tool for tracking the effectiveness of safety programs and driving improvements, whether for a safety manager working on site or for industry discussions on safety regulations. Ensuring that safety statistics are useful requires that not only are existing figures and analyses made easily accessible, but that the people and organizations compiling statistics understand the information needs of safety professionals.

KEY COSTS

Mining companies have limited control over the revenue side of their statement of return because mineral prices are generally set through international trading and exchanges. To remain competitive, companies rigorously work to control their costs.

Wages

The Canadian mining industry boasts the highest wages and salaries of all industrial sectors in Canada (see *Annexes 7* and *8* for details). The average annual pay for a mining worker in 2016 exceeded $111,000, which surpassed the average annual earnings of workers in forestry, manufacturing, finance and construction by a range of $23,000 to $37,000.

This wage gap has remained relatively consistent in recent years. In remote regions or in situations where workers rotate, higher wages help to attract and retain them.

Agnico Eagle Mines Limited, Haul Truck Training Simulator

MAC MEMBERS WIN 2016 JOHN T. RYAN NATIONAL TROPHIES

CANADA TROPHY FOR COAL MINES

Teck Resources Limited, Greenhills Operations, Elkford, British Columbia

A team of approximately 650 employees work together to make Greenhills Operations successful. Greenhills' safety culture depends on the spirit of openness, cooperation and personal commitment to safety performance of all its employees. Safety is a value that is deeply embedded and, as a result, Greenhills has consistently been among one of the safest mines in British Columbia. This is the fourth John T. Ryan Trophy for Greenhills Operations.

NATIONAL METAL CATEGORY

Cameco, McArthur River Mine, Saskatchewan

For the third consecutive year, Cameco's McArthur River Mine claims this prize, operating for 1.86 million hours without a lost time injury in 2015. Located in northern Saskatchewan, the McArthur River Mine is the world's largest high-grade uranium operation.

CANADA TROPHY FOR SELECT MINES

Vale, Voisey's Bay Mine, Voisey's Bay, Newfoundland and Labrador

The Voisey's Bay Mine is located on the northeastern coast of Labrador. Paramount is "life matters most," a commitment by all site employees to genuinely care for each other at work, while helping to identify risks and prevent injury. Voisey's Bay has continued to set a high standard for safety, receiving the John T. Ryan Regional Safety Trophy in 2013 and the John T. Ryan National Safety Trophy in 2014. In 2014, the mine achieved the milestone of one million site hours without a lost time injury.

De Beers, Victor Mine, James Bay Lowlands, Ontario

Victor Mine is a remote fly-in/fly-out mine located in the James Bay lowlands of northern Ontario, approximately 90 kilometres west of the Attawapiskat First Nation. Ontario's first diamond mine, Victor Mine received the award in the select mines category in recognition of its outstanding safety performance in 2015. During the year, the Victor Mine team had zero lost time incidents and recorded the lowest overall reportable injury rate among all mines in Ontario.

Overall Production Costs

Mining operations incur significant production costs. The industry's three main production costs – wages, energy (fuel and electricity), and materials and supplies – totalled $4.8 billion, $2.7 billion and $7.8 billion, respectively, in 2015, the most recent year for which data are available (see *Figure 27*). Together, these figures constitute a 4% decrease in the cost of mining in Canada year-over-year. This is largely attributable to lower energy costs year-over-year resulting from lower oil prices. Wages accounted for 13% of the industry's total 2015 production value, while energy accounted for 7% – a 2% decrease year-over-year – and materials and supplies represented 21% of the total value.

Remote and Northern Regions

Lack of infrastructure, sparse or no population, and often extreme seasonal temperatures make remote and northern regions in Canada high-cost jurisdictions in which to build and operate a mine.

Frequently, companies that seek to develop mining projects in remote and northern regions must build the infrastructure they require for operation. Historically, this infrastructure has included the following: power generation such as hydroelectric dams and transmission; transportation infrastructure such as ports, road and railways; and airstrips and on-site accommodation for fly-in/fly-out employees.

These additional costs constitute a northern premium that companies and industries operating in centrally located jurisdictions generally do not incur. The mining cost differential can be significant between jurisdictions that lack infrastructure and those that have better access to a mode of transport for mining resupply and bringing product to market, a community where workers can live, and access to the power grid. A company's requirement to build infrastructure in the North that would already be built and accessible in the south accounts for a large portion of the increased costs.

To better understand these costs, MAC and industry partners undertook a study that compared the costs of operating in a remote and northern region relative to the costs of operating a comparable mine in a centrally located jurisdiction. The study determined that for base and precious metals, the premium associated with developing a remote and northern mine ranges from 2 to 2.5 times the cost of a comparable mine in a southern region. Furthermore, the report determined that 70% of this cost increase is related directly to infrastructure investment.

The future of mining lies increasingly in remote and northern Canada. At the same time, mining development is helping the government achieve its stated economic, Indigenous reconciliation and climate change goals in these regions. For this reason, MAC is encouraged by recent federal infrastructure investment decisions that recognize northern challenges and opportunities, such as the Trade and Transportation Corridors Initiative (TTCI), which dedicates $400 million for trade-enabling infrastructure in the territories. MAC also supports the Investing in Canada Plan, which allocates funding on a per-capita "plus" model. These are creative and much-needed investments in Canada's north. Beyond these programmatic developments, positive funding decisions in support of the Yukon Resource Gateway ($360 million) and the T'licho Road ($155 million) in the Northwest Territories will increase project viability and community connectivity, reduce costs and remoteness and, ultimately, lessen territorial reliance on Ottawa.

MAC also welcomes the creation of the Canada Infrastructure Bank (CIB) and continues to stress the importance of the CIB recognizing challenges facing Canada's north and supporting economic development opportunities in remote locations. MAC supports the evaluation of projects on a merit basis. MAC also maintains that the CIB should consider the unique circumstances of Canada's north and the significantly higher costs associated with living or operating there to ensure applications are assessed on a level playing field.

INNOVATION AND RESEARCH AND DEVELOPMENT

Innovation is a broad theme, and relevant statistics are not always current or easy to compare. The information presented below indicates that Canadian mining embraces innovation, but that Canada faces a challenge in facilitating a robust environment in which to foster innovation and enhance research and development (R&D).

While the industry invests millions each year in R&D, Canada underperforms compared to its peers. At risk is Canada's ability to attract new investment as other jurisdictions offer more attractive innovation environments.

Canada's Approach to Innovation

MAC welcomes the Government of Canada's commitment to support innovation in key sectors, including up to $950 million through the Innovation Superclusters Initiative. In response to this initiative, the Canadian mining industry developed a strong and unique supercluster proposal, CLEER (Clean, Low-energy, Effective, Engaged and Remediated): Powering Clean Growth through Mining Innovation.

In October 2017, the CLEER proposal was one of nine shortlisted by Innovation, Science and Economic Development Canada. Of the 50 proposals originally submitted, the CLEER initiative was the only one focused on clean resources, and CLEER was invited to participate in the next phase of the selection process.

CLEER leverages existing regional clusters, including established mining centres in Ontario, British Columbia, Alberta, Saskatchewan and Quebec. Going forward, CLEER will establish a pan-Canadian network of clusters — a "cluster of clusters" — an innovative approach that reflects the diverse nature of the Canadian mining industry.

BHP Billiton, Jansen Project, Saskatchewan

The CLEER proposal is the only one to harness and amplify the strengths of existing regional clusters, and would result in the broad distribution of benefits across Canada, including the North, urban centres and remote communities.

The objectives of the CLEER supercluster are shared priorities of government and the communities in which MAC members operate, and are central to how the industry will address climate change.

If successful, this initiative would tackle the challenges of water use, energy intensity and environmental footprint, with aggressive targets of at least a 50% reduction in each area by 2027.

CLEER would make several key contributions to the Canadian economy, including:

- Positioning Canada as a top global supplier of clean-tech solutions that could be deployed across the resource sectors, making Canada a global leader in the production of clean minerals and metals.
- Helping to transform the productivity, performance and competitiveness of the Canadian mining sector. In turn, this would spur sustainable mining development across Canada.
- Contributing to the growth of the Canadian mining supply and services sector through co-investing to build its innovation and commercialization capacities.
- Helping to establish linkages with advanced next-generation sectors of the economy, thereby making the mining supply and services sector, regional mining clusters, and regional economies more diverse and more geared towards advanced knowledge industries.
- Contributing to the growth of the mining sector in Canada by vastly improving mine productivity and performance, leading to much-improved project economics for expanding existing mines and developing new mines.
- Spurring economic activity in northern and other remote areas across Canada, which will support Indigenous economic reconciliation.
- Leveraging $500 million in investments in research and innovation projects across multiple regions and sectors in the first five years of the project.

To remain sustainable, progressive and profitable, the industry must innovate and collectively challenge existing ways of thinking. Through innovation investment from industry and governments, the Canadian mining industry can address these critical business challenges and continuously improve the sector's environmental and health and safety performance. This will help ensure that Canada's mining sector can maintain and grow its immense socio-economic contributions to communities across the country, while meeting Canadians' evolving expectations of the industry. ■

Agnico Eagle Mines Limited, Kittila Mine, Finland

FIGURE 23
MINERALS SECTOR EMPLOYMENT, 2016

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Indirect	196,000
Direct	403,000
Mining (including services)	92,541
Primary manufacturing	101,208
Downstream	209,330

Source: Statistics Canada, Natural Resources Satellite Account.

FIGURE 24
EMPLOYMENT IN THE MINERAL EXTRACTION STAGE, 2007-2016

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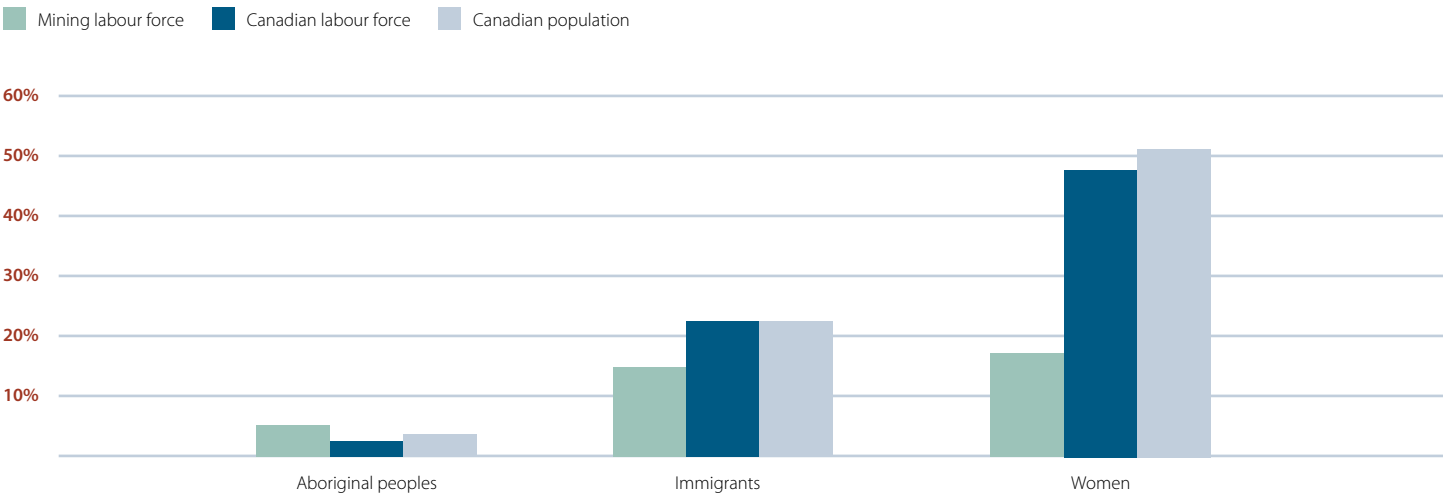
Year	Metal	Non-metal	Coal	Total
2007	27,020	18,970	4,935	50,925
2008	28,480	20,985	5,315	54,780
2009	23,955	19,360	5,515	48,830
2010	25,520	20,825	6,325	52,670
2011	28,220	21,615	6,495	56,330
2012	31,005	20,890	6,525	58,420
2013	32,890	24,555	8,790	66,235
2014	36,895	28,825	7,870	73,590
2015	40,400	25,340	6,220	71,960
2016	40,505	25,670	5,205	71,380

Source: Statistics Canada, CANSIM Table 383-0031.

FIGURE 25
DIVERSITY IN CANADA'S MINING LABOUR FORCE, 2011

Return to text



Sources: Mining Industry Human Resources Council; Statistics Canada.

FIGURE 26
CANADIAN MINING INDUSTRY EMPLOYMENT AND HIRING FORECAST SCENARIOS, 2018-2027

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Year	Net Change in Employment	Retirement	Non-Retirement Separation	Cumulative Hiring Requirements
Contractionary	-24,940	47,710	20,430	43,200
Baseline	12,780	52,630	22,420	87,830
Expansionary	48,520	57,490	24,400	130,410

Sources: Mining Industry Human Resources Council; Canadian Mining Industry Employment, Hiring Requirements and Available Talent 10-year Outlook, 2017.

FIGURE 27

SELECTED COSTS OF PRODUCTION IN THE MINERAL INDUSTRY [1], 2015

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By Industry	Establishments Surveyed (number)	Wages for Production and Related Workers ($000)	Fuel & Electricity ($000)	Materials & Supplies ($000)	Value of Production ($000)
Metal Ore Mining	65	2,870,241	1,532,618	5,337,272	21,886,217
Non-metallic Mining and Quarrying	1,136	1,412,061	853,829	1,819,701	12,741,810
Coal	19	542,640	308,050	696,164	2,966,077
Total mineral industry	**1,220**	**4,824,942**	**2,694,497**	**7,853,137**	**37,594,104**

Sources: Natural Resources Canada; Statistics Canada.
[1] Excludes the oil and gas extraction industry.
Notes: Value of Production vs. Mineral Production: Value of Production is for mining activity only and wouldn't include all costs related to shipping etc. that are included in Value of Shipments (or Mineral Production).
Numbers may not add due to rounding.

SECTION 5

THE ENVIRONMENT: SUSTAINABLE DEVELOPMENT AND SOCIAL RESPONSIBILITY

THE CANADIAN MINING INDUSTRY IS COMMITTED TO RESPONSIBLE ENVIRONMENTAL STEWARDSHIP, AND CONTINUALLY SEEKS METHODS TO IMPROVE PROCESSES, REDUCE FOOTPRINTS AND ENHANCE SOCIAL AND ENVIRONMENTALLY RESPONSIBLE PRACTICES.

Environmental and social considerations are increasingly well integrated into mine planning and management. Furthermore, resource development and environmental conservation are not mutually exclusive, but can be achieved by effective regulation and responsible sustainability practices. For example, a mine built today is required by Canadian law to provide financial assurance that it can be reclaimed when operations cease, and mine closure plans must be prepared and accepted by government authorities before construction. While mining has a relatively small, localized footprint, the impacts on the local area can be significant and should be managed responsibly over the life of the mine, and beyond. MAC's *Towards Sustainable Mining*® (*TSM*®) initiative is an example of how resource development can co-exist with environmental conservation, and how partnerships can be fostered between mining companies and communities.

In recent decades, the industry has made great strides in reducing mining's environmental impacts through the actions of individual companies, government regulations and stewardship initiatives such as *TSM*. Together, corporate social responsibility, progressive regulations and the adherence to a host of voluntary standards have earned Canadian mining a global reputation for leading social and environmental practices.

ENVIRONMENTAL STEWARDSHIP

The Canadian mining industry has made significant progress in its environmental performance by participating in a host of sustainability programs and initiatives.

Internationally, an array of sustainability and social license initiatives affect the Canadian mining industry.

Companies seeking project financing are required to apply rigorous environmental and social standards set by organizations such as the International Finance Corporation, Export Development Canada, the World Bank and commercial banks that have adopted the Equator Principles. Firms dealing in dangerous substances abide by the Basel Convention and the International Cyanide Management Code (as well as Canada's own *Transportation of Dangerous Goods Act*). The practices of many companies are guided by the United Nations Global Compact, the Extractive Industries Transparency Initiative, the Kimberley Process, ISO 14001 certification and other sustainability programs. For a more detailed overview of how MAC member companies apply international standards and programs, see *Figure 28*.

Domestically, companies are engaged in a variety of stewardship programs, including *TSM*, the Mine Environment Neutral Drainage Program (MEND) and the National Orphaned/Abandoned Mines Initiative (NOAMI).

Towards Sustainable Mining

TSM is an award-winning performance system that helps mining companies evaluate and manage their environmental and social responsibilities. *TSM* is MAC's commitment to responsible mining and every member company commits to implementing it for their Canadian facilities as a condition of membership. Several companies also voluntarily apply it at their international sites. Since its establishment in 2004, participation in *TSM* has grown steadily, and the Mining Association of British Columbia and the Québec Mining Association have adopted the initiative for their members.

In recent years, *TSM*'s positive reputation has been attracting international attention. In 2015, the Finnish Mining Association (FinnMin) adopted *TSM* for its members' operations, the first national mining association outside of Canada to do so. Since then, the Cámara Argentina de Empresarios Mineros, the Botswana Chamber of Mines and the Chamber of Mines of the Philippines have adopted *TSM* and are at various stages of implementing the program.

How TSM Works

TSM includes a set of tools and indicators that drive performance and ensure key mining risks are managed responsibly at mining facilities. By adhering to the *TSM Guiding Principles*, mining companies demonstrate leadership by:

- Engaging with and supporting local communities
- Driving world-leading environmental practices
- Committing the resources and leadership to promote the safety and health of employees

TSM's main objective is to enable mining companies to meet society's needs for minerals, metals and energy products in the most socially, economically and environmentally responsible way possible. The program's core strengths are:

- **Accountability.** *TSM* reporting at the facility level of their Canadian operations is mandatory for members.
- **Transparency.** Annual reporting is conducted against the *TSM* indicators with independent verification.
- **Credibility.** *TSM* includes ongoing consultation with a national Community of Interest Advisory Panel to improve industry performance and shape *TSM* for continual advancement.
- **Performance driven.** *TSM* includes a requirement to demonstrate measurable continual sustainability improvement.

Currently, *TSM* sets out performance indicators and targets in seven areas:

- Tailings management
- Energy use and greenhouse gas emissions management
- Aboriginal and community outreach
- Crisis management and communications planning
- Biodiversity conservation management
- Safety and health
- Preventing forced and child labour

Each year, MAC produces a *TSM Progress Report* detailing the facility-level performance of participating companies. *TSM* assessments take place at the facility level to ensure that management systems are in place, with results externally verified every three years. In 2017, 65 facilities reported their 2016 results.

Below is a summary of results for three areas that pertain to environmental stewardship: tailings management, biodiversity conservation management, and energy use and greenhouse gas emissions management. For a more complete overview of industry performance, please refer to the 2017 *TSM Progress Report*, which is available on the MAC website.

Tailings Management

Tailings facilities are necessary components of mining activity, and it is crucial that they be managed responsibly to protect human safety and the environment. Overall, the industry's performance in tailings management has improved significantly over the years (see *Figure 29*). This is largely due to senior executives recognizing the importance of managing a facility's most significant environmental and safety risk. However, with the tailings dam failure at the Mount Polley Mine in 2014, the industry faced a significant challenge and is committed to building on the efforts it has made in recent decades to develop a strong record in tailings management.

MAC's focus in 2016 and 2017 was on updating the *TSM Tailings Management Protocol* and the accompanying guides. These updates incorporated the recommendations of an independent task force MAC had commissioned in 2015 to ensure that *TSM* requirements and guidance continued to reflect best practice in tailings management. MAC released a revised *TSM Tailings Management Protocol* and a strengthened edition of its internationally recognized *A Guide to the Management of Tailings Facilities* in November 2017. MAC is currently reviewing a companion document, *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities*, and expects to publish a revised edition in 2018. For more information about MAC's tailings management tools and expertise, visit *www.mining.ca/tailings-management*.

Beyond *TSM*, oil sands operators are making measured progress in tailings management. The Oil Sands Tailings Consortium (OSTC) was founded in 2010 when seven of Canada's largest oil sands mining companies agreed to

share tailings research and technology in a unified effort to advance tailings management. In March 2012, the OSTC became part of Canada's Oil Sands Innovation Alliance (COSIA), which is discussed in more detail below.

PROMISING TECHNOLOGY FOR OIL SANDS TAILINGS

Managing tailings in the oil sands is a key environmental concern for the mining industry. Oil sands operators are committed to developing technologies to reduce reclamation times. One example is TRO™, developed by Suncor Energy. This technology involves adding a polymer flocculent to fluid fine tailings, which allows water to be released and tailings to dry more quickly. Other innovative examples include Syncrude's centrifuge technology and Canadian Natural Resources Limited's (CNRL) Atmospheric Fines Drying process, both of which accelerate the release of water from tailings, enhancing the drying process.

These innovative technologies and processes are expected to accelerate the rate of land and tailings reclamation and, in the years ahead, help to ensure the industry is reclaiming the landscape in a progressive manner. Suncor, Syncrude and CNRL are sharing intellectual property and industry best practices with the broader oil sands mining industry through their collaboration with member companies in COSIA.

Biodiversity Conservation Management

Mining, conducted in consultation with communities of interest, can co-exist with biodiversity conservation. Adopting responsible practices for biodiversity conservation management through all stages of a mine's life cycle is an industry priority. The *TSM Biodiversity Conservation Management Protocol* confirms that mining facilities have made formal commitments to manage biodiversity at their sites, that action plans for significant biodiversity aspects are implemented, and that biodiversity conservation reporting systems are in place to inform decision making and to publicly communicate the performance of facilities.

Figure 30 demonstrates that MAC members have continued to make significant improvements across the three indicators:

- 75% have a senior management commitment to biodiversity conservation in place.
- 67% have implemented a biodiversity conservation management system.
- 72% report publicly on biodiversity conservation activities and performance.

Energy Use and Greenhouse Gas (GHG) Emissions Management

Improving energy efficiency and reducing GHG emissions are priorities for the Canadian mining industry to limit impacts on the environment, address climate change, and help reduce operational costs at mine sites.

The *TSM Energy Use and GHG Emissions Management Protocol* confirms whether a facility has established a comprehensive system for energy use and GHG emissions. For this protocol, a facility must show its management system includes assigned accountability from senior management, and that it has a process in place to ensure energy data are reviewed regularly and are well integrated into operator actions. Facilities are also expected to provide energy awareness training, and have systems in place to track and report energy use and GHG emissions data for both internal and external reporting. Finally, in *TSM*'s spirit of continuous improvement, this protocol seeks to confirm that facilities establish and meet targets for their energy use and GHG emissions performance.

The requirements to obtain a Level A in this *TSM* protocol are more stringent than those for obtaining ISO 50001 certification. While ISO is a more broadly recognizable program globally, this comparison helps contextualize the extent of the commitment that MAC members make in pursuit of energy and GHG management excellence. Of the facilities participating in *TSM*:

- 76% have comprehensive energy use and GHG emissions management systems.
- 92% have implemented energy use and GHG emissions management reporting systems.
- 56% have established and met performance targets.

The percentage of facilities that have achieved a Level A or higher has increased since 2013, the year in which the protocol went through a substantial revision. The revised protocol condensed the number of indicators from six to three. This change acknowledged that in the mining sector facilities produce GHGs primarily through the burning of fossil fuels for energy and, thus, GHG emissions are controlled by managing energy consumption.

Figure 31 shows performance for the three indicators of the *TSM Energy Use and GHG Emissions Management Protocol*.

Since 2015, mining companies pursuing energy management best practices to increase energy efficiency and reduce GHG emissions through the *TSM* initiative became eligible for funding from the Canadian Industry Program for Energy Conservation (CIPEC), a division of Natural Resources Canada. This is a significant endorsement of *TSM* and a powerful recognition of the program's effectiveness in improving energy management practices at Canadian mining operations.

CLIMATE CHANGE AND THE MINING INDUSTRY

MAC and its members are committed to supporting the transition to a lower carbon future, and to being a constructive partner with the Government of Canada on this important issue. To assist government in the development of an effective pan-Canadian climate change policy, MAC released these *Principles for Climate Change Policy Design* in April 2016:

- **Establish a broad-based carbon price** that is applicable to all sectors of the Canadian economy.
- **Be revenue neutral** by investing revenues generated through carbon pricing into the development of lower emission technologies to manage the transition to a lower carbon future, including climate adaptation, and to ensure a level playing field for trade-exposed industries that are emission intensive.
- **Address competitiveness and carbon leakage concerns** across all sectors to prevent declines in investment, employment, tax revenues and trade.
- **Be predictable, flexible and sensitive to changing economic conditions and geographic circumstances**, to enable consumers and industry to adapt and to treat regions fairly, particularly Canada's north.
- **Be simple, complementary and effective** to ensure that a national climate change regime works in tandem with existing provincial schemes, avoids duplication, and is simple to understand and administer.
- **Support investments in the development and implementation of technologies that lower emissions** through capital investments, which could include public-private partnerships.
- **Recognize early action**, acknowledging that some companies have been proactive in reducing their climate footprints and that several provinces have already established climate change mitigation regimes.

Mining Sector Emissions Profile

According to the Canadian Industrial Energy End-Use Data and Analysis Centre, direct emissions from Canada's operating metal and non-metal mines accounted for just 1.2% of the country's total GHG emissions in 2015 (see *Figure 32*).

Despite lacking federally regulated targets, many extraction operations have improved their capabilities in compressed air, ventilation, metering and energy management, and have been doing so for years. Canadian mining companies are also involved in innovative initiatives to find non-diesel alternatives for large mobile equipment. Investment in these areas is a priority for the industry as older and deeper mines require more energy to access and extract the same amount of ore. Mines in northern Canada face a special energy challenge because of the lack of electrical grid capacity, making them reliant on diesel fuel. As a result, some mines are less able to lower their carbon emissions due to the remoteness of their locations and the infrastructure challenges they face.

Oil sands production has a track record of continuous improvement in emissions reduction (data not included in Figure 32). Between 1990 and 2012, GHG emissions associated with every barrel of oil sands crude produced decreased by 28%. For oil sands mining, GHG emissions reductions have been driven by innovations such as hydrotransport and efficiency improvements in bitumen extraction, upgrading, and natural-gas-fired cogeneration for electricity and steam. With the advancement of steam-assisted gravity drainage about a decade ago, technical improvements have continually enhanced the steam-to-oil ratio, increasing the efficiency of this process. Despite reductions in the energy intensity of each barrel of oil produced, the absolute level of GHG emissions has grown as oil sands production volumes have increased.

Federal Climate Change Policy

MAC is engaged in the following policy and regulatory initiatives, all of which are happening concurrently:

- Proposed regulations for coal- and natural-gas-fired electricity generation
- Proposed regulations for a Clean Fuel Standard
- Proposed regulations for stationary diesel engines
- Proposed enhanced GHG reporting requirements
- The Technical Backstop carbon pricing consultation

While these initiatives each require independent consideration, how they interrelate must also be assessed. It is critical that they work harmoniously to create consistent, coordinated and complementary policies and regulations.

In Canada's growing patchwork of climate change initiatives, provincial and federal policies are increasingly likely to target the same GHG emissions. MAC is concerned about the potential for duplication between existing or developing regulatory initiatives that could result in over-regulation of the same emissions. It is also possible that some of these initiatives will duplicate or conflict with what provincial governments are already doing. This duplication would increase overall costs, create additional reporting and compliance burden, frustrate private sector innovation, and generally blunt the incentive for corporations to take action, all without achieving significant additional GHG emissions reductions.

MAC believes that carbon pricing is the simplest and most cost-effective way to lower GHG emissions, that it should do most of the heavy lifting, and that any additional policies or regulations must complement – not undermine – it. To achieve this objective, MAC recommends that government:

- Make carbon pricing the core of its climate policy, which should be backed by robust protections for emissions-intensive and trade-exposed sectors, and should also be sensitive to remote and northern regions.
- Clearly demonstrate complementarity, in the form of a robust and publicly disclosed economic impact assessment, before adopting non-pricing climate change policies and regulations to avoid cumulative effects.

Climate Change Policy in the North

Northern energy costs are compounded by the infrastructure deficit in the territories and remote regions of the provinces. The extremely limited reach of transmission and distribution infrastructure means mines and development projects are off-grid and dependent, with very few exceptions, on diesel. Beyond the cost of fuel itself, the cost per unit of delivered fuel is inflated significantly by associated investments essential to supporting the mines' energy supply chain. Fuel-switching opportunities are also limited and are contingent on geographical considerations.

The infrastructure deficit and the current state of available technologies means that companies operating in the North will not be able to replace diesel (and thus mitigate its emissions) on the scale required to avoid absorbing carbon pricing as a cost of business.

While the government has developed valuable tools to support the North's transition to a lower carbon economy, such as infrastructure funding, their deployment will come after the implementation of carbon pricing.

As the government develops its backstop mechanism, which territorial governments are likely to deploy due to capacity constraints, it must build recognition of the factors affecting northern mining into climate change policies and regulations. One-size-fits-all policies have not worked in the North before, and those related to climate change are no different.

Mining and Natural Gas

Mining companies that have had access to natural gas have been using it to power operations for decades. Recent developments in natural gas have increased its viability and generated interest from other miners across the industry. Technological advances in gas extraction have boosted supply through new finds and increased access to known deposits. Due to market developments in North America, gas prices remain low compared to Europe and Asia. As a cleaner fuel, gas also has a smaller GHG footprint than diesel fuel. This places natural gas in a good position to help miners reduce their carbon emissions when it is viable to fuel switch.

Stornoway Diamond Corporation's Renard Diamond Mine is a recent example of a mining company embracing the natural gas opportunity. The mine, now in production, anticipates significant cost and environmental benefits from using natural gas compared to diesel:

- Annual operating cost reductions of between $8 million and $10 million over the initial 11-year mine life, representing a mine-life cost savings of $89 million.
- Incremental capital cost of only $2.6 million over the cost of diesel gensets, representing a net payback of four months.
- An estimated reduction in GHG emissions of 43%, with significant reductions in NO_2 and SO_2.

Another example is ArcelorMittal, which is piloting a project to switch to natural gas for its Port Cartier operation. The pilot expects to displace 4.7 million litres of heavy fuel oil in 2018, mitigating 4,800 tonnes of CO_2 equivalent. If successful and deployed permanently, the fuel-switching project will reduce emissions by an estimated 50,000 tonnes of CO_2 equivalent annually. In addition, Western Copper and Gold intends to power its Yukon-based Casino project, which is still at the permitting stage, with natural gas. This would be a first for mining in the territories.

For many mines, however, there are other considerations. Given that natural gas prices are subject to volatility – such as winter price spikes – questions over the viability of switching require detailed analysis. In many situations, mining companies face similar challenges in accessing natural gas as they do with other diesel-replacing alternatives. In remote areas, particularly in the North, no direct transmission or distribution pipeline network exists – and building one would be capital-intensive. Maritime transportation of natural gas is also expensive as it requires ships and unloading and storage facilities – a compounded challenge as very little port infrastructure currently exists, and all-weather road systems are scarce.

Natural gas technologies, however, continue to improve and incrementally enhance the fuel's usability for miners. Some natural gas generation technologies have been designed to retrofit existing diesel systems, making a fuel switch less capital intensive. From an end-use perspective, progress has also been made towards the development of liquid natural gas engines for heavy vehicles where potential fuel savings and emissions mitigation are significant.

Mining and Renewable Energy

Renewable energy technologies and their economics continue to improve. Renewable power is appealing to mining companies because it has the potential to reduce energy costs and environmental impacts, enhance energy security and address climate change.

Given the heightened cost of powering mining operations, companies are giving the benefits of renewable energy technologies greater consideration. The levelized cost of electricity (LCOE) for wind, solar photovoltaic, concentrated solar power and some biomass technologies has steadily decreased, enhancing their competitiveness, particularly for off-grid generation. According to the International Renewable Energy Agency, prices of solar photovoltaic modules have fallen by about 80% since the end of 2009, while wind turbine prices have fallen by 30–40%.

While cost competitiveness improvements in renewable energy are both welcome and attractive, they do not account for additional capital costs associated with remote development. The technology improvements also vary based on the quality of the renewable resource. Just as miners need to go where the viable deposits are located, renewable energy generation is contingent on the strength and reliability of the renewable asset. This restriction prevents renewable energy generation from becoming an industry-wide energy solution, no matter how improved the technology is.

But for mines that have access to a viable renewable asset, diversifying energy portfolios with a reliable intermittent power source that simultaneously offsets their reliance on diesel has benefits that may merit the investment. Recent examples include Rio Tinto's and Dominion Diamond Corporation's Diavik Diamond Mine in the Northwest Territories, IAMGOLD's Rosebel Mine in Suriname, and Glencore's Raglan Mine in Quebec.

MINERS PUT ENERGY INTO RENEWABLE POWER

Sitting on a plateau 600 metres high on the Ungava Peninsula in northern Quebec, Glencore's Raglan Mine is well situated to take advantage of the power of wind. In 2014, the company did exactly that when it completed its construction of a 120-metre-high wind turbine and storage facility, the largest in Quebec.

The project, a private-public partnership between Raglan Mine, TUGLIQ Energy and the federal and provincial governments, was unprecedented in scale, and was specially designed for severe Arctic climate conditions.

In its inaugural year, the 3-megawatt wind turbine and storage facility saved 2.1 million litres of diesel and reduced GHG emissions by 5.85 kilotons. Based on these results, Glencore estimates that it will save more than $40 million in fuel-related costs over the projected 20-year life of the wind turbine. This successful pilot project could have transformative impacts across northern Canada, helping to pave the way for the more widespread adoption of greener energy alternatives.

THE CLEAN ENERGY ECONOMY

There is a natural synergy between mining and clean technology. Extracted raw materials are transformed into technology that assists mining operations in reducing their environmental footprints and enhancing efficiency and reliability. These products and technologies also drive performance improvements and efficiency gains, and result in a lower carbon footprint across society.

Promising technology areas include low carbon energy, energy storage, carbon capture and storage, green buildings and materials, clean vehicles and renewable energy.

A cleaner society depends on metals and minerals for building blocks. Hybrid vehicles, for example, draw energy from nickel hydride batteries. Catalytic converters, which reduce air pollution from vehicles, require platinum, rhodium and cerium. Rechargeable batteries are made from lithium, and solar cells require gallium, indium and germanium. The average electric car contains 75 kilograms of copper wiring, nearly three times as much as a conventional vehicle. Water purification systems rely on nickel and rare earth elements. The fuel efficiency of aircraft has improved by 70% over the past 40 years because of materials like aluminum, and next-generation technologies will be based on even lighter composites.

As primary materials, mining products will remain fundamental to the Canadian economy as it transitions towards a lower carbon future. As the mining industry continues to improve its environmental performance, so will its products continue to shape our world.

COAL'S ROLE IN A SUSTAINABLE SOCIETY

About 770 kilograms of steelmaking coal (metallurgical coal not thermal coal) are required to produce 1 tonne of steel, and more than 700 million tonnes of steelmaking coal are used each year in global steel production. Steel is used to create the infrastructure and other materials Canadians use every day. For example, steel is crucial for:

- **Public transportation.** Approximately 30,000 tonnes of steelmaking coal was required to build Vancouver's Canada Line. This 19-kilometre rapid transit line currently accommodates more than three million passenger trips through Vancouver per month.
- **Personal recreation.** Approximately 1.1 kilograms of steelmaking coal is required to build the average bicycle frame.
- **Alternative energy.** Approximately 100 tonnes of steelmaking coal is necessary to produce the steel to build the average wind turbine.

Source: Teck Resources Limited

Recycling and E-Waste

E-waste is one of the fastest-growing waste streams in the world and includes items such as mobile devices, computers, monitors, televisions and DVD players, among other electronic equipment. The lifespan of computers in developing countries, for example, has dropped significantly in recent years, and mobile devices frequently have a lifespan of less than two years. As consumers and businesses favour disposable technology and a shorter life cycle for electronics, the amount of e-waste generated is increasing. For example, recent statistics suggest that over 22 million Canadians have mobile device subscriptions, with many people replacing their devices on either an annual or biennial schedule.

A large portion of e-waste can be recycled, components of which can be recovered as "urban ore." E-waste recycling involves reprocessing obsolete or unwanted electronics that have exhausted their re-use potential and would otherwise be disposed of in landfills. From 50,000 mobile phones, Electronics Product Stewardship Canada estimates that approximately 1 kilogram of gold, 400 grams of palladium, 10 kilograms of silver, and 420 kilograms of copper can be recycled. By recycling these items, valuable materials are kept out of landfills and can produce new products using resources that do not need to be mined.

For example, Glencore's Horne smelter, located in Rouyn-Noranda, Canada, has been recovering copper and precious metals from end-of-life electronics for over 30 years. The smelter receives end-of-life electronics from North America, Europe, Asia and South America. The materials are sampled for accurate value determination and processed to produce copper anodes. These are shipped to a Montreal refinery for further refinement into saleable products.

It is estimated that the world's supply of end-of-life electronics offers a material resource of 40 million tonnes annually, from which a variety of component materials can be recycled. Propelling these efforts internationally is the Basel Convention, which controls the export of hazardous waste and requires e-waste to be treated as close to its origins as possible. The Convention, which entered into force in 1992, now has 186 parties, 53 of which are signatories, including Canada and the European Union.

While e-waste recycling programs have increased across Canada in recent years, more awareness is needed among Canadians of the options available for recycling old electronics. As well, the future of metal and e-waste recycling in Canada depends partly on how far government regulations go in requiring manufacturers and consumers to take responsibility for the life cycle of the products they use.

Cameco, Environmental Awareness Week, Key Lake Mine, Saskatchewan

INDIGENOUS RELATIONSHIPS AND PARTNERSHIPS

Proportionally, the mining industry is the largest private sector employer of Indigenous peoples in Canada. This can be partly attributed to the proximity of Canada's 1,200 Indigenous communities to mining operations. Most of these communities are located within 200 kilometres of approximately 180 producing mines and more than 2,500 active exploration properties. While this geographical proximity provides a foundation for collaboration and partnership, more can always be done to enhance relationships between the mining industry and Indigenous communities. (See Section 4 of this report for more discussion.)

Leading Canadian mining companies pursue innovative, progressive and mutually beneficial partnerships with Indigenous communities. Since the groundbreaking 1974 Strathcona Agreement, Natural Resources Canada estimates that 500 bilateral agreements – impact benefit agreements (IBAs) or other agreements at the exploration stage – have been signed for, and that 400 of them remain active.

These agreements include commitments to support or provide education, training, jobs, business development and financial payments, as well as other initiatives, to help ensure mining projects bring long-lasting benefits to local communities.

While earlier agreements typically contained provisions for employment and training, more recent IBAs have been expanded to include the promotion of opportunities for Indigenous businesses through set-aside contracts and joint ventures. They also consider social and cultural matters, provide for environmental monitoring involving Indigenous Traditional Knowledge, set up funding arrangements and dispute resolution mechanisms, and include direct payment and resource-sharing arrangements, among other provisions.

Given the proximity of many Indigenous communities to mineral deposits, a booming Indigenous population, and an increasing demand for the significant economic opportunities that accompany mining projects, there is significant potential for additional partnerships and agreements between Indigenous communities and the mining industry.

Progressive agreements, such as the EKATI mine project agreement in the Northwest Territories and the Raglan agreement in Quebec, have provided Indigenous communities with high paying jobs, skills training, profit-sharing, business opportunities and environmental benefits. In addition to these agreements, the industry has taken proactive policy positions on issues such as government resource revenue sharing, which supports greater participation of Indigenous peoples, communities, businesses and governments in the mining industry.

Agreements between Vale and Labrador's Innu and Inuit people include sections on training, employment, contracting, financial benefits, environmental matters and dispute settlement. In the partnership between the Government of British Columbia and the Stk'emlupsemc of the Secwepemc Nation (SSN), the provincial government shares revenues from New Gold's New Afton mine directly with the SSN, in addition to New Afton's separate agreement with the same bands. This government-to-government agreement broke new ground in Indigenous and natural resources public policy, providing the confidence and mutual benefit needed for mining projects to move forward.

Since then, other revenue-sharing agreements have been struck between the Government of British Columbia and Indigenous communities across the province. In 2016, the Ktunaxa Nation Council and Teck Resources concluded one of the most comprehensive agreements of its kind in Canada.

Spanning approximately 40 years and all five operations in the Elk Valley region, the agreement sets out commitments for both parties in the areas of consultation

and engagement, environment and land stewardship, employment and business opportunities for Ktunaxa citizens, and cultural resources management.

While the relationship between mining companies and Indigenous peoples has largely been positive, several public policy issues continue to create uncertainty for both groups. Mining companies operating in Canada have seen an increasing level of complexity related to the Crown's duty to consult. This complexity is largely reflected in the different policy responses by federal, provincial and territorial governments as to what the actual "trigger" is for consultation, how the consultation process will unfold, who will lead the process, what procedural aspects are delegated to companies, and what support exists for the parties involved. Added to this is the frequent duplication and lack of coordination of effort by both levels of government on consultation activities for the same project. The current review of federal laws that comprise Canada's project approvals and environmental assessment regime provides an opportunity to address these challenges and provide additional clarity on roles and responsibilities.

Flowing from its commitment to a renewed relationship with Indigenous peoples, the federal government adopted the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) in May 2016 and continues to develop a framework for its implementation. The government has since clarified that it is committed to implementing UNDRIP in a manner that fits within Canada's constitutional and legal framework. UNDRIP's principle of Free, Prior and Informed Consent (FPIC), in this context, is generally understood to refer to a process of continuous engagement. Several MAC members, who are also members of the International Council on Minerals and Metals (ICMM), have committed to "work toward obtaining the consent of Indigenous peoples" consistent with ICMM's Indigenous Peoples and Mining Position Statement.

More so than any other Canadian industrial sector, the mining sector has a proven track record of successfully working towards and maintaining positive and respectful relationships with Indigenous communities. Establishing new relationships, deepening those already in place, and pursuing understanding and shared commitments through formal agreements is of great importance to our industry and is accepted as a best practice.

REGULATORY ENVIRONMENT

Developing and operating a mine in Canada requires compliance with a multitude of federal and provincial or territorial legislative and regulatory requirements.

Some of these requirements are specific to mining, while many more apply generally to environmental protection, and the health and safety of workers and the public. To deal with this complexity, Canadian companies, as well as domestic and foreign investors, rely on governments to provide clear information about requirements, approval processes, timelines and responsibilities.

New mines and major expansions must undergo federal reviews and approvals in addition to the review and permitting requirements of their provincial jurisdiction, which is the primary regulator. New mining projects and major expansions are subject to the *Canadian Environmental Assessment Act* (CEAA 2012) and, depending on the details of the project and the mine site, they may require approvals under other federal legislation, such as the *Fisheries Act* and the *Navigation Protection Act*. All three federal Acts were amended in 2012.

The regulatory reform of 2012 maintained the federal government's high level of mining project oversight, if not increased it. Mining projects constitute the majority of projects undergoing environmental assessment under CEAA 2012. The mining industry's experience with the 2012 regulatory reform has been fraught. Under CEAA 2012, for example, the industry has seen a deterioration in coordination between federal and provincial jurisdictions and among federal government departments and agencies, which has created delays and uncertainty. Duplication in provincial processes and federal intrusion into provincial jurisdiction has also resulted in inefficiencies and costly impacts to project economics. In addition, the Act is not well integrated into post-environmental assessment permitting, which also leads to delays and uncertainty.

Another key issue is that CEAA 2012 is currently structured to assess only large, clearly defined projects such as mines, rather than the cumulative effects of human and other industrial activities in a given region. This calls into question the Act's scope, which disproportionately focuses on the mining industry. As well, it creates delays and uncertainty for mining projects in regions where species listed under the *Species at Risk Act* or their habitat are found on provincial Crown land. The *Species at Risk Act* does not yet have a full suite of compliance tools, policies and coordination mechanisms for effective implementation.

The aggregate impact of these issues has been deterioration in Canada's relative standing as a destination for mining investment. Uncertainty surrounding these processes has contributed to a steady decline in mining investment in recent years.

For example, only four new mining projects were submitted for federal environmental assessment in 2017 to date (see *Figure 33*).

For the reasons above, MAC welcomed the government's review of the federal environmental assessment process, which was launched in 2016. The government published a discussion paper in June and is expected to amend the Act and regulations in 2018. MAC has participated actively in the government's consultative process and is a member of the Multi-Interest Advisory Committee, which was formed to assist in the review. For the industry to thrive in Canada, the process for reaching a decision on whether a mine can be built, and under what conditions, needs to be determined through a timely, coordinated and seamless process that continues to be grounded in meaningful consultation. In turn, this will help restore and preserve Canada's reputation as an attractive jurisdiction for mineral investment and sustainable mining development.

Beyond the federal environmental assessment review, the government is also poised to amend the *Metal Mining Effluent Regulations* (MMER), which underwent a three-year review that concluded in 2015. These are federal regulations under the *Fisheries Act*. The amendments would expand the scope of the regulations to include diamond mines and would stipulate more stringent effluent discharge limits, particularly for new mines. It is essential that the MMER provide a clear compliance mechanism for mining in Canada, with requirements that facilitate growth and economic opportunities while protecting the environment. The amendments to the MMER are expected to be finalized in 2018.

Environment and Climate Change Canada is also in the process of developing proposed *Fisheries Act* regulations for coal mines, which would be similar to the MMER. ■

Suncor, Wetlands Monitoring near Fort McMurray, Alberta

FIGURE 28

MAC MEMBER COMPANY APPLICATION OF INTERNATIONAL STANDARDS AND PROGRAMS

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INTERNATIONAL INITIATIVES

MAC member company application of International Standards and Programs *Applied at international facilities. **TSM is applied at international facilities, but results are not reported publicly.	Industry Sustainability Initiatives			Management System Standards		International Voluntary Initiatives				Reporting, Disclosure and Transparency Standards					Financing Standards	Listed on Socially Responsible Investing Indices		Commodity Specific Standards		
	MAC Towards Sustainable Mining*	ICMM Sustainable Development Framework	WGC Conflict Free Gold Standard	ISO 14001: EMS Standard	OHSAS 18001	UN Global Compact	Extractive Industries Transparency Initiative	Voluntary Principles on Security and Human Rights	OECD Guidelines for Multinational Enterprises	AA 1000	Global Reporting Initiative	Carbon Disclosure Project	Water Disclosure Project	Carbon Pricing Leadership Coalition	IFC Social and Environmental Performance Standards	Dow Jones Sustainability Index	Jantzi Social Index	Responsible Jewellery	International Cyanide Code	Kimberley Process
Companies/Business units headquartered in Canada with international operations:																				
Agnico Eagle Mines Ltd.	✓		✓								✓	✓	✓			✓		✓	✓	
Barrick Gold Corporation		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	
IAMGOLD Corporation	✓			✓	✓				✓		✓	✓			✓		✓			
Kinross Gold Corporation			✓	✓	✓	✓	✓	✓			✓	✓	✓		✓		✓		✓	
HudBay Minerals Inc.**	✓			✓	✓		✓	✓	✓		✓	✓	✓		✓					
First Quantum Minerals Inc.	✓					✓	✓	✓				✓			✓					
Teck Resources Limited **	✓	✓		✓		✓	✓		✓		✓	✓	✓	✓	✓	✓				
Vale (Base Metals)				✓	✓	✓	✓	✓			✓	✓	✓	✓	✓					
New Gold Inc.**	✓		✓	✓	✓	✓					✓	✓					✓		✓	
Eldorado Gold			✓	✓	✓	✓					✓	✓	✓						✓	
Goldcorp		✓	✓		✓	✓	✓	✓		✓		✓	✓		✓				✓	
Lundin				✓	✓	✓		✓	✓	✓	✓	✓	✓							
Companies headquartered outside of Canada with Canadian operations:																				
Glencore		✓		✓	✓	✓	✓	✓			✓	✓	✓		✓	✓				
De Beers Canada Inc.**	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓			✓		✓
Newmont Mining Corporation		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	
Rio Tinto		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		✓		✓
ArcelorMittal				✓	✓		✓				✓									

Sources: MAC Member Companies, TSM Progress Report 2017.

FIGURE 29
TSM TAILINGS MANAGEMENT

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TAILINGS MANAGEMENT ASSESSMENTS
PERCENTAGE OF FACILITIES AT A LEVEL A OR HIGHER 2006, 2015 AND 2016

Sources: MAC Member Companies, TSM Progress Report 2017.

FIGURE 30
TSM BIODIVERSITY CONSERVATION MANAGEMENT

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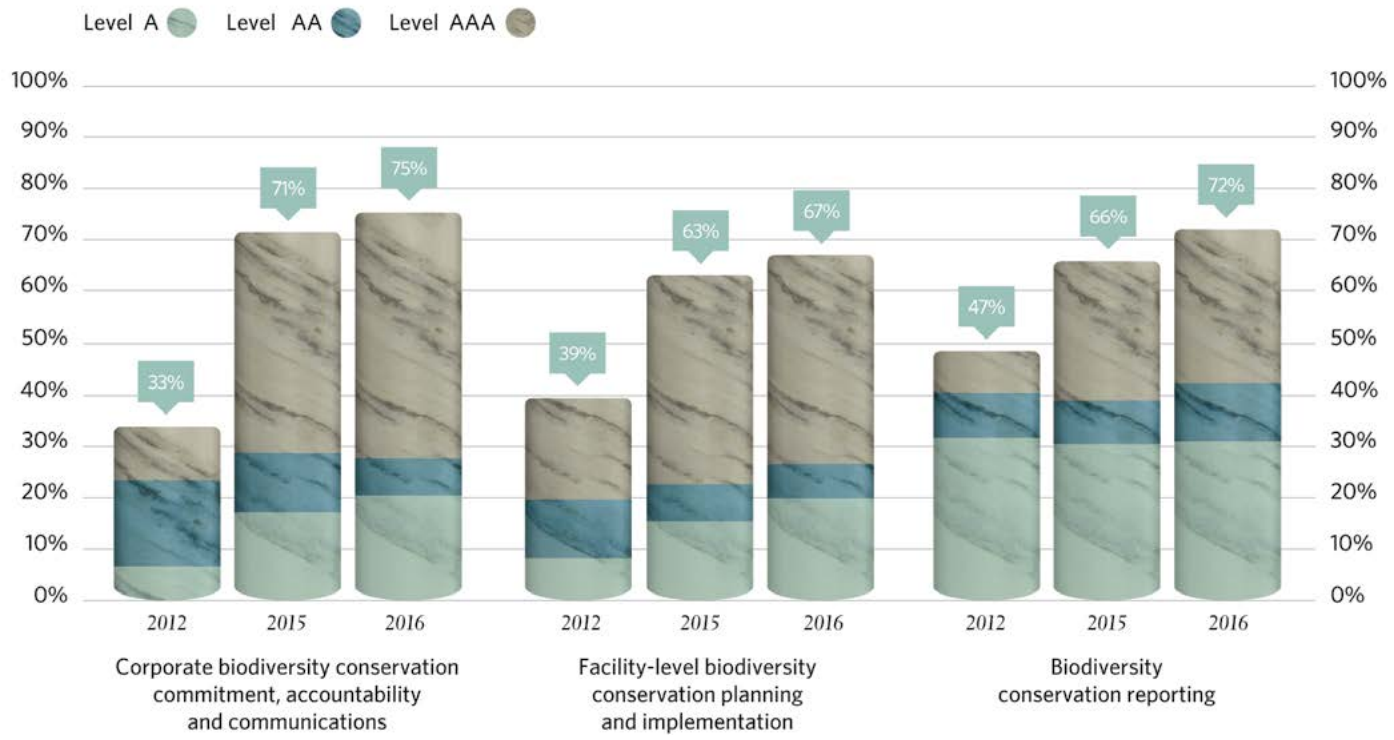
BIODIVERSITY CONSERVATION MANAGEMENT ASSESSMENTS
PERCENTAGE OF FACILITIES AT A LEVEL A OR HIGHER 2012, 2015 AND 2016



Sources: MAC Member Companies, TSM Progress Report 2017.

FIGURE 31
TSM ENERGY USE AND GHG EMISSIONS MANAGEMENT

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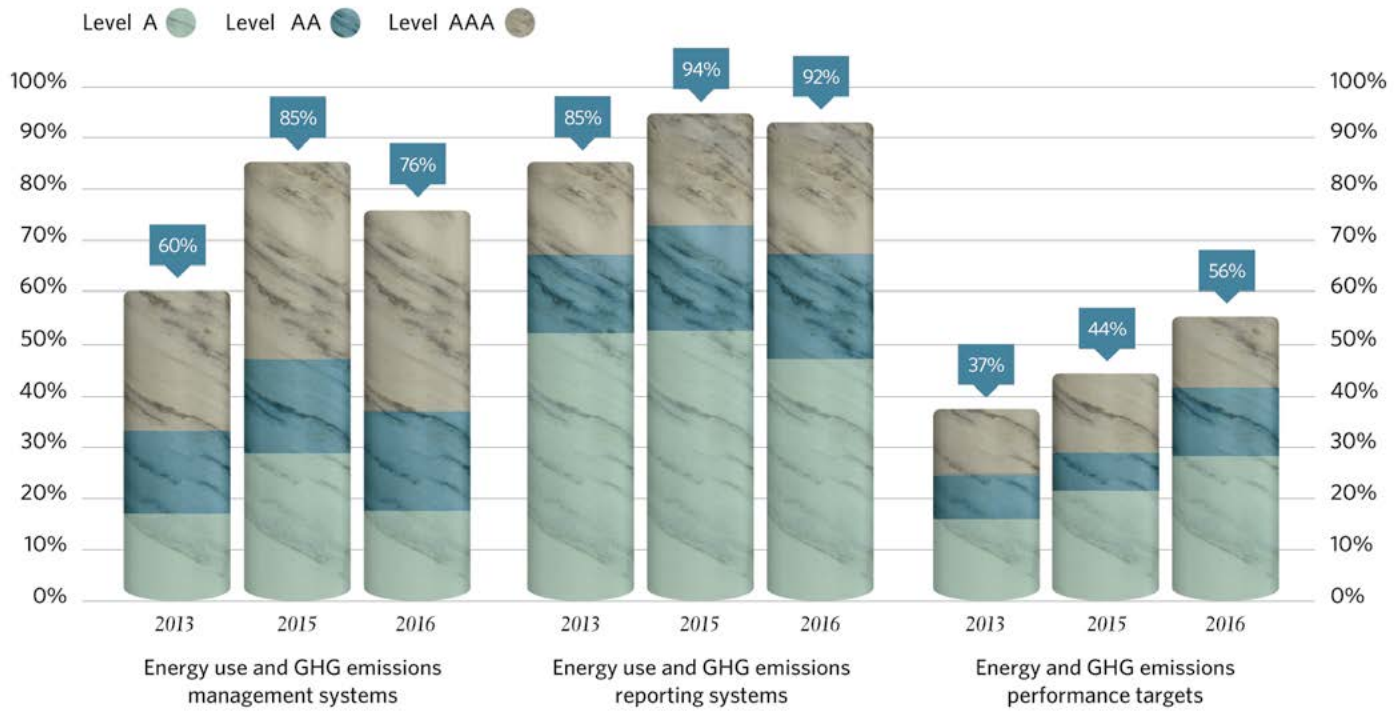
ENERGY USE AND GHG EMISSIONS MANAGEMENT ASSESSMENTS
PERCENTAGE OF FACILITIES AT A LEVEL A OR HIGHER 2013, 2015 AND 2016



Sources: MAC Member Companies, TSM Progress Report 2017.

FIGURE 32

MINING INDUSTRY ENERGY AND GHG EMISSIONS DATA, 1990 and 2015

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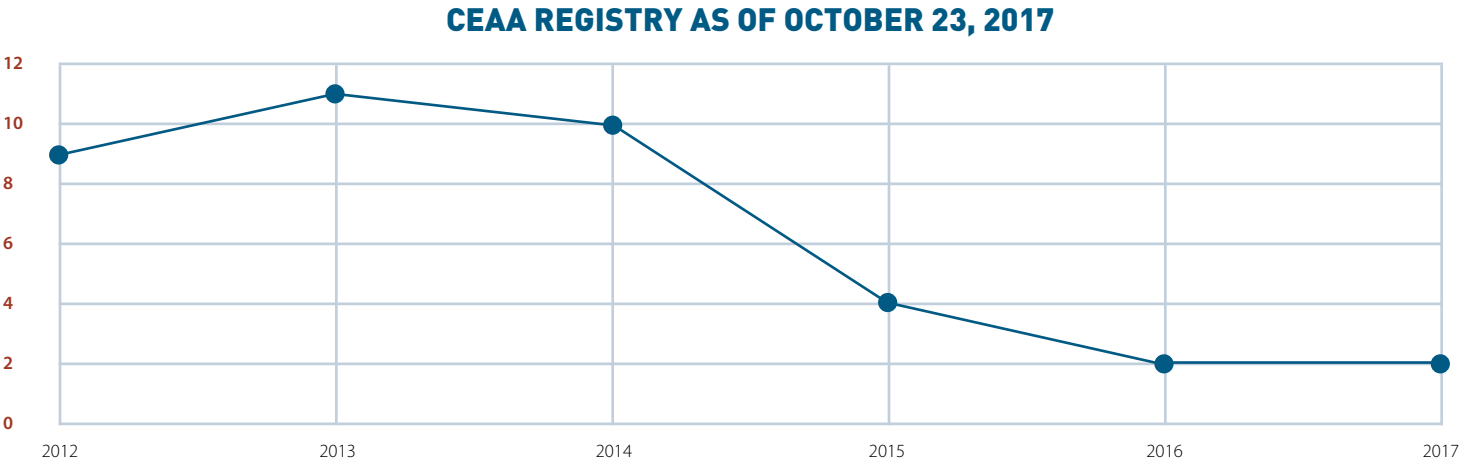
	1990	2015
Canadian economy		
Canadian energy use (PJ)	9,608	11,924
Energy used by broader industry (PJ)	2,400	3,656
Canadian GHG emissions (mt)	613	741
Direct GHG emissions by all industries (mt)	104.1	149.6
Metal and non-metal mining		
Total energy use (PJ)	143	150
Share of Canadian energy use (%)	1.48	1.126
Total GHG emissions (Mt CO2e)	8.57	8.6
Share of Canadian GHG emissions (%)	1.4	1.16

Source: Canadian Industrial Energy End-Use Data Analysis Centre (CIEEDAC) Report, 2017.
Total includes direct and indirect emissions.
MAC has sought to include coal and oil sands mining data into the above calculations to provide a more representative, mining sector-wide statistic; however, CIEEDAC does not have access to oil sands mining or coal mining energy and emissions data to augment the non-metal mining data set.

FIGURE 33

CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY - MINING PROJECTS 2012-2017

Return to text



Note: 2012 and 2017 not complete years.

Source: Canadian Environmental Assessment Agency

SECTION 6

THE WORLD: INTERNATIONAL MARKET ACTIVITIES AND DEVELOPMENTS

CANADIAN EXPLORATION AND MINING COMPANIES HAVE A SIGNIFICANT PRESENCE OUTSIDE CANADA'S BORDERS, AND CANADA IS REGARDED AS A GLOBAL LEADER FOR RESPONSIBLE MINING. BEYOND BEST PRACTICES, HOWEVER, WORLD MARKET CONDITIONS SHAPE THE INDUSTRY, AS DO GLOBAL TRADE AND INVESTMENT POLICIES.

CANADIAN MINING'S INTERNATIONAL PRESENCE

Canadian mining companies operate in more than 100 countries around the world. According to Natural Resources Canada, the value of Canadian mining assets abroad (CMAA) reached $170.8 billion in 2015, up 2.6% year-over-year and accounting for two-thirds of total Canadian mining assets (see *Figure 34*). By comparison, this figure is nearly twice that of Canadian mining assets at home, which amounted to $88.3 billion.

As geographic indicators, Latin America and Africa, respectively, were the top two continental destinations for Canadian international mining assets. Notably, however, Asia experienced the greatest gain in percentage terms (+18.2%).

Africa experienced significant growth (+15.9%) in 2015. The most notable changes occurred in:

- **Democratic Republic of the Congo (+$1.3 billion).** Ivanhoe Mines reassessed the value of its Kamoa copper project following its partial sale.
- **Zambia (+$2.3 billion).** First Quantum Minerals officially opened the Sentinel copper mine in 2015 and continued to make investments at Kansanshi, the largest copper mine in Africa.

In Latin America, which accounted for 52% of CMAA, increases in Brazil, Panama and Peru were offset by declines in Chile, the Dominican Republic and Guatemala. This resulted in a consistent overall value for the region compared to the previous year at $88.5 billion in 2015.

Notable changes occurred in:

- **Brazil (+$1.7 billion).** Silver Wheaton increased its interest in Vale's Salobo copper-gold mine.
- **Panama (+$2.2 billion).** Development continued at the Cobre Panama copper mine owned by First Quantum Minerals.
- **Peru (+$0.9 billion).** Hudbay's Constancia copper-gold-molybdenum mine reached commercial production during 2015. Silver Wheaton acquired an interest in Glencore's output from the Antamina copper-zinc-molybdenum-silver mine.

There are significant annual investments associated with these assets. In fact, companies listed on the Toronto Stock Exchange (TSX) and the Venture Exchange (TSX-V) raised $1.8 billion for African mining projects in 2016 and $4.9 billion in equity capital for Latin American mining for the same year. Despite these investments, Canadian mining companies are facing increasing competition from other mining jurisdictions operating internationally, such as Australia and China.

Canadian Direct Investment Abroad

Canadian direct investment abroad (CDIA), and mining's share of that, is an indicator of the industry's international presence. CDIA was projected at $1.05 trillion in 2016 (see *Figure 35*). Of that, the mining sector accounted for $90.8 billion, or 9%, of the total. This is up 33% year-over-year and is reflective of rising commodity prices at the time.

The Value of Company Expenditures in Host Countries

Beyond measuring inflows and outflows of industry capital, the impact of a mine's horizontal value chain on local communities and host countries' national GDP is considerable. This value chain significantly exceeds the taxes and royalties paid to governments, and can help reshape the dialogue around resource nationalism by more clearly identifying mining's vast economic contributions.

It has been estimated that approximately 80% of all money spent in building and operating a mine is spent in the host country through wages, local procurement and payments to various levels of government. This estimate is supported by research conducted by MAC in 2017. Using methodology developed by the World Gold Council, MAC surveyed its members on their 2016 expenditures related to mining activities outside of Canada. The purpose of this study was to better understand the Canadian mining sector's overall contributions to economic development around the world, beyond focusing exclusively on taxes and royalties.

Nine MAC member companies – representing 38 producing operations and 12 non-producing operations, and employing 70,500 employees and contractors – provided information on their expenditures related to employee salaries, payments to suppliers, community investment, taxes and royalties, and payments to providers of capital.

The data provided by these 50 operations reveal results similar to those in the World Gold Council's 2014 report, *Responsible gold mining and value distribution*, which showed that the majority of expenditures associated with mining activities are spent in host countries. For MAC's survey, the reported expenditures totalled US$14.3 billion, with US$13 billion (91%) being spent in the host country.

The survey also found that the largest beneficiaries within host countries are companies that supply equipment and services to mining operations, accounting for 37% of the total.

AN ANALYSIS OF NINE MAC MEMBERS' INTERNATIONAL ACTIVITIES – SPANNING 50 OPERATIONS AND DEVELOPMENT PROJECTS – REVEALED THAT 91% OF COMPANY EXPENDITURES WERE SPENT WITHIN THE HOST COUNTRY.

The second largest beneficiaries are payments to employees, accounting for 11% of the total, followed by combined payments to governments and communities accounting for 9% of the total. For example, the in-jurisdiction expenditure within Mexico, based on data from the mining operations included in this survey, was US$3.2 billion, with payments to suppliers accounting for US$1.3 billion. *Figure 36* summarizes the consolidated survey data for 21 national jurisdictions and demonstrates that the broader economic contributions mining generates extend far beyond mining project taxes and royalties.

Local Procurement and the Sustainable Development Goals

The positive economic impacts created when Canadian mining companies procure goods and services in their host countries and communities can be game-changers for economic and social development. While civil society and the public at large have tended to focus heavily on the level of tax paid by mining companies, procurement is the single-largest payment type a mining operation will make over its lifespan.

Therefore, recognition of the role that local procurement can play in helping to achieve Sustainable Development Goals (SDGs) is increasing. As discussed in the joint report, *Mapping Mining to the Sustainable Development Goals: An Atlas*, local procurement can contribute meaningfully to a number of SDGs as shown below.

1
NO POVERTY
Local procurement creates revenue and jobs for the countries that host mining.

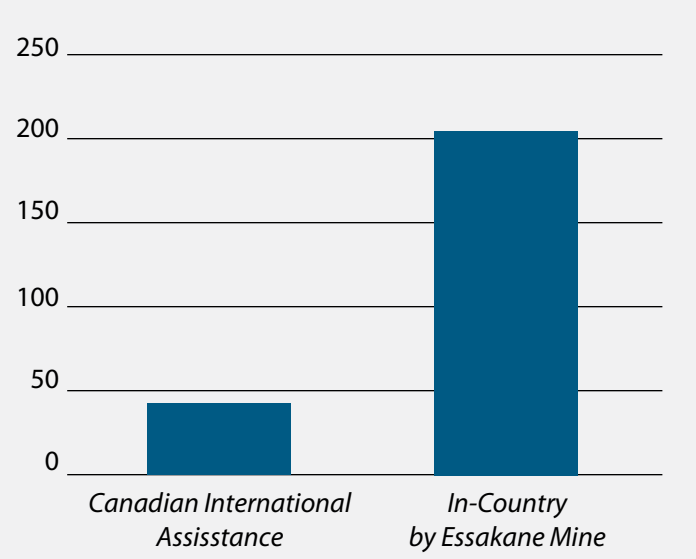
9
INDUSTRY, INNOVATION AND INFRASTRUCTURE
Local procurement increases skills and transfers technology to less developed countries.

8
DECENT WORK AND ECONOMIC GROWTH
Local procurement creates jobs with learning opportunities and more balanced growth in host countries.

10
REDUCED INEQUALITIES
Local procurement helps ensure the benefits of mining are more shared across the economy.

Organizations such as Mining Shared Value – a non-profit initiative of Engineers Without Borders Canada – are promoting awareness of the power of local procurement. For example, a single mine operated by one of MAC's members can spend hundreds of millions of dollars on procurement in a host country. This often represents several times the amount of official development assistance the Canadian government may provide to that country. The example below shows the scale of economic contributions by a single mine – IAMGOLD's Essakane operation in Burkina Faso – compared to Canada's aid contributions to the same country.

2015 SPENDING IN BURKINA FASO ($ MILLIONS CAD)



This graph was contributed by Mining Shared Value, a non-profit initiative of Engineers Without Borders Canada that works to improve the development impacts of mineral extraction by promoting local procurement by the global mining industry.

CANADA'S MINERAL TRADE

Despite showing a trade deficit in the third and fourth stages of mining in 2016, the sector as a whole maintained a surplus of $15.8 billion (see *Figure 37*). Approximately a four-fold increase from a decade earlier, this surplus indicates a healthy global demand for Canadian mineral products.

THE MINING SECTOR IN CANADA IS ONE OF THE FEW SECTORS THAT CONSISTENTLY MAKES A POSITIVE CONTRIBUTION TO CANADA'S BALANCE OF TRADE.

Exports

The value of Canada's mineral and metal exports increased by approximately 11% between 2007 and 2016 but experienced a year-over-year drop of 3.4% compared to 2015. At $77 billion, exports of mineral products for the first three stages of mining remained robust in 2015 and are on par with pre-recession levels. Stage 4 exports totalled $15 billion, up 27% from 2014. Combined, the exports for the four stages reached $91.6 billion, or 19% of the total value of Canada's exports (see *Figure 38*).

Over half of Canada's mineral and metal exports by value were destined for the United States in 2015, with iron and steel, aluminum, gold, silver, platinum, potash, copper, zinc and nickel holding the largest values (see *Annex 9*). The European Union is a leading destination for Canadian gold, iron ore, nickel and diamonds. Other destinations, including China, buy significant volumes of copper, iron ore, coal and potash.

Imports

Total imports for the first three stages of mining decreased by more than 5% year-over-year, coming in at $41.3 billion. Notable, however, is that Stage 2 imports accounted for all of this drop, underscoring the competitiveness challenges that Canada's smelters and refineries face on the global stage. Stage 4 edged downward by 1.4%, marking the first year-over-year decline since 2009. Combined, the four stages totalled $77 billion in imports (see *Figure 37*). Of Canada's total mineral imports by value in 2016, approximately 50% came from the United States, which equalized the balance of trade between the two countries for minerals and metals (see *Annex 10*).

CANADA'S TRADE POLICIES

The Canadian mining industry boasts a significant international presence with operations in more than 100 countries, and is one of the few sectors that consistently makes a positive contribution to Canada's balance of trade.

Free trade, investment and taxation agreements help facilitate the trade of mining products and investment flows. These agreements reduce barriers for investment, enhance transparency and advance cooperation. The reduction and elimination of tariffs increases the competitiveness of Canadian mineral products in foreign jurisdictions by levelling the playing field from a cost standpoint, thus enabling companies to capture greater market share.

Investment agreements, complete with dispute resolution mechanisms, provide mining investors with greater certainty over the investments that companies make in foreign jurisdictions.

Labour mobility and regulatory cooperation mechanisms enable companies to secure the key skills they need for project development and operation, and promote dialogue through the complex process of obtaining regulatory approvals.

However, international agreements do not alone facilitate trade. Canada must have the capacity to advance more product to tidewater so that companies can take advantage of the greater market share created by these agreements. Therefore, trade-enabling and transportation infrastructure is essential for companies to get their goods to market. Beyond infrastructure expansion, the efficient operation of Canadian transportation modes, such as rail, is critical.

Part of maintaining Canada's global leadership is ensuring that Canadian mining and supply sectors have access to modern and comprehensive trade and investment vehicles to meet the world where it does business. MAC is pleased to see the Government of Canada pursuing a robust trade agenda, and supports participation in the following engagements.

North American Free Trade Agreement

In 1994, the North American Free Trade Agreement (NAFTA) came into effect, creating one of the world's largest free trade zones and laying the foundation for strong economic growth and rising prosperity for Canada, the United States and Mexico. Since then, Canada's trade with the US has risen by 254% to $670 billion, while trade with Mexico has grown by a staggering 900% to $41 billion. NAFTA has also created millions of jobs. According to the US Chamber of Commerce, about 14 million American jobs depend on trade with Mexico and Canada.

The agreement has systematically eliminated most tariff and non-tariff barriers to free trade and investment between the three countries. This has increased trade and investment levels in North America, and enabled stronger economic growth, including that of Canadian mining companies, many of which have assets across North America. NAFTA improves competitiveness by providing businesses with better access to services, supplies, investment capital and talent across North America.

MAC supports the Government of Canada in its efforts to seek the maximum benefits possible, and will remain supportive and engaged as negotiations progress.

Comprehensive Economic and Trade Agreement with the European Union

On September 21, 2017, the Canada-European Union Comprehensive Economic and Trade Agreement (CETA) came into force.

The new agreement eliminates 98% of Canadian and EU tariffs and will phase out most remaining tariffs over time. Of specific interest to the Canadian mining industry is the elimination of the following tariffs:

- Aluminum and aluminum products, from rates averaging 6.3%, with peaks of 10.0%
- Nickel and nickel products, from rates of up to 3.3%
- Non-ferrous metals, including copper, zinc, lead and tin, from rates averaging 3.1%, with peaks of 9.0%
- Iron and steel and its products, from rates of up to 7.0%

The agreement also expands into the areas of investment, labour mobility and enhanced regulatory cooperation, as well as lifts ownership restrictions on uranium. CETA is the first bilateral trade agreement in which Canada has included provisions on regulatory cooperation. By fostering cooperation earlier in the regulatory process, differences in approaches between Canada and the European Union may be reduced, resulting in fewer barriers to trade once regulations are in place. To support this process, MAC has partnered with Euromines and EY in a stakeholder-driven research project to determine how best to launch and shape the provisions on regulatory cooperation pertaining to raw materials.

Trans-Pacific Partnership

MAC supported the Trans-Pacific Partnership (TPP) and past efforts to develop that agreement. Originally, the TPP was a multilateral trade negotiation among 12 countries: the United States, Australia, Japan, Mexico, New Zealand, Singapore, Malaysia, Vietnam, Peru, Chile, Brunei Darussalam, and Canada. Together, these countries represent a market of nearly 800 million consumers and a combined GDP of $28.5 trillion – nearly 40% of the global economy.

Canada's exports of metals and minerals to these countries were worth, on average, $158.6 billion per year from 2012 to 2014. Through the reduction of tariffs, operators in Canada stood to gain significantly from TPP partnerships. For example, tariffs for Canadian exports would have been considerably less than those currently applied by Japan (up to 7.9%), Vietnam (up to 40%), Malaysia (up to 50%), Australia (up to 5%,) New Zealand (up to 10%), and Brunei (up to 20%).

In January 2017, the United States withdrew from the TPP. Historically, Canada has had close trade ties with the United States, so the value of the TPP for Canadian mining companies was the expansion of trade relationships with a broader consortium of countries whose economies are

growing rapidly, and whose future anticipated growth is strong. Even without the participation of the United States, a TPP 2.0 agreement has strategic value for Canadian mining companies by expanding their access to growing markets.

Trade Relations With China

China is the single largest consumer of raw materials. Recent estimates suggest that China accounts for 54% of aluminum, 48% of copper, 50% of nickel, and 45% of all steel (and, therefore, a significant percentage of steelmaking coal) consumed globally. China is also a major consumer of precious metals, buying or mining 23% and 15% of the world's gold and silver supply, respectively. The country also consumes 13% of the world's uranium production, a number poised to increase given the number of nuclear reactors under construction or being commissioned.

China is Canada's third-largest market for the export of minerals and metals after the United States and the European Union, with an export value exceeding $4.2 billion in 2016, or approximately 5% of our overall total.

With 18 countries having free trade agreements in place with China, and 11 more countries in various stages of negotiation and pre-negotiation discussions, many nations have acknowledged that their economic futures are inexorably tied to China.

ArcelorMittal, Mont-Wright Mining Complex, Quebec

Given this reality and China's importance to Canada's future, MAC has encouraged the Government of Canada to continue enhancing economic and diplomatic relations with the aim of launching free trade negotiations.

On September 22, 2016, Prime Minister Justin Trudeau and Chinese Premier Li Keqiang opened exploratory discussions on a possible Canada–China Free Trade Agreement (FTA). On March 3, 2017, the government launched consultations to solicit views from Canadians on a possible FTA with China. MAC communicated its support for stronger trade relations with China but emphasized that any agreement should seek:

- Trade free from tariffs
- Trade free from regulatory barriers
- Clear rules for two-way access to foreign investment, which is critical to business certainty

An FTA with China is a significant opportunity for Canada to capture greater Chinese market share for raw materials. Further, Canada possesses a North American advantage in that the Ports of Metro Vancouver and Prince Rupert are, on average, three days closer to multiple Asian ports, including Chinese ports, than our American and Mexican competitors.

MERCOSUR

Mercosur is a South American sub-regional common market trade bloc whose current full members are Argentina, Brazil, Paraguay and Uruguay. In November 2016, Prime Minister Trudeau committed to maintaining an ongoing dialogue on deepening the Canada–MERCOSUR trade and investment relationship.

MAC has supported the government's efforts to reassess the viability of an FTA with MERCOSUR, and participated in consultations on the matter. Combined, the assets of Canadian companies operating in Brazil and Argentina exceeded $22.2 billion in 2015, underscoring the significance of these two countries, which account for 5% and 8%, respectively, of the value of Canadian mining assets abroad. Further, research of a sample of eight MAC member companies indicated that their combined mining investment in Argentina and Brazil in 2016 exceeded $1.9 billion.

Beyond investment and assets, MAC and its members are exporting best practices in mining sustainability to MERCOSUR countries. The most significant recent example of this is in Argentina, where the Cámara Argentina de Empresarios Mineros (CAEM) adopted MAC's *Towards Sustainable Mining*® (*TSM*®) initiative.

Argentina's adoption of *TSM* is an important step forward in cooperation on responsible mining standards between Canada and a major mining jurisdiction in Latin America.

THE CANADIAN INVESTMENT REGIME

Foreign investment gives Canadian businesses easier access to new technologies and ideas, and enhances connectivity to larger markets and production chains. Ensuring that two-way flows of capital remain fair and open is essential. Negotiating safeguards for industry investment abroad, while enabling foreign investment into Canada, are key.

Foreign Investment Promotion and Protection Agreements

A Foreign Investment Promotion and Protection Agreement (FIPA) is a bilateral agreement aimed at protecting and promoting foreign investment through legally binding rights and obligations. At the time of writing, Canada has 37 FIPAs in force, has concluded negotiations with five additional countries, and remains engaged in ongoing negotiations with nine other countries.

While the enforcement components of FIPAs are rarely used, the mere existence of a FIPA provides foreign governments with a set of rules and expectations for fairness and transparency, and gives investors additional confidence. The speed with which the government has negotiated these agreements has helped facilitate industry investment in key destinations.

IAMGOLD, Reclamation Activities near the Essakane Gold Mine, Burkina Faso

Investment in Latin America

Eight of Canada's 37 active FIPAs are with Latin American countries, reflecting the industry's presence in the region, as well as the continent's mineral wealth and potential. As of 2016, Canadian companies held $88.5 billion in assets in Latin America, nearly half of the total value of Canada's overseas mineral assets.

Investment in Africa

Since 2010, the Canadian government has concluded, signed or brought 12 FIPA negotiations into force with African countries. A further three FIPA negotiations are currently ongoing with African countries. In recent years, many African countries have been seeking to benefit from their natural resource endowments, and have become more open to new mining investments and the expansion of existing mining projects. Some of the major resources mined in Africa are iron ore, diamonds, gold, platinum, uranium, copper and coal.

While significant opportunities for strong partnerships exist between mining companies and their host countries, challenges must be overcome to ensure projects can develop in ways that enable the host community, country and company to benefit.

Foreign Direct Investment in Canada

Canada relies heavily on foreign direct investment (FDI), and the mining industry and downstream value-added manufacturing activities accounted for approximately 7% of FDI in 2016. When isolated from this total, 2016 mining FDI into Canada totalled $35 billion, approximately 4.3% of Canada's overall total (see Figure 35).

Canada's Competitiveness for Mineral Investment

Canada has long been a top mining nation in mineral production, mining finance, mining services and supplies, and sustainability and safety. However, there are signs that this leadership position is slipping, which has the potential to jeopardize Canada's ability to attract FDI and seize new opportunities for growth:

- The number of active mineral projects in Canada is down by almost one-half from the 2011 peak of 2,700 projects.
- At the time of writing, only four new mining projects were submitted for federal environmental assessment in 2017.
- Over the past five years, Canada has lost its ranking for seven out of 13 products for which it had been a top-five global producer.

- Australia's mining supply sector has surpassed Canada's in 2015.
- Mining innovation dollars are steadily flowing out of Canada to countries such as Australia, Germany and South Africa.

Natural Resources Canada identified this drop in current and potential investment in major mining-related projects in its report, *Natural Resources: Major Projects Planned and Under Construction – 2017 to 2027*. The report indicates that total number of projects planned and under construction has declined by one-third (49 projects), dropping more than 50% ($86 billion) in value from June 2014 to June 2017. Metal mines experienced the single-largest drop, accounting for 81% of the suspended projects and 79% of the suspended investments.

At risk is a key sector of the Canadian economy, and one that leads the world in sustainable mining practices. Mining contributes $57.6 billion to the national GDP and accounts for 19% of the total value of Canada's exports. Mining employs 403,000 people directly and an additional 193,000 indirectly, supports one of the largest supply sectors in the world, and is proportionally the top private sector employer of Indigenous peoples. The industry also supports many other important sectors of the Canadian economy, such as transportation, construction and manufacturing.

Imminent federal government decisions on regulatory, infrastructure, innovation, climate change, tax and mineral policies will directly influence Canada's ability to recover suspended project investments. Given the synergistic relationship between several of these policy areas, the potential for unintended consequences is high, and major changes to any of these policy areas could radically affect the sector. Vigilant interdepartmental coordination across government is needed to ensure complementarity in policy and regulatory developments and initiatives.

Strategic public policies that encourage sustainable mining development in Canada will enable the sector to expand its already vital contributions to communities across the country. Recent examples are bold trade-enabling infrastructure investments such as the T'licho Road in the Northwest Territories and the Resource Gateway in Yukon. Creative policy, such as the northern allocation in the National Trade Corridors Initiative, and per-capita-plus funding for the territories in federal infrastructure allocations, will help develop nation-building and investment-attracting transportation corridors in the years ahead.

Forward-looking policy decisions such as these are needed across government to allow the industry to further its role as a powerful partner in growing the economy, reconciling with Canada's Indigenous Peoples, addressing climate change, and advancing innovation. ■

Agnico Eagle Mines Limited, Whale Tail Project, Nunavut

FIGURE 34

THE GEOGRAPHICAL DISTRIBUTION OF CANADA'S MINING ASSETS, 2015

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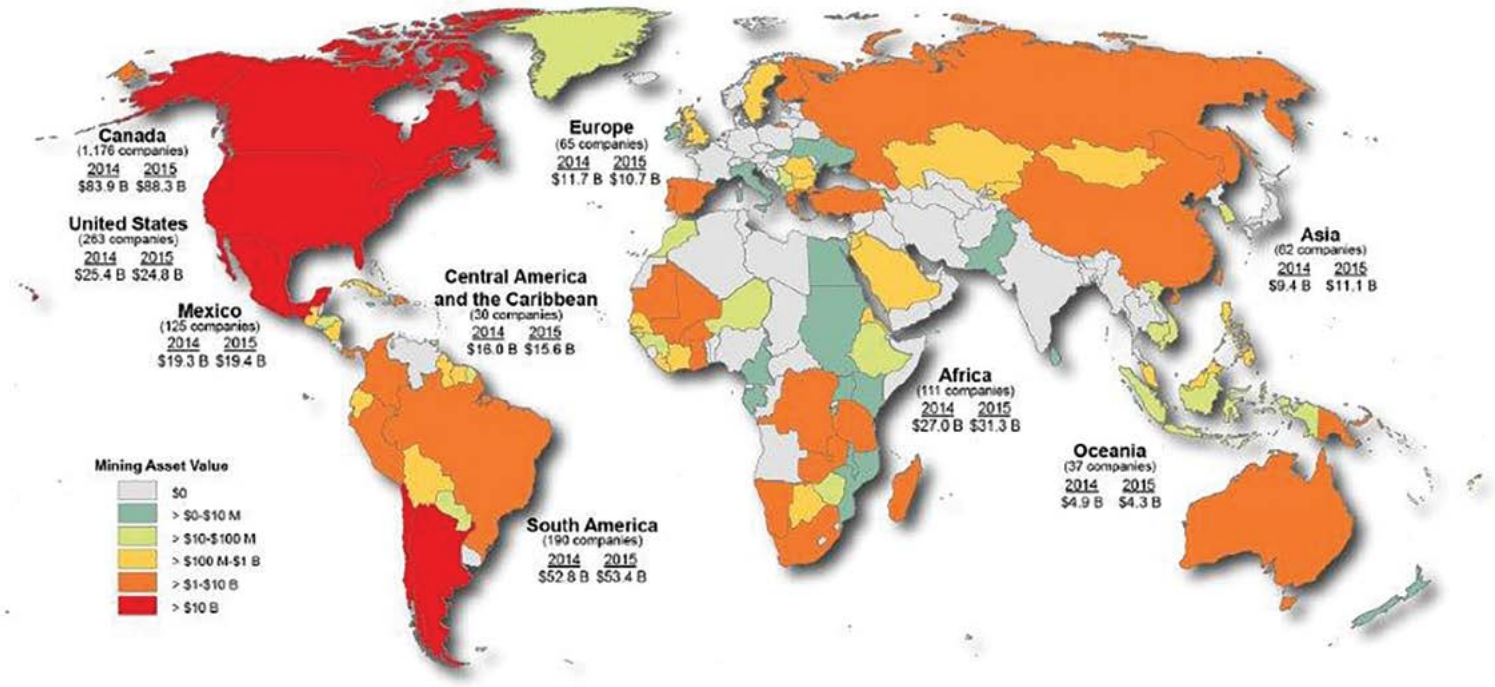

Source: Minerals and Metals Sector, Natural Resources Canada.

FIGURE 35

CANADIAN MINERAL INDUSTRY DIRECT INVESTMENT ABROAD AND FOREIGN DIRECT INVESTMENT STOCKS, 1999-2016[p]

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($ millions)

Year	Total, all industries		Mining (except oil and gas)		Non-metallic mineral product manufacturing		Primary metal manufacturing		Fabricated metal product manufacturing	
	Canadian direct investment abroad	Foreign direct investment in Canada	Canadian direct investment abroad	Foreign direct investment in Canada	Canadian direct investment abroad	Foreign direct investment in Canada	Canadian direct investment abroad	Foreign direct investment in Canada	Canadian direct investment abroad	Foreign direct investment in Canada
1999	290,730	252,563	23,878	5,520	3,048	4,867	9,859	3,732	4,570	2,162
2000	356,506	319,116	23,666	5,535	2,621	5,009	11,662	4,593	4,881	2,214
2001	399,253	340,429	23,666	7,122	3,257	5,425	14,393	4,266	6,091	2,468
2002	435,494	356,819	22,779	6,069	3,028	5,682	13,281	4,064	5,582	2,442
2003	412,217	373,685	22,374	5,666	2,632	6,276	x	4,428	5,464	2,681
2004	448,546	379,450	22,481	8,611	2,105	6,108	x	5,200	4,624	2,748
2005	452,195	397,828	23,025	10,291	2,237	3,659	x	4,484	4,707	2,198
2006	518,839	437,171	23,849	22,375	6,439	6,243	26,255	9,563	4,458	2,941
2007	515,294	512,266	25,045	23,502	5,590	6,525	26,438	29,126	3,251	3,125
2008	641,920	550,539	27,189	9,544	6,787	7,768	30,828	41,879	3,775	2,920
2009	630,818	573,901	38,801	12,219	6,212	8,158	24,132	37,899	3,420	2,473
2010	637,285	592,406	46,706	16,140	5,953	7,276	4,227	34,201	2,293	2,157
2011	675,020	603,455	54,541	14,701	6,384	8,067	5,636	33,784	2,262	2,968
2012	704,335	633,778	63,782	18,622	5,305	7,881	3,172	32,542	2,010	3,153
2013	778,371	688,873	77,108	21,898	5,835	7,092	4,715	27,954	2,270	3,270
2014	845,203	744,671	78,744	36,871	1,155	7,718	7,299	28,986	3,925	3,504
2015	1,035,157	789,012	95,464	33,182	3,400	7,913	4,569	15,093	3,386	3,436
2016[p]	1,049,571	825,704	90,818	35,505	3,161	9,326	3,994	9,146	3,436	2,442

Source: Statistics Canada, CANSIM Table 376-0052.
[p] Preliminary.

FIGURE 36
MINING COMPANY INVESTMENT IN HOST COUNTRIES - 2016

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In-Country Expenditures

Country	Total country specific expenditures (US$m)	Total US$m[1]	As a % of total expenditures	Payments to governments US$m[2]	Payments to Suppliers US$m	Payments to employees	Communities US$m	Payments to providers of capital	Total mineral revenue	Number of employees and contractors[3]
Argentina	$1,164.79	$1,117.22	96%	$40.70	$381.01	$155.35	$2.00		$921.76	2,501.00
Australia	$107.50	$107.50	100%	$14.71	$66.80	$40.60	$0.10		$161.00	325.00
Bolivia	$169.44	$133.71	79%	$27.38	$20.95	$17.93			$102.83	560.00
Brazil	$818.69	$815.08	100%	$0.35	$348.61	$57.75	$0.77		$599.61	3,546.00
Burkina Faso	$600.63	$453.13	75%	$38.63	$170.50	$35.90	$0.60		$529.00	3,104.00
Chile Total	$1,449.69	$1,444.10	100%	NA	$114.15	$50.97	$0.57		$219.45	957.00
Cuba	$884.20	$884.20	100%	$65.88	NA	$68.82	$640.34		NA	NA
Dominican Republic	$359.00	$266.00	74%	NA	$91.00	$42.00			$607.00	NA
Ghana	$433.60	$373.64	86%	NA	$141.46	$43.38	$1.76		$0.03	2,400.00
Guatamala	$380.36	$360.36	95%	$26.36	$123.00	$35.00	$9.00		$242.00	2,323.00
Greece	$446.64	$403.14	90%	$4.63	$151.90	$40.10	$1.60		$42.70	2,417.00
Madagascar	$107.94	$107.94	100%	NA	NA	$34.32	$6.00		NA	NA
Mali	$30.00	$30.00	100%	NA	NA	$15.00			$0.09	33.00
Mauritania	$244.77	$65.86	27%	NA	$174.90	$51.48	$1.39		$208.01	3,650.00
Mexico	$3,268.25	$3,162.45	97%	$105.02	$1,338.80	$171.89	$77.19	1.03	$1,874.76	8,563.90
Peru	$1,288.01	$1,207.71	94%	$51.38	$491.46	$61.23	$3.74		$971.10	6,309.00
Romania	$45.34	$40.74	90%	$12.10	$12.40	$1.80	$0.10		NA	321.00
Russia	$298.85	$191.51	64%	NA	$206.71	$74.63	$0.51		$919.20	2,800.00
Suriname	$534.08	$420.18	79%	$19.98	$161.90	$37.35	$0.85		$3.51	1,672.00
Turkey	$519.40	$373.00	72%	$47.00	$174.40	$38.10	$1.30		$392.10	1,795.00
USA	$1,137.88	$1,082.35	95%	$0.16	$694.37	$400.03	$1.38		$1,577.27	27,228.70
Totals	**$14,289.06**	**$13,039.83**	**91%**	**$454.28**	**$4,864.31**	**$1,473.63**	**$749.19**		**$9,371.42**	**70506**

Source: Mining Association of Canada.
Notes: 1 Includes in-jurisdiction payments to providers of capital.
2 Includes royalties and land use, income and other taxes, employee taxes, other payments.
3 Contractor salaries are included as payments to suppliers.
** Information not available.*

FIGURE 37
BALANCE OF CANADA'S MINERAL TRADE, 2016

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Stage	Domestic Exports ($ thousands)	Total Exports ($ thousands)	Total Imports ($ thousands)	Balance of Trade ($ thousands)
Stage I	24,134,793	24,188,939	8,101,511	16,087,428
Stage II	34,015,622	34,569,391	12,899,761	21,669,630
Stage III	15,384,108	16,518,981	20,325,718	-3,806,737
Stage IV	15,096,964	17,576,153	35,715,591	-18,139,438
Total	**88,631,488**	**92,853,465**	**77,042,581**	**15,810,884**

Sources: Natural Resouces Canada; Statistics Canada.
Notes: Total exports represents the sum of domestic exports and re-exports. Re-exports are the goods of foreign origin that have not been materially transformed in Canada. This includes foreign goods withdrawn for export from bonded customs warehouses. Totals may not add due to rounding. As of 2014, Natural Resources Canada no longer includes nitrogen within the minerals and metals trade statistics. Historical data have been revised to reflect this change.

FIGURE 38

VALUE OF CANADA'S MINING AND MINERAL PROCESSING INDUSTY TRADE, 2003-2016

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Year	Domestic Exports ($ thousands)	Total Exports ($ thousands)	Imports ($ thousands)	Balance of Trade ($ thousands)
2003	45.6	47.0	45.0	2.1
2004	53.7	55.5	51.9	3.6
2005	61.0	63.2	56.3	6.8
2006	71.4	74.2	61.6	12.5
2007	80.1	83.6	62.2	21.4
2008	90.2	93.0	68.7	24.3
2009	62.7	65.0	54.7	10.3
2010	80.2	83.2	66.1	17.1
2011	95.9	100.3	76.7	23.6
2012	88.1	91.1	75.5	15.6
2013	86.9	90.0	73.4	16.6
2014	89.6	93.2	79.9	13.4
2015	92.0	96.2	80.9	15.3
2016	88.5	92.9	77.0	15.9

Sources: Natural Resouces Canada; Statistics Canada.
Notes: Total exports represents the sum of domestic exports and re-exports. Re-exports are the goods of foreign origin that have not been materially transformed in Canada. This includes foreign goods withdrawn for export from bonded customs warehouses. Totals may not add due to rounding. As of 2014, Natural Resources Canada no longer includes nitrogen within the minerals and metals trade statistics. Historical data have been revised to reflect this change.

ANNEX 1
PRODUCING MINES IN CANADA, 2016

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COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Newfoundland and Labrador				
Rambler Metals and Mining PLC	Nugget Pond	(C.)	Snook's Arm	Cu, Au
Rambler Metals and Mining PLC	Ming	(U.)	Baie Verte	Cu, Au, Ag, Zn
Anaconda Mining Inc.	Pine Cove	(P., C.)	Baie Verte	Au
Vale Newfoundland and Labrador Limited	Voisey's Bay	(P., C.)	Voisey's Bay	Ni, Cu, Co
Iron Ore Company of Canada (IOC)	Carol Lake	(P., C.)	Labrador City	Fe
Atlantic Minerals Limited	Lower Cove	(P.)	Lower Cove	Limestone, dolomite
Nova Scotia				
Nova Scotia Power Inc.	Glen Morrison	(P.)	Cape Breton	Limestone
CGC Inc.	Little Narrows	(P.)	Little Narrows	Gypsum
Antigonish Limestone Ltd.	Southside Antigonish Harbour	(P.)	Southside Antigonish Harbour	Limestone
Mosher Limestone Company Limited	Upper Musquodoboit	(P.)	Upper Musquodoboit	Limestone, gypsum
Lafarge Canada Inc.	Brookfield	(P., Plant)	Brookfield	Limestone
National Gypsum (Canada) Ltd.	East Milford	(P.)	Milford	Gypsum
The Canadian Salt Company Limited	Pugwash	(U.)	Pugwash	Salt
Compass Minerals Canada Corporation	Amherst (Nappan)	(Solution mining)	Nappan	Salt
Pioneer Coal Ltd.	Stellarton	(P.)	Stellarton	Coal (thermal)
New Brunswick				
Le Groupe Berger Ltée	Baie-Sainte-Anne	(P.)	Baie-Sainte-Anne	Vermiculite, perlite
Graymont Inc.	Havelock	(P., Plant)	Havelock	Lime, limestone
Potash Corporation of Saskatchewan Inc.	New Brunswick	(U., Plant)	Sussex	Potash, salt
Brookville Manufacturing Company	Brookville	(P., Plant)	Saint John	Dolomitic lime
Elmtree Resources Ltd.	Sormany	(P., Plant)	Sormany	Limestone
Trevali Mining Corp.	Caribou	(P., U., C.)	Bathurst	Zn, Pb, Ag, Cu, Au
Quebec				
Rio Tinto, Fer et Titane inc.	Tio	(P.)	Havre-Saint-Pierre	Ilmenite
ArcelorMittal Mines Canada Inc.	Mont-Wright	(P., C.)	Fermont	Fe
ArcelorMittal Mines Canada Inc.	Fire Lake	(P.)	Fermont	Fe
Magris Resources Inc.	Niobec	(U., C.)	Saint-Honoré-de-Chicoutimi	Nb
Glencore Canada Corporation	Raglan	(U., C.)	Katinniq	Ni, Cu, Co, PGM
Canadian Royalties Inc.	Nunavik	(P., U., C.)	Kangiqsujuaq	Ni, Cu, Co, PGM
Goldcorp Inc.	Éléonore	(U., C.)	Opinaca Reservoir	Au
Metanor Resources Inc.	Bachelor Lake	(U., C.)	Desmaraisville	Au, Ag
Nystar NV	Langlois	(U., C.)	Lebel-sur-Quévillon	Zn, Cu, Au, Ag
Richmont Mines Inc.	Beaufor	(U.)	Val-d'Or	Au, Ag
Glencore Canada Corporation	Bracemac-McLeod	(U., C.)	Matagami	Zn, Cu, Au, Ag
Agnico Eagle Mines Limited	Goldex	(U., C.)	Val-d'Or	Au, Ag
Richmont Mines Inc.	Camflo	(C.)	Malartic	Au, Ag
Agnico Eagle Mines Limited and Yamana Gold Inc.	Canadian Malartic	(P., C.)	Malartic	Au, Ag
Agnico Eagle Mines Limited	Lapa	(U.)	Rivière-Héva	Au
Agnico Eagle Mines Limited	LaRonde	(U., C.)	Preissac	Au, Zn, Cu, Pb, Ag

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
IAMGOLD Corporation	Westwood	(U.)	Cadillac	Au, Cu, Ag, Zn
Hecla Mining Company	Casa Berardi	(U., C.)	north of La Sarre, Casa Berardi Twp.	Au, Ag
K+S Windsor Salt Ltd	Seleine	(U.)	Îles-de-la-Madeleine	Salt
Le Groupe Berger Ltée	Saint-Modeste	(P.)	Saint-Modeste	Vermiculite, perlite
Graymont Inc.	Marbleton	(P., Plant)	Marbleton	Limestone, lime
Graymont Inc.	Bedford	(P., Plant)	Bedford	Limestone, lime
OMYA (Canada) Inc.	Saint-Armand	(P., Plant)	Saint-Armand	Calcium carbonate
CRH plc	Joliette	(P.)	Joliette	Limestone
Graymont Inc.	Joliette	(P., Plant)	Joliette	Lime, limestone
Imerys Mica Suzorite, Inc.	Lac Letondal	(P.)	Parent, Suzor Twp.	Mica
Imerys Graphite and Carbon	Lac-des-Îles	(P., Plant)	Saint-Aimé-du-Lac-des-Îles	Graphite
Abcourt Mines Inc.	Sleeping Giant	(C.)	north of Amos	Au, Ag
Abcourt Mines Inc.	Elder	(U.)	Rouyn-Noranda	Au, Ag
Ciment Québec inc.	Quebec	(P., Plant)	Québec City	Limestone
Ciment Québec inc.	Saint-Basile	(P., Plant)	Saint-Basile	Limestone
Graymont Inc.	Les Carrières Calco	(P., Plant)	St-Marc-des-Carrières	Calcium carbonate
Stornoway Diamond Corporation	Renard	(P., U., C.)	Mistissini	Diamonds
Carrière d'Acton Vale ltée	Acton Vale	(P., Plant)	Acton Vale	Calcium carbonate
Lafarge Canada Inc.	St-Constant	(P., Plant)	St-Constant	Limestone
Demix Agrégats	Laval	(P., Plant)	Laval	Limestone
Ciment Québec inc.	Laval	(P., Plant)	Laval	Limestone
Colacem Canada inc.	Kilmar	(P., Plant)	Calumet	Limestone
Ontario				
Detour Gold Corporation	Detour Lake	(P., C.)	Matagami	Au
Kirkland Lake Gold Ltd.	Holt	(U., C.)	Timmins	Au
Kirkland Lake Gold Ltd.	Holloway	(U.)	Timmins	Au
Kirkland Lake Gold Inc.	Macassa	(U., C.)	Kirkland Lake area	Au, Ag
Primero Mining Corp.	Black Fox	(P., U., C.)	Matheson	Au
Kirkland Lake Gold Inc.	Taylor	(U.)	Cochrane	Au
Alamos Gold Inc.	Young-Davidson	(U., C.)	Kirkland Lake area	Au
Glencore Canada Corporation	Nickel Rim South	(U.)	Sudbury	Ni, Cu, Co, PGM, Au
Vale Canada Limited	Garson	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Vale Canada Limited	Stobie	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Vale Canada Limited	Clarabelle	(C.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Vale Canada Limited	Copper Cliff North	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Goldcorp Inc.	Hoyle Pond	(U.)	south of Porcupine	Au
Tahoe Resources Inc.	Bell Creek	(U., C.)	Timmins	Au
Vale Canada Limited	Creighton	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Goldcorp Inc.	Dome	(U., C.)	Timmins	Au
Goldcorp Inc.	Hollinger	(P., U., C.)	Timmins	Au
Vale Canada Limited	Ellen	(P., U.)	Sudbury	Cu, Ni
Vale Canada Limited	Coleman/McCreedy East	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Glencore Canada Corporation	Fraser	(U.)	Sudbury	Ni, Cu, Co, PGM
Glencore Canada Corporation	Strathcona	(C.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Glencore Canada Corporation	Kidd Creek	(U., C.)	Timmins	Cu, Zn, Ag, Se, Te, In, Cd
KGHM Polska Miedz S.A.	Levack/Morrison	(U.)	Sudbury	Cu, Ni
Vale Canada Limited	Totten	(U.)	Worthington	Ni, Cu, Co, PGM, AuGlencore

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Tahoe Resources Inc.	Timmins West	(U.)	Timmins	Au
Richmont Mines Inc.	Island Gold	(U., C.)	Dubreuilville	Au
Wesdome Gold Mines Ltd.	Mishi	(P., C.)	Timmins	Au
Wesdome Gold Mines Ltd.	Eagle River	(U., C.)	Wawa	Au
Barrick Gold Corporation	Hemlo (Williams)	(P., U., C.)	Marathon	Au
North American Palladium Ltd.	Lac des Iles	(P., U., C.)	Thunder Bay	PGM, Ni, Au, Cu, Co
Goldcorp Inc.	Musselwhite	(U., C.)	Thunder Bay	Au, Ag
Goldcorp Inc.	Red Lake	(U., C.)	Balmertown	Au, Ag
Canadian Wollastonite	St. Lawrence	(P.)	Kingston	Wollastonite
OMYA (Canada) Inc.	Tatlock	(P.)	Tatlock	Calcium carbonate
Lafarge Canada Inc.	Bath	(P.)	Bath	Limestone
ESSROC Canada Inc.	Picton	(P.)	Picton	Limestone
CRH plc	Ogden Point	(P.)	Ogden Point	Limestone
Unimin Canada Ltd.	Blue Mountain	(P., Plant)	Blue Mountain	Nepheline syenite
Unimin Canada Ltd.	Nephton	(P., Plant)	Toronto	Nepheline syenite
St. Marys CBM (Canada) Inc.	Bowmanville	(P.)	Bowmanville	Limestone
CGC Inc.	Hagersville	(U., Plant)	Hagersville	Gypsum
E.C. King Contracting Ltd. (Miller Paving Co.)	Owen Sound	(P.)	Owen Sound	Dolomitic lime
MarFred Minerals Ltd.	Tracey Lake	(U.)	North Williams	Barite
St Marys CBM (Canada) Inc.	St Marys	(P.)	St. Marys	Limestone
Compass Minerals Canada Corporation	Goderich	(U., Plant)	Goderich	Salt
IMERYS Talc	Penhorwood	(P.)	Penhorwood	Talc
K+S Windsor Salt Ltd.	Windsor	(solution mining)	Windsor	Salt
K+S Windsor Salt Ltd.	Ojibway	(U.)	Windsor	Salt
De Beers Canada Inc.	Victor	(P., Plant)	James Bay Lowlands	Diamonds
Miller Minerals (Miller Paving Co.)	Bucke	(P.)	New Liskeard	Limestone
Carmeuse Lime (Canada) Limited	Dundas	(P.)	Dundas	Dolomitic lime
Lafarge Canada Inc.	Dundas	(P.)	Dundas	Limestone
Carmeuse Lime (Canada) Limited	Beachville	(P., Plant)	Ingersoll	Limestone, lime
Compass Minerals Canada Corporation	Goderich	(solution mining)	Goderich	Salt
Boreal Agrominerals Inc.	Spanish River Carbonite	(P.)	northwest of Sudbury	Vermiculite
Lafarge Canada Inc.	Meldrum Bay	(P., Plant)	Manitoulin Island	Limestone, dolomite
Manitoba				
Tantalum Mining Corporation of Canada Limited	Tanco	(U., C.)	Lac-du-Bonnet	Cs
Vale Canada Limited	Thompson	(P., U., C.)	Thompson	Ni, Cu, Co, PGM
Vale Canada Limited	Birchtree	(U.)	Thompson	Ni, Cu, Co, PGM
HudBay Minerals Inc.	Snow Lake	Cu, Zn, Au, Ag	Snow Lake	Cu, Zn
HudBay Minerals Inc.	Lalor Lake	(U.)	Snow Lake	Cu, Zn, Au, Ag
HudBay Minerals Inc.	Reed	Cu, Zn, Au, Ag	Snow Lake	Cu, Zn
HudBay Minerals Inc.	777	(U.)	Flin Flon	Cu, Zn, Au, Ag
HudBay Minerals Inc.	Flin Flon	Cu, Zn, Au, Ag	Flin Flon	Cu, Zn
Graymont Inc.	Faulkner	(P., Plant)	Faulkner	Limestone, lime
CertainTeed Gypsum Canada, Inc.	Amaranth	(P.)	Harcus	Gypsum
ERCO Worldwide	Hargrave	(U., Plant)	Virden	Sodium chlorate

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Saskatchewan				
Silver Standard Resources Inc.	Santoy	(U.)	Santoy Lake	Au
Silver Standard Resources Inc.	Seabee	(U., C.)	Laonil Lake	Au, Ag
Cameco Corporation	Rabbit Lake	(U., C.)	Rabbit Lake	U
Cameco Corporation	Cigar Lake	(U.)	Wollaston Lake	U
Cameco Corporation	McArthur River	(U.)	north of Key Lake	U
Cameco Corporation	Key Lake	(C.)	north of Highrock Lake	U
Potash Corporation of Saskatchewan Inc.	Rocanville	(U., Plant)	Rocanville	Potash
The Mosaic Company	Esterhazy (K-1 and K-2)	(U., Plant)	Esterhazy	Potash, salt
Compass Minerals Canada Corporation	Wynyard (Big Quill)	(P., U., Plant)	Wynyard	Potassium sulphate
Canadian Clay Products Inc.	Wilcox	(P.)	Wilcox	Clay, bentonite
The Mosaic Company	Belle Plaine	(U., Plant)	Belle Plaine	Potash, salt
Potash Corporation of Saskatchewan Inc.	Lanigan	(U.)	Lanigan	Potash
The Mosaic Company	Colonsay	(U., Plant)	Colonsay	Potash, salt
Potash Corporation of Saskatchewan Inc.	Allan	(U., Plant)	Allan	Potash
Potash Corporation of Saskatchewan Inc.	Patience Lake	(U., Plant)	Blucher	Potash
Saskatchewan Mining and Minerals Inc.	Chaplin Lake	(P., Plant)	Chaplin	Sodium sulphate
Potash Corporation of Saskatchewan Inc.	Cory	(U., Plant)	Cory	Potash
Agrium Inc.	Vanscoy	(U., Plant)	Vanscoy	Potash, salt
Compass Minerals Canada Corporation	Unity	(solution mining)	Unity	Salt
Westmoreland Coal Company	Estevan	(P.)	Bienfait	Coal (thermal)
Westmoreland Coal Company	Poplar River	(P.)	Coronach	Coal (thermal)
Alberta				
K+S Windsor Salt Ltd	Lindbergh	(solution mining)	Elk Point	Salt
Hammerstone Corporation	Steepbank	(P.)	north of Fort McMurray	Limestone
Hammerstone Corporation	Muskeg Valley	(P.)	north of Fort McMurray	Limestone
Rio Petro Ltd.	Sunnynook	(solution mining)	Cessford	Salt
Suncor Energy Inc.	Fort McMurray West	(P.)	Fort McMurray	Limestone
Calcium Incorporated	Calling Lake	(solution mining)	Calling Lake	Salt
Tiger Calcium Services Inc.	Mitsue	(solution mining)	Slave Lake	Salt
Graymont Inc.	Summit	(P., Plant)	Coleman	Limestone, lime
Graymont Inc.	Exshaw (Gap)	(P., Plant)	Exshaw	Limestone, lime
Lafarge Canada Inc.	Exshaw	(P., Plant)	Exshaw	Limestone
Burnco Rock Products Ltd.	Clearwater	(P., Plant)	Clearwater River	Limestone
Lehigh Cement Company	Mcleod	(P.)	Cadomin	Limestone
Westmoreland Coal Company	Sheerness	(P.)	Hanna	Coal (thermal)
Westmoreland Coal Company	Paintearth	(P.)	Forestburg	Coal (thermal)
Westmoreland Coal Company	Genesee	(P.)	Genesee	Coal (thermal)
Transalta Corporation	Highvale	(P.)	Seba Beach	Coal (thermal)
Coal Valley Resources Inc.	Coal Valley	(P.)	Edson	Coal (thermal)
Teck Resources Limited	Cardinal River (Cheviot)	(P.)	Hinton	Coal (metallurgical)
Suncor Energy Inc.	Millennium and Steepbank	(P.)	Fort McMurray	Upgraded crude oil
Shell Canada Energy	Jackpine	(P.)	Fort MacKay	Upgraded crude oil
Syncrude Canada Ltd.	Aurora North and South	(P.)	Fort MacKay	Upgraded crude oil
Syncrude Canada Ltd.	Mildred Lake	(P.)	Fort MacKay	Upgraded crude oil
Shell Canada Energy	Muskeg River	(P.)	Fort MacKay	Upgraded crude oil
Canadian Natural Resources Ltd.	Horizon	(P.)	Fort MacKay	Upgraded crude oil

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
British Columbia				
New Gold Inc.	New Afton	(U., C.)	Kamloops	Au, Ag, Cu
Copper Mountain Mining Corporation	Copper Mountain	(P., C.)	Princeton	Cu, Au, Ag
Teck Resources Limited	Highland Valley Copper	(P., C.)	Logan Lake	Cu, Mo
Imperial Metals Corporation	Mount Polley	(P., C.)	northeast of Williams Lake	Au, Cu
Taseko Mines Limited	Gibraltar	(P., C.)	north of Williams Lake	Cu, Mo
Centerra Gold Inc.	Mt Milligan	(P., C.)	Fort St. James	Cu, Au
Huckleberry Mines Ltd.	Huckleberry	(P., C.)	Houston	Cu, Mo, Au
Imperial Metals Corporation	Red Chris	(P.)	Kinaskan Lake	Au, Ag, Cu
Georgia-Pacific Canada, Inc.	4J	(P.)	Canal Flats	Gypsum
Baymag Inc.	Mount Brussilof	(P.)	Mount Brussilof	Magnesite (fused), magnesia (products)
CertainTeed Gypsum Canada, Inc.	Elkhorn	(P.)	Windermere	Gypsum
Lafarge Canada Inc.	Falkland	(P., Plant)	Falkland	Gypsum
Lafarge Canada Inc.	Harper Ranch	(P., Plant)	Kamloops	Limestone
Absorbent Products Ltd.	Bud	(P.)	Princeton	Calcium, clay
Canadian Zeolite Corp.	Bromley Creek/Zeo	(P.)	Bromley Creek	Zeolite
Absorbent Products Ltd.	Red Lake	(P.)	Kamloops	Diatomite, bentonite, leonardite
Graymont Inc.	Pavilion Lake	(P., Plant)	Pavilion Lake	Limestone, lime
Imperial Limestone Co. Ltd.	Van Anda	(P.)	Texada Island	Limestone
Texada Quarrying Ltd. (Lafarge Canada Inc.)	Gillies Bay	(P.)	Texada Island	Limestone
Ash Grove Cement Company	Blubber Bay	(P.)	Texada Island	Limestone
Fireside Minerals Ltd.	Fireside	(P.)	Fireside	Barite
Imasco Minerals Inc.	Benson Lake	(P.)	Benson Lake	Limestone
Teck Resources Limited	Coal Mountain	(P.)	Sparwood	Coal (metallurgical, thermal)
Teck Resources Limited	Line Creek	(P.)	Sparwood	Coal (metallurgical, thermal)
Teck Resources Limited	Elkview	(P.)	Sparwood	Coal (metallurgical)
Teck Resources Limited	Fording River	(P.)	Elkford	Coal (metallurgical)
Teck Resources Limited	Greenhills	(P.)	Sparwood	Coal (metallurgical)
Hillsborough Resources Limited	Quinsam	(U.)	Campbell River	Coal (thermal)
Conuma Coal Resources Ltd.	Brule	(P.)	Tumbler Ridge	Coal (metallurgical)

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Yukon				
Capstone Mining Corporation	Minto	(P., C.)	Pelly Crossing	Cu, Au, Ag
Northwest Territories				
Diavik Diamond Mines Inc.	Diavik	(U., Plant)	Lac de Gras	Diamonds
Dominion Diamond Corporation	Ekati	(U., Plant)	Lac de Gras	Diamonds
Nunavut				
ArcelorMittal Mines Canada Inc.	Mary River	(P.)	Pond Inlet	Fe
Agnico Eagle Mines Ltd.	Meadowbank	(P., C.)	Baker Lake	Au

Source: Natural Resources Canada.
(P.) Open-Pit, (U.) Underground, (C.) Concentrator
Notes: Excluded operations of clay products, peat, and most construction materials (stone, sand and gravel).
Included are operations that produced during 2015.

ANNEX 2

MINING ESTABLISHMENTS IN CANADA, BY MINERAL, PROVINCE OR TERRITORY, 2015

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	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC	YT	NT	NV	TOTAL
Metals														
Iron Ore	1	-	-	-	1	-	-	-	-	-	-	-	-	2
Gold & Silver Ore	1	-	-	-	13	12	1	1	-	-	-	-	1	29
Lead-zinc ore	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Nickel-copper ore	1	-	-	-	2	4	1	-	-	-	-	-	-	8
Copper, copper-zinc ore	2	-	-	-	2	1	1	1	-	8	1	-	-	16
Uranium	-	-	-	-	-	-	-	5	-	-	-	-	-	5
Other Metals	-	-	-	-	2	1	1	-	-	-	-	1	-	5
TOTAL METALS	**5**	**-**	**-**	**-**	**20**	**18**	**4**	**7**	**-**	**8**	**1**	**1**	**1**	**65**
Non-metals														
Diamonds	-	-	-	-	-	1	-	-	-	-	-	3	-	4
Gypsum	-	-	2	1	-	-	-	-	-	1	-	-	-	4
Peat	1	1	1	24	28	-	5	1	6	1	-	-	-	68
Potash	-	-	-	1	-	-	-	9	-	-	-	-	-	10
Salt	-	-	2	-	1	4	-	3	1	-	-	-	-	11
Sand and gravel	1	-	6	9	68	271	17	59	215	88	1	-	-	735
Stone	2	-	17	9	87	110	9	-	25	26	-	-	-	285
Shale, Clay and other refractory minerals	-	1	-	3	2	-	1	1	2	-	-	-	10	
Other non-metals	-	-	-	-	3	1	-	1	-	3	1	-	-	9
TOTAL NON-METALS	**4**	**1**	**29**	**44**	**190**	**389**	**31**	**74**	**248**	**121**	**2**	**3**	**-**	**1,136**

Sources: Natural Resources Canada; Statistics Canada.
- Nil

ANNEX 3

CANADIAN PRODUCTION OF LEADING MINERALS BY PROVINCE AND TERRITORY, 2016[P]

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	GOLD		POTASH (K_2O)[1]		COPPER		NICKEL		COAL	
	KILOGRAMS	$000	KILOTONNES	$000	TONNES	$000	TONNES	$000	KILOTONNES	$000
Newfoundland	682	36,499	-	-		35,969	228,153		52,616	659,487
Prince Edward Island	-	-	-	-	-	-	-	-	-	-
Nova Scotia	-	-	-	-	-	-	-	-	-	-
New Brunswick	-	-	-	7	3,683	-	-	-	-	-
Quebec	50,636	2,710,959	-	-	-	42,780	271,354	-	52,624	659,584
Ontario	73,262	3,922,311	-	-	203,590	1,291,373	96,792	1,213,186	-	-
Manitoba	3,104	166,158	-	-	42,921	272,249	25,333	317,524	-	-
Saskatchewan	2,355	126,099	10,147	3,885,708	-	-	-	-	x	x
Alberta	32	1,725	-	-	-	-	-	-	x	x
British Columbia	13,175	705,346	-	-	345,252	2,189,935	-	-	x	x
Yukon	3,487	186,704	-	-	31,797	201,692	-	-	-	-
Northwest Territories	-	-	-	-	-	-	-	-	-	-
Nunavut	9,146	489,635	-	-	-	-	-	-	-	-
Canada	**155,879**	**8,345,437**	**10,154**	**3,889,391**	**702,310**	**4,454,755**	**227,364**	**2,849,780**	**60,501**	**3,554,938**

	IRON ORE		DIAMONDS		SAND AND GRAVEL [2]		CEMENT [3]		STONE [4]	
	KILOTONNES	$000	000'S OF CARATS	$000	KILOTONNES	$000	KILOTONNES	$000	KILOTONNES	$000
Newfoundland	19,425	1,675,200	-	-	2,390	8,471	-	-	7,768	62,599
Prince Edward Island	-	-	-	-	x	x	-	-	x	x
Nova Scotia	-	-	-	-	2,794	24,810	x	x	9,353	108,340
New Brunswick	-	-	-	-	2,795	12,918	-	-	7,481	60,199
Quebec	25,012	x	-	-	17,544	97,930	2,683	372,879	39,401	465,351
Ontario	-	-	600	355,950	74,297	498,856	5,412	645,513	66,191	748,517
Manitoba	-	-	-	-	14,137	97,654	-	-	5,439	53,510
Saskatchewan	-	-	-	-	9,003	84,744	-	-	-	-
Alberta	-	-	-	-	166,420	1,640,808	x	x	6,859	50,388
British Columbia	-	-	-	-	24,323	230,842	x	x	8,299	76,804
Yukon	-	-	-	-	x	x	-	-	x	x
Northwest Territories	-	-	10,504	1,265,289	x	x	-	-	x	x
Nunavut	2,646	x	-	-	-	-	-	-	-	-
Canada	**47,083**	**3,753,809**	**11,104**	**1,621,239**	**315,588**	**2,712,494**	**12,243**	**1,690,381**	**152,059**	**1,635,165**

Sources: Natural Resources Canada; Statistics Canada.
(p) Preliminary; - Nil; x Confidential.
(1) Excludes shipments to Canadian potassium sulphate plants.
(2) Mineral production of sand and gravel for Nunavut is included in totals for the Northwest Territories.
(3) Includes exported clinker minus imported clinker. (4) Shipments of stone to Canadian cement, lime and clay plants are not included.

ANNEX 4

CANADA'S WORLD ROLE AS A PRODUCER OF CERTAIN IMPORTANT MINERALS, 2016[P]

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			RANK OF FIVE LEADING COUNTRIES				
		WORLD	1	2	3	4	5
			Canada	Russia	Belarus	China	Germany
Potash (K_2O equivalent)	000 t	39,000	10,000	6,500	6,400	6,200	3,100
(mine production)	% of world total		25.6	16.7	16.4	15.9	7.9
			Kazakhstan	Canada	Australia	Niger	Russia
Uranium (metal content) (2015)	t	60,496	23,800	13,325	5,654	4,116	3,055
(mine production)	% of world total		39.3	22.0	9.3	6.8	5.0
			Brazil	Canada			
Niobium (mine production)	t	64,000	58,000	5,800			
	% of world total		90.6	9.1			
			Russia	Botswana	Canada	Angola	Congo
Gemstones	000 t		23,500	15,000	13,000	8,100	2,800
	% of world total		33.1	21.2	18.3	11.4	3.9
			Philippines	Canada	Russia	Australia	New Caledonia
Nickel (mine production)	000 t	2,250	500	256	255	206	205
	% of world total		22.2	11.4	11.3	9.2	9.1
			South Africa	Russia	Canada	Zimbabwe	United States
Platinum group metals (metal content)	kg	380,000	193,000	105,000	32,000	23,000	17,100
	% of world total		50.8	27.6	8.4	6.1	4.5
			Congo	China	Canada	Russia	Australia
Cobalt (mine production)[2]	t	123,000	66,000	7,700	7,300	6,200	5,100
	% of world total		53.7	6.3	5.9	5.0	4.1
			China	Russia	Canada	India	UAE
Aluminum (primary metal)	000 t	57,600	31,000	3,580	3,250	2,750	2,400
	% of world total		53.8	6.2	5.6	4.8	4.2
			China	South Korea	Japan	Canada	Begium
Indium	000 t	655	290	195	70	65	25
	% of world total		44.3	29.8	10.7	9.9	3.8

			RANK OF FIVE LEADING COUNTRIES				
		WORLD	1	2	3	4	5
			United States	China	Russia	Canada	Saudi Arabia
Sulphur, elemental (mine production)	000 t	69,300	9,780	8,800	6,700	5,500	4,900
	% of world total		4.1	12.7	9.7	7.9	7.1
Canada third, by value			Russia	Botswana	D.R.C.	Australia	Canada
Diamonds (precious) (2015)	000 carats	127,399	41,912	20,779	10,016	13,564	11,677
	% of world total		32.9	16.3	7.9	10.6	9.2
			South Africa	China	Australia	Mozambique	Canada
Titanium concentrate (Ilmenite)	000 t	5,860	1,300	800	720	490	475
	% of world total		22.2	13.7	12.3	8.4	8.1
			China	Australia	Russia	United States	Canada
Gold (mine production)	t	3,100	455	270	250	209	170
	% of world total		14.7	8.7	8.1	6.7	5.5
Canada seventh			China	South Korea	Japan	Kazakhstan	Russia
Cadmium (metal)	t	23,000	7,400	4,500	1,900	1,500	1,350
	% of world total		32.2	19.6	8.3	6.5	5.9
Canada seventh			China	India	Brazil	Turkey	North Korea
Graphite	000 t	1,200	780	170	80	32	30
	% of world total		65.0	14.2	6.7	2.7	2.5
Canada seventh			China	Russia	Finland	United States	Turkey
Mica (natural)	000 t	1,130,000	785,000	100,000	54,000	30,200	25,200
	% of world total		69.5	8.8	4.8	2.7	2.2
Canada seventh			Finland	Ireland	Sweden	Germany	Belarus
Peat	000 t	28,000	6,500	4,100	3,600	3,000	1,800
	% of world total		23.2	14.6	12.9	10.7	6.4
Canada eighth			Chile	Peru	China	United States	Australia
Copper (mine production)	000 t	19,400	5,500	2,300	1,740	1,410	970
	% of world total		28.4	11.9	9.0	7.3	5.0
Canada eighth			Australia	Brazil	China	India	Russia
Iron ore (mine production) (usable ore)	000 t	2,230	825	391	353	160	100
	% of world total		37.0	17.5	15.8	7.2	4.5

			RANK OF FIVE LEADING COUNTRIES				
		WORLD	1	2	3	4	5
Canada eighth			China	Russia	India	United States	Indonesia
Nitrogen (fixed)--ammonia	000 t	140,000	46,000	12,000	11,000	9,800	5,000
	% of world total		32.9	8.6	7.9	7.0	3.6
Canada eighth			China	United States	India	Germany	Australia
Salt (mine production)	000 t	255,000	58,000	42,000	19,000	12,500	12,000
	% of world total		22.7	16.5	7.5	4.9	4.7
Canada ninth			China	Peru	Australia	United States	Mexico
Zinc (mine production)	000 t	11,900	4,500	1,300	850	780	710
	% of world total		37.8	10.9	7.1	6.6	6.0
Canada tenth			China	Chile	United States	Peru	Mexico
Molybdenum (mo content) (mine production)	t	227,000	90,000	52,000	31,600	20,000	12,300
	% of world total		39.6	22.9	13.9	8.8	5.4
Canada not on the list			Mexico	Peru	China	Chile	Australia
Silver	t	27,000	5,600	4,100	3,600	1,500	1,400
	% of world total		20.7	15.2	13.3	5.6	5.2
Canada twelfth			China	United States	India	Australia	Indonesia
Coal (primary) (2015)	000 t	7,708,700	3,527,200	812,800	691,300	508,700	469,300
	% of world total		45.8	10.5	9.0	6.6	6.1
Canada fourteenth			China	Russia	United States	Norway	France
Silicon	000 t	7,200	4,600	747	396	380	121
	% of world total		63.9	10.4	5.5	5.3	1.7
Canada seventeenth			China	United States	India	Russia	Brazil
Lime	000 t	350,000	230,000	17,000	16,000	11,000	8,300
	% of world total		65.7	4.9	4.6	3.1	2.4
Canada twentieth			China	Iran	United States	Turkey	Thailand
Gypsum (mine production)	000 t	263,000	130,000	16,000	15,500	13,000	12,000
	% of world total		49.4	6.1	5.9	4.9	4.6
Canada seventeenth			United States	Italy	France	Turkey	Germany
Sand and Gravel (Industrial)	000 t	179,000	91,700	13,900	8,750	8,000	7,500
	% of world total		51.2	7.8	4.9	4.5	4.2

			RANK OF FIVE LEADING COUNTRIES				
		WORLD	1	2	3	4	5
Canada had zero tungsten production in 2016			China	Vietnam	Russia	Bolivia	Austria
Tungsten (mine production)	t	86,400	71,000	6,000	2,600	1,400	860
	% of world total		82.2	6.9	3.0	1.6	1.0
Canada not on the list			China	Australia	United States	Peru	Mexico
Lead (mine production)	000 t	4,820	2,400	500	335	310	250
	% of world total		49.8	10.4	7.0	6.4	5.2

Sources: U.S. Geological Survey (USGS); International Energy Association; Kimberley Process.
n.a. Not applicable.

ANNEX 5

MINERAL PRODUCTION OF CANADA, 2010-2016[P]

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METALLIC MINERALS		2010		2011		2012		2013		2014		2015		2016[P]	
	Unit	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
Antimony	t	x	x	x	x	x	x	148	1,562	4	45	1	5	0	2
Bismuth	t	91	1,759	136	3,346	110	2,370	103	2,006	4	97	2	29	2	24
Cadmium	t	2,403	9,644	1,516	4,135	247	500	160	316	129	276	68	102	55	101
Calcium	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cesium	t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Cobalt	t	2,644	125,144	3,741	146,768	3,698	114,604	4,005	118,114	3,907	137,844	4,339	156,720	4,245	147,485
Copper	t	507,883	3,941,677	553,725	4,831,801	560,476	4,453,541	620,989	4,695,298	654,468	4,983,772	697,322	4,905,661	702,310	4,454,755
Gold	kg	102,147	4,143,067	101,975	5,087,438	106,373	5,704,878	131,404	6,141,048	151,472	6,817,154	160,751	7,667,339	155,879	8,345,437
Ilmenite	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Indium	kg	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Iron ore	000 t	36,178	5,314,154	35,705	5,505,772	38,892	4,875,068	42,063	5,348,433	43,173	4,173,516	46,220	2,854,585	2,646	47,083
Iron, remelt	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lead	t	62,397	138,022	62,548	166,003	62,014	127,438	22,895	50,506	3,579	8,288	3,699	8,485	10,848	26,429
Lithium	t	x	x	x	x	x	x	x	x	x	x	-	-	-	-
Magnesium	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	t	8,524	x	8,543	x	8,936	x	7,956	186,788	9,358	259,876	2,505	48,846	2,708	51,551
Nickel	t	156,270	3,509,833	211,417	4,787,323	203,970	3,546,420	218,026	3,372,864	218,233	4,069,165	225,351	3,408,431	227,364	2,849,780
Niobium (Columbium)	t	4,298	x	4,551	x	4,705	x	4,916	x	5,774	x	5,385	x	6,099	x
Platinum group	kg	9,864	260,304	22,337	749,572	22,490	644,195	25,465	767,363	31,386	1,058,992	33,248	1,059,512	31,093	932,774
Selenium	t	97	8,001	128	17,500	145	16,656	138	10,411	142	8,879	156	6,575	176	3,823
Silver	t	570	381,086	582	658,514	657	659,005	620	489,872	472	320,274	371	239,656	379	277,588
Tantalum	t	-	-	-	-	-	-	40	12,698	-	-	-	-	-	-
Tellurium	t	8	1,913	9	3,167	10	1,540	8	895	8	1,066	10	990	18	815
Tungsten	t	364	7,370	2,466	73,707	2,554	88,436	3,017	86,293	2,708	84,331	2,289	62,339	-	-
Uranium	t	9,927	1,230,182	9,017	1,307,174	9,520	1,197,441	7,889	806,418	9,780	933,583	13,279	1,609,476	12,421	117,790
Zinc	t	609,567	1,356,287	591,004	1,281,887	601,514	1,171,147	412,277	811,361	322,605	771,026	275,410	632,892	294,288	794,578
Total, Metallic Minerals		**..**	**21,358,783**	**..**	**25,569,557**	**..**	**23,558,411**	**..**	**23,497,305**	**..**	**24,225,029**	**..**	**23,125,240**	**..**	**23,231,546**

NON-METALLIC MINERALS		2010		2011		2012		2013		2014		2015		2016[p]	
	Unit	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
Barite	000 t	21	6,500	x	x	x	x	x	x	x	x	x	x	x	x
Carbonatite	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Cement [1]	000 t	11,523	1,512,624	11,914	1,587,136	12,553	1,621,476	12,022	1,618,827	12,136	1,692,131	12,334	1,689,851	12,243	1,690,381
Chrysotile	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Clay products [2]	000 t	..	148,907	..	135,422	..	136,502	..	122,577	..	118,012	..	124,446	..	144,460
Diamonds	000 ct	11,804	2,377,147	10,752	2,509,232	10,529	2,005,764	10,600	1,964,125	12,012	2,236,043	11,677	2,148,583	11,104	1,621,239
Gemstones	t	35	4,966	42	2,941	178	3,217	554	4,607	6,919	5,991	8,233	7,953	224	7,391
Graphite	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Gypsum [3]	000 t	3,046	47,771	2,449	34,632	1,832	24,987	1,837	25,872	1,793	25,474	1,726	19,675	1,662	18,892
Lime	000 t	1,863	288,787	1,937	294,909	1,965	316,322	1,856	308,127	1,995	344,816	1,852	335,489	1,797	329,488
Magnesite	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Marl	000 t	x	x	-	-	-	-	-	-	-	-	-	-	-	-
Mica	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Nepheline syenite	000 t	603	57,304	602	58,377	586	61,892	646	72,911	654	83,805	614	97,880	475	45,610
Peat	000 t	1,286	260,664	1,139	213,359	1,277	238,018	1,173	213,798	1,178	249,078	1,297	257,030	1,120	240,342
Phosphate	000 t	x	x	x	x	x	x	x	x	-	-	-	-	-	-
Potash (K_2O) [4]	000 t	9,700	5,061,927	10,686	7,569,282	8,976	6,342,562	10,196	5,768,609	10,818	5,581,264	11,462	6,132,751	10,154	3,889,391
Potassium sulphate	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Pumice	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Quartz (silica) [3]	000 t	1,503	66,372	1,620	84,280	1,517	85,256	2,331	80,064	2,011	90,441	2,053	107,377	1,959	112,408
Salt	000 t	10,278	602,607	12,757	697,404	10,820	487,686	12,244	655,848	14,473	752,321	14,343	791,980	9,620	548,523
Sand and gravel	000 t	211,342	1,573,968	222,288	1,560,213	239,307	1,822,978	241,113	1,941,867	223,407	1,831,464	228,030	1,884,531	315,588	2,712,494
Serpentine	000 t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soapstone, talc, pyrophyllite	000 t	100	26,125	116	25,244	130	30,249	175	34,223	90	38,985	175	50,335	202	56,547
Sodium sulphate	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Stone [3]	000 t	170,664	1,637,757	161,729	1,591,511	152,977	1,559,358	147,746	1,509,427	147,739	1,541,321	158,034	1,687,916	152,059	1,635,165
Sulphur, elemental	000 t	6,247	298,990	5,970	637,250	5,594	581,611	5,624	342,937	5,252	326,335	5,187	423,452	4,653	132,822
Sulphur, in smelter gas	000 t	610	70,903	638	116,022	665	132,230	677	129,197	590	100,125	558	114,383	664	113,556
Titanium dioxide	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Tremolite	000 t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zeolite	000 t	x	x	x	x	x	x	x	x	-	-	-	-	x	x
Total, Non-Metallic Minerals		**..**	**14,699,276**	**..**	**17,839,820**	**..**	**16,471,421**	**..**	**15,477,138**	**..**	**15,778,620**	**..**	**19,645,779**	**..**	**17,525,932**

MINERAL FUELS		2010		2011		2012		2013		2014		2015		2016[p]	
	Unit	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
Coal	000 t	68,152	5,540,967	67,113	7,471,408	66,471	5,880,836	68,751	4,886,804	69,035	3,896,746	61,985	3,126,266	60,501	3,554,938
Total Mineral Fuels		**68,152**	**5,540,967**	**67,113**	**7,471,408**	**66,471**	**5,880,836**								

	2010		2011		2012		2013		2014		2015		2016[p]	
TOTAL MINERAL PRODUCTION	**..**	**41,599,026**	**..**	**50,880,785**	**..**	**45,910,667**	**..**	**43,861,247**	**..**	**43,913,961**	**..**	**45,897,285**	**..**	**44,312,416**

Sources: Natural Resources Canada; Statistics Canada.
[p] Preliminary; x Confidential; – Nil; . . Not available.
Notes:
[1] Includes exported clinker.
[2] Production values for bentonite and diatomite have been included in clay products.
[3] Shipments of gypsum, silica and stone to Canadian cement, lime and clay plants are not included in this table.
[4] Shipments of potash to Canadian potassium sulphate plants are not included in this table.
Numbers may not add due to rounding.

ANNEX 6

CANADIAN RESERVES OF SELECTED MAJOR METALS, 1978-2015[P]

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Metal Contained in Proven and Probable Mineable Ore[1] in Operating Mines[2] and Deposits Committed to Production

Year	Copper (000 t)	Nickel (000 t)	Lead (000 t)	Zinc (000 t)	Molybdenum (000 t)	Silver (t)	Gold[3] (t)
1978	16,184	7,843	8,930	26,721	464	30,995	505
1979	16,721	7,947	8,992	26,581	549	32,124	575
1980	16,714	8,348	9,637	27,742	551	33,804	826
1981	15,511	7,781	9,380	26,833	505	32,092	851
1982	16,889	7,546	9,139	26,216	469	31,204	833
1983	16,214	7,393	9,081	26,313	442	31,425	1,172
1984	15,530	7,191	9,180	26,000	361	30,757	1,208
1985	14,201	7,041	8,503	24,553	331	29,442	1,373
1986	12,918	6,780	7,599	22,936	312	25,914	1,507
1987	12,927	6,562	7,129	21,471	231	25,103	1,705
1988	12,485	6,286	6,811	20,710	208	26,122	1,801
1989	12,082	6,092	6,717	20,479	207	24,393	1,645
1990	11,261	5,776	5,643	17,847	198	20,102	1,542
1991	11,040	5,691	4,957	16,038	186	17,859	1,433
1992	10,755	5,605	4,328	14,584	163	15,974	1,345
1993	9,740	5,409	4,149	14,206	161	15,576	1,333
1994	9,533	5,334	3,861	14,514	148	19,146	1,513
1995	9,250	5,832	3,660	14,712	129	19,073	1,540
1996	9,667	5,623	3,450	13,660	144	18,911	1,724
1997	9,032	5,122	2,344	10,588	149	16,697	1,510
1998	8,402	5,683	1,845	10,159	121	15,738	1,415
1999	7,761	4,983	1,586	10,210	119	15,368	1,326
2000	7,419	4,782	1,315	8,876	97	13,919	1,142
2001	6,666	4,335	970	7,808	95	12,593	1,070
2002	6,774	4,920	872	6,871	82	11,230	1,023
2003	6,037	4,303	749	6,251	78	9,245	1,009
2004	5,546	3,846	667	5,299	80	6,568	787
2005	6,589	3,960	552	5,063	95	6,684	958
2006	6,923	3,940	737	6,055	101	6,873	1,032
2007	7,565	3,778	682	5,984	213	6,588	987
2008	7,456	3,605	534	5,005	222	5,665	947
2009	7,290	3,301	451	4,250	215	6,254	918
2010	10,747	3,074	400	4,133	254	6,916	1,473
2011	10,570	2,936	247	4,812	256	6,954	2,225
2012	10,364	2,617	126	4,163	256	5,598	2,148
2013[r]	10,777	2,682	116	3,532	145	5,013	2,140
2014[P]	10,214	2,287	88	2,972	121	5,498	2,070
2015[P]	9,937	2,725	83	3,009	101	5,345	1,984

Source: Natural Resources Canada, based on company reports and the Federal-Provincial/Territorial Annual Survey of Mines and Concentrators.
[1] No allowance is made for losses in milling, smelting and refining. Excludes material classified as "resources." [2] Includes metal in mines where production has been suspended temporarily. [3] Excludes metal in placer deposits because reserves data are generally unavailable.
[r] Revised; [P] Preliminary.
Note: One tonne (t) = 1.1023113 short tons = 32 150.746 troy oz.

ANNEX 7

EMPLOYMENT COUNT AND ANNUAL COMPENSATION IN THE CANADIAN MINING, SMELTING AND REFINING INDUSTRIES, 2007-2016

Return to text

	Number of Employees	Compensation per Job
Metal Mines		
2007	27,020	101,875
2008	28,480	108,464
2009	23,955	126,947
2010	25,520	125,829
2011	28,220	123,332
2012	31,005	122,291
2013	32,890	142,794
2014	36,895	142,645
2015	40,400	122,116
2016	40,505	124,158
Non-metal Mines		
2007	18,970	74,893
2008	20,985	80,468
2009	19,360	81,499
2010	20,825	83,930
2011	21,615	88,192
2012	20,890	91,784
2013	24,555	88,555
2014	28,825	81,788
2015	25,340	103,347
2016	25,670	98,197
Coal Mines		
2007	4,935	110,541
2008	5,315	114,275
2009	5,515	116,476
2010	6,325	107,232
2011	6,495	121,897
2012	6,525	131,956
2013	8,790	129,186
2014	7,870	123,493
2015	6,220	127,135
2016	5,205	128,991

Smelting & Refining[2]		
2007	60,850	92,420
2008	62,780	88,243
2009	49,610	89,777
2010	53,815	91,753
2011	59,080	90,848
2012	50,025	98,989
2013	50,865	100,083
2014	50,240	101,840
2015	48,375	110,168
2016	49,335	106,367
Total Mining, Smelting and Refining		
2007	111,775	92,531
2008	117,560	92,931
2009	98,440	98,690
2010	106,485	99,309
2011	115,410	100,041
2012	108,445	106,247
2013	117,100	111,846
2014	123,830	110,706
2015	120,335	113,620
2016	120,715	111,575

Sources: Statistics Canada; Natural Resources Canada.
(1) Compensation for Smelting and Refining and Total based on weighted average.
(2) Comprised of NAICS 3311, NAICS 3313, and NAICS 3314.

ANNEX 8

TOTAL COMPENSATION PER JOB, BY SELECT CANADIAN INDUSTRIAL SECTOR, 2007-2016

Return to text

($)	Forestry	Mining, Smelting and Refining[1]	Manufacturing	Construction	Finance & Insurance
2007	64,322	92,531	61,503	65,095	64,929
2008	65,878	92,931	63,121	67,044	63,586
2009	65,009	98,690	62,659	66,816	63,606
2010	66,300	99,310	63,217	67,103	64,045
2011	68,864	100,040	65,081	68,944	65,872
2012	72,926	106,247	67,427	71,252	69,776
2013	79,534	111,846	69,696	73,229	70,217
2014	83,120	110,706	71,974	76,124	73,290
2015	88,942	113,620	74,105	78,453	78,148
2016	88,025	111,575	74,991	78,910	82,717

Sources: Statistics Canada; Natural Resources Canada.

[1] Based on a weighted average of NAICS 212, 3311, 3313, and 3314.

ANNEX 9

DOMESTIC EXPORTS OF MINERALS AND MINERAL PRODUCTS, BY COMMODITY AND COUNTRY OF DESTINATION, 2016

Return to text

($)

METALS	U.S.A.	European Union (EU-28)	China	japan	Other Countries	Total
Aluminum	9,238,720,937	169,321,049	195,733,971	207,810,939	868,991,042	10,680,577,938
Antimony	346,434	336,886	—	—	1,431	684,751
Barium	—	—	—	—	12,702	12,702
Beryllium	50,234	—	—	—	—	50,234
Bismuth	256,263	—	915,061	783,619	370	1,955,313
Cadmium	495,629	756,249	2,377,529	45,422	227,282	3,902,111
Calcium metals	658,551	37,966	—	—	577,142	1,273,659
Chromium	29,549,196	—	5,156	—	940,892	30,495,244
Cobalt	67,326,122	56,277,001	6,335,524	76,290,752	93,079,835	299,309,234
Copper	3,002,406,393	538,451,261	1,020,870,615	742,297,920	853,939,104	6,157,965,293
Gold	5,343,652,268	11,336,003,725	153,365,006	222,391,346	1,361,962,174	18,417,374,519
Iron and steel	11,208,218,418	212,295,647	150,436,909	14,750,172	1,289,133,704	12,874,834,850
Iron ore	47,085,843	1,827,360,919	643,291,676	500,680,240	777,554,102	3,795,972,780
Lead	748,987,300	10,368,237	12,492,363	1,417,426	20,262,903	793,528,229
Lithium	68,331	—	75,848	—	39,546	183,725
Magnesium and magnesium compounds	63,155,151	180,822	168,129	16,194	765,288	64,285,584
Manganese	592,676	16,583	2,305	—	347,566	959,130
Mercury	769,244	725	—	—	820	770,789
Molybdenum	36,128,156	27,655,140	3,309	—	277,962	64,064,567
Nickel	936,649,765	1,353,375,996	410,923,629	131,358,010	1,355,305,977	4,187,613,377
Niobium	68,777,821	105,633,027	38,469,287	2,446,452	51,181,263	266,507,850
Platinum group metals	1,108,353,981	84,999,355	325,095	4,038,355	35,879,494	1,233,596,280
Rare earth metals	378,776	23,069	11,487	2,660	346,651	762,643
Selenium	317,005	189,454	22,015	—	342,526	871,000
Silicon	156,160,559	1,425,202	556,126	2,500	9,928,750	168,073,137
Silver	1,530,867,906	46,335,497	16,416,162	24,039,905	21,916,722	1,639,576,192
Tantalum	2,965,044	99,916	81,504	13,327	54,356	3,214,147
Tellurium	2,902,702	9,175,291	5,032	110,281	2,095,250	14,288,556
Tin	32,432,173	943,365	52,009	575	125,647	33,553,769
Titanium metal	42,054,227	22,311,302	2,005,859	1,076,485	8,770,345	76,218,218
Tungsten	11,322,535	1,850,327	336,064	29,297	766,443	14,304,666
Uranium and thorium	1,052,817,730	498,688,076	165,866,527	21,727,767	242,336,287	1,981,436,387
Vanadium	122,366,680	231,963,680	35,892,811	54,011,448	10,699,921	454,934,540
Zinc	1,681,503,905	13,766,367	8,798,632	204,765	93,963,301	1,798,236,970
Zirconium	2,833,889	7,724,611	6,472,241	60,895	272,108	17,363,744
Other metals	4,171,498,870	971,178,232	76,486,272	74,646,106	727,027,327	6,020,836,807
Grand Total	**40,712,670,714**	**17,528,744,977**	**2,948,794,153**	**2,080,252,858**	**7,829,126,233**	**71,099,588,935**

($)

NON-METALS	U.S.A.	European Union (EU-28)	China	Japan	Other Countries	Total
Abrasives	308,529,451	12,582,814	7,753,058	8,446,369	22,636,341	359,948,033
Boron	1,555,545	333,935	2,396,299	1,582	2,265,357	6,552,718
Bromine	20,372	494	251	31,125	5,258	57,500
Calcium (Industrial minerals)	—	—	—	—	828	828
Cement	904,418,389	6,358,996	1,707,709	210,615	7,138,892	919,834,601
Chlorine and chlorine compounds	150,884,791	867,265	11,144	—	5,803,676	157,566,876
Chrysotile (Asbestos)	1,035,747	74,621	230,810	2,265	978,460	2,321,903
Clay and clay products	20,367,301	13,024,928	1,095,919	95,271	10,457,653	45,041,072
Diamonds	99,749,452	1,094,709,626	1,731	104,766	799,640,108	1,994,205,683
Dolomite	24,630,145	—	—	—	3,549,076	28,179,221
Feldspar	27,994	—	—	—	2,790	30,784
Fluorspar	6,953,323	2,370,317	1,044,485	214	3,161,438	13,529,777
Glass and glassware products	615,701,472	27,758,157	4,347,738	1,343,407	28,023,909	677,174,683
Granite	33,772,375	1,720,298	1,002,416	—	1,686,946	38,182,035
Graphite	46,609,861	7,373,934	761,971	1,143,315	6,042,031	61,931,112
Gypsum	91,569,855	379,271	110,601	17,507	1,318,374	93,395,608
Iodine	3,084,431	421,136	98,354	—	245,632	3,849,553
Lime	63,997,674		16,120	—	34,466	64,048,260
Limestone flux and other limestone	16,817,584	1,663,278	361,700	—	8,675,076	27,517,638
Marble, travertine and other calcareous stones	43,660,710	1,773,713	181,819	—	658,493	46,274,735
Mica	11,038,187	662,693	203,402	2,290,167	2,135,325	16,329,774
Mineral pigments	137,601,605	1,027,908	731,357	319,783	5,378,259	145,058,912
Nepheline syenite	116,925,652	1,215,637	839,137	833,443	3,887,111	123,700,980
Pearls	1,286,131	39,422	500	—	328,266	1,654,319
Peat	436,732,623	546,845	886,267	10,858,726	18,661,241	467,685,702
Phosphate and phosphate compounds	65,093,497	723,122	509,579	78,341	8,222,238	74,626,777
Potash and potassium compounds	2,448,872,073	25,749,727	393,972,964	209,132	1,828,411,958	4,697,215,854
Salt and sodium compounds	598,936,077	6,255,189	5,272,000	32,977,119	38,717,014	682,157,399
Sand and gravel	79,252,893	80,241	—	26	1,103,266	80,436,426
Sandstone	175,888	—	—	—	—	175,888
Silica and silica compounds	69,214,831	3,382,691	1,116,936	190,272	3,099,453	77,004,183
Slate	5,493,927	6,608,016	—	115,769	107,188	12,324,900
Sulphur and sulphur compounds	207,119,141	48,155	100,791,898	—	196,319,338	504,278,532
Talc, soapstone and pyrophyllite	60,634,669	28,063	328,304	7,769	29,162	61,027,967
Titanium oxides	228,704,302	13,263,021	2,872,403	—	66,733,197	311,572,923

Other non-metals	745,292,049	14,662,016	6,816,154	1,925,850	45,302,548	813,998,617
Other structurals	216,784,679	5,388,069	1,241,949	237,052	19,716,691	243,368,440
TOTAL NON-METALS	**7,862,544,696**	**1,251,093,598**	**536,704,975**	**61,439,885**	**3,140,477,059**	**12,852,260,213**

MINERAL FUELS	U.S.A.	European Union (EU-28)	China	Japan	Other Countries	Total
Coal	344,673,150	428,594,829	731,217,124	1,073,807,897	2,162,914,360	4,741,207,360
Coke	7,505,534	—	—	—	869,673	8,375,207
TOTAL MINERAL FUELS	**352,178,684**	**428,594,829**	**731,217,124**	**1,073,807,897**	**2,163,784,033**	**4,749,582,567**
TOTAL MINING DOMESTIC EXPORTS	**48,927,394,094**	**19,208,433,404**	**4,216,716,252**	**3,215,500,640**	**13,133,387,325**	**88,701,431,715**

Sources: Natural Resouces Canada; Statistics Canada.
- Nil.

ANNEX 10

TOTAL IMPORTS OF MINERALS AND MINERAL PRODUCTS, BY COMMODITY AND COUNTRY OF IMPORT, 2016

Return to text

METALS	U.S.A.	European Union (EU-27)	China	Mexico	Other Countries	Total
Aluminum	3,373,124,266	345,968,142	602,504,350	46,026,824	1,906,341,910	6,273,965,492
Antimony	959,014	650,913	11,628,241	135,656	2,533,907	15,907,731
Barium	3,773,945	919,618	1,783,759	—	157,193	6,634,515
Beryllium	750,521	3,043	—	491,559	579	1,245,702
Bismuth	256,972	247,073	1,254,555	42,529	39,370	1,840,499
Cadmium	3,260,954	6,606,605	8,353,459	1	10,559,812	28,780,831
Calcium metals	50,964,771	5,750,664	711,644	35,540	1,318,798	58,781,417
Chromium	6,682,450	13,117,949	4,052,597	581,949	52,130,028	76,564,973
Cobalt	24,679,720	12,981,303	308,626	248,840	16,936,515	55,155,004
Copper	1,603,981,627	163,251,287	154,807,762	94,607,696	580,098,165	2,596,746,537
Gallium	235,464	8,863	412,736	—	3,081	660,144
Germanium	9,887,830	452,663	467,322	1,023	5,052,312	15,861,150
Gold	2,051,360,930	15,285,060	3,595,784	110,869,462	6,959,051,876	9,140,163,112
Hafnium	11,865	—	90,797	—	9,984	112,646
Indium	1,568,129	115,594	37,893	—	21,846	1,743,462
Iron and steel	13,096,682,589	2,219,756,109	2,859,127,930	1,102,347,635	3,114,544,445	22,392,458,708
Iron ore	612,801,514	4,355,008	14,381	266	6,096,151	623,267,320
Lead	290,119,484	9,794,189	10,344,090	17,529,017	131,547,476	459,334,256
Lithium	26,232,390	9,126,112	22,377,952	638,365	44,441,355	102,816,174
Magnesium and magnesium compounds	69,612,559	9,822,247	179,293,608	736,963	14,979,161	274,444,538
Manganese	119,932,138	7,194,724	44,041,268	6,158,618	157,946,944	335,273,692
Mercury	3,660,976	4,897,041	801,898	61,383,327	3,544,825	74,288,067
Molybdenum	47,677,722	5,762,016	1,235,336	2,630,049	11,290,942	68,596,065
Nickel	344,755,491	176,465,671	16,812,992	1,518,463	107,237,553	646,790,170
Niobium	20,135,804	154,811	490,086	—	34,619,175	55,399,876
Platinum group metals	80,757,122	96,690,163	24,623	63,026	202,914,104	380,449,038
Rare earth metals	395,181	192,916	1,264,231	—	589,104	2,441,432
Rhenium	13,899	—	2,745	—	—	16,644
Selenium	43,244	180,094	298,252	113,698	1,062,505	1,697,793
Silicon	6,580,915	599,027	6,041,214	—	62,135,343	75,356,499
Silver	1,057,688,637	507,900,253	57,987,853	189,679,023	1,280,271,467	3,093,527,233
Strontium	19,799	521,989	35	289,605	223	831,651
Tantalum	3,443,703	30,094	66,021	—	243,320	3,783,138
Tellurium	295,462	15,872	155,458	—	1,895,757	2,362,549
Thallium	3,923	—	83	—	—	4,006
Tin	29,124,746	806,190	5,635,820	206,588	54,863,398	90,636,742
Titanium metal	122,033,748	44,326,506	23,970,155	47,485	78,177,662	268,555,556
Tungsten	13,258,013	1,570,634	2,996,798	5	3,065,831	20,891,281
Uranium and thorium	79,900,303	12,428,436	474,573	3,691	488,468,653	581,275,656

Vanadium	3,388,811	5,804,917	2,346,540	—	11,102,359	22,642,627
Zinc	491,419,061	21,007,704	4,741,635	82,266,417	206,814,041	806,248,858
Zirconium	60,669,912	2,715,350	140,207	—	2,735,639	66,261,108
Other metals	6,151,222,284	1,361,789,483	2,563,148,824	1,660,630,173	2,802,385,137	14,539,175,901
Grand Total	**29,863,367,888**	**5,069,266,333**	**6,593,844,133**	**3,379,283,493**	**18,357,227,946**	**63,262,989,793**

NON-METALS	U.S.A.	European Union (EU-27)	China	Mexico	Other Countries	Total
Abrasives	216,308,790	105,005,655	45,533,388	11,078,174	112,704,118	490,630,125
Arsenic	10,090	—	76,925	—	16,379	103,394
Barite and witherite	6,738,798	520,300	3,310,186	—	7,220,662	17,789,946
Boron	30,037,154	1,034,066	1,784,637	—	18,454,319	51,310,176
Calcium (Industrial minerals)	2,451,178	2,240	94,075	370	1,795,491	4,343,354
Cement	532,100,361	52,527,140	128,185,576	5,412,145	119,991,040	838,216,262
Chlorine and chlorine compounds	99,616,960	12,752,752	12,495,440	1,257,523	3,659,504	129,782,179
Chrysotile (Asbestos)	123,914,498	7,672,079	7,796,343	2,145,247	16,746,314	158,274,481
Clay and clay products	336,548,226	312,655,149	490,870,338	75,567,143	199,122,837	1,414,763,693
Diamonds	92,337,822	40,386,503	4,976,702	—	387,354,477	525,055,504
Dolomite	15,019,958	15,918	432,915	1,733	28,383	15,498,907
Feldspar	852,025	176	—	—	64	852,265
Fluorspar	21,300,389	5,156,774	5,437,676	41,468,082	8,053,904	81,416,825
Glass and glassware products	2,415,575,824	292,761,510	609,742,370	252,866,885	184,087,046	3,755,033,635
Granite	12,943,365	21,067,999	26,165,194	130,677	71,039,220	131,346,455
Graphite	128,107,686	101,786,113	158,882,056	11,228,745	33,809,619	433,814,219
Gypsum	206,466,354	8,182,648	520,017	4,962,171	275,616	220,406,806
Iodine	4,147,357	24,433	5,601	—	9,225,020	13,402,411
Lime	54,410,376	731,190	1,187	—	30,134	55,172,887
Limestone flux and other limestone	40,813,578	1,547,387	2,357,210	34	382,222	45,100,431
Marble, travertine and other calcareous stones	17,202,689	45,859,321	38,900,376	3,845,154	46,094,535	151,902,075
Mica	5,639,724	2,003,081	298,795	1,474	2,355,172	10,298,246
Mineral pigments	158,101,931	42,162,970	5,469,050	2,002,728	21,358,419	229,095,098
Nepheline syenite	256,519	—	—	—	31,678	288,197
Olivine	814,041	2,434,648	129,552	28	1,048,748	4,427,017
Pearls	9,509,502	2,288,930	28,760,128	230,171	16,026,866	56,815,597
Peat	15,428,061	1,301,097	139,256	70	3,899,953	20,768,437
Perlite	18,785,280	6,849,394	8,003	13,865	73,114	25,729,656
Phosphate and phosphate compounds	713,671,786	11,823,802	13,144,782	1,639,618	64,157,234	804,437,222
Potash and potassium compounds	92,309,029	5,421,675	5,887,197	681,255	17,988,407	122,287,563
Salt and sodium compounds	489,163,380	35,069,655	58,902,744	19,527,717	99,611,453	702,274,949
Sand and gravel	16,895,569	138,335	1,161,508	86,463	266,974	18,548,849

Sandstone	1,271,604	91,684	74,535	—	4,243,647	5,681,470
Silica and silica compounds	274,110,409	21,252,002	24,153,473	5,264,921	10,815,218	335,596,023
Slate	1,335,899	249,892	4,648,225	935	2,514,594	8,749,545
Sulphur and sulphur compounds	29,684,179	897,205	764,760	2,481	718,382	32,067,007
Talc, soapstone and pyrophyllite	15,056,464	808,236	122,196	—	255,145	16,242,041
Titanium oxides	175,805,602	18,491,872	31,636,879	16,007,003	12,588,107	254,529,463
Vermiculite	1,783,451	5,837	113,482	—	1,932,263	3,835,033
Other nonmetals	1,140,226,479	108,788,209	48,279,625	23,971,635	115,793,771	1,437,059,719
Other structurals	116,162,989	24,217,249	47,294,567	2,936,339	36,238,302	226,849,446
TOTAL NON-METALS	**7,632,915,376**	**1,293,985,126**	**1,808,556,969**	**482,330,786**	**1,632,008,351**	**12,849,796,608**

MINERAL FUELS	U.S.A.	European Union (EU-27)	China	Mexico	Other Countries	Total
Coal	567,749,551	2,713,958	4,129,683	383,821	162,326,034	737,303,047
Coke	165,435,822	13,006,746	200	—	17,727,384	196,170,152
TOTAL MINERAL FUELS	**733,185,373**	**15,720,704**	**4,129,883**	**383,821**	**180,053,418**	**933,473,199**

TOTAL MINING IMPORTS	**38,229,468,637**	**6,378,972,163**	**8,406,530,985**	**3,861,998,100**	**20,169,289,715**	**77,046,259,600**

Sources: Natural Resouces Canada; Statistics Canada.
- Nil.

THE CANADIAN MINING INDUSTRY AT A GLANCE

	2005	2007	2009	2014	2015	2016
Mining industry GDP ($ billion)	40.0	41.9	32.0	57	55.6	57.6
Percentage of total Canadian GDP (%)	3.8	3.4	2.7	3.5	3.4	3.4
Value of mineral production ($ billion)	27.4	40.6	32.2	44.7	42.8	40.8
Synthetic crude production value ($ billion)	9.2	18.0	n/a	35.5	21.5	19.6
Synthetic crude production (million cubic metres)	21.9	39.9	n/a	55.3	56.6	54.1
Number of mining establishments	859	766	961	1,209	n/a	1201
Mineral extraction employment	47,000	53,000	52,000	60,215	60,565	71,380
Total direct and indirect mining industry employment	353,000	360,000	308,000	376,000	560,000	596,000
Mineral exploration/appraisal spending ($ billion)	1.3	2.8	1.9	1.9	1.7	1.6
Mining industry capital expenditures ($ billion)	7.4	10.1	9.8	15.1	13.8	n.a
Oil sands capital expenditures ($ billion)	9.8	16.8	10.6	25.1	16.9	n.a
Stock of foreign mining direct investment ($ billion)	n/a	n/a	n/a	21.1	10.4	35.5
Stock of Canadian mining direct investment abroad ($ billion)	56.4	57.3	64.5	n/a	62.6	90.8

n/a—not available

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