FACTS AND FIGURES

OF THE CANADIAN MINING INDUSTRY

F&F 2016

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 2015, though some from prior years and some from 2016. Dollar amounts are expressed in Canadian dollars unless noted otherwise.

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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. 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, even at the bottom of a downturn, has contributed greatly to Canada's economic strength. The industry directly employs more than 373,000 workers across the country in mineral extraction, smelting, fabrication and manufacturing, and indirectly employs an additional 190,000. Proportionally, the mining industry is also the largest private sector employer of Aboriginal people in Canada and employment is poised to increase. The industry $56 billion contribution to Canada's gross domestic product in 2015 included $24.6 billion in mineral extraction, and $30.9 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 2015, selling a diversified array of minerals abroad. Exports of aluminum, copper, gold, iron and steel, iron ore, nickel, silver, uranium, zinc, diamonds, potash, coal and other mineral products ranged from several hundred million to $17.6 billion.

Canada remained the world's top destination for non-ferrous exploration spending in 2015, but experienced a 19% decrease in allocations year-over-year. This marks the fourth 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 (TSX-V) were home to 57% of the world's publicly listed mining companies in 2013, and accounted for 62% of the global mining equity raised in 2014. 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 2015 exceeded $115,000, which surpassed the average annual earnings of workers in the forestry, manufacturing, finance and construction sectors.

In 2013, the most recent year for which data are available, Canadian mining companies invested $677 million in research and development (R&D). Mining's investment surpassed that of the machinery sector, the pharmaceutical sector and the wood products and paper sector. The same year, the industry employed over 4,500 people in R&D. This is more than the pharmaceutical and forestry sectors, both of which receive extensive financial and policy support from the government.

A STATE OF TRANSITION

Foreign direct investment into Canada's mining sector dropped by more than 50% year-over-year in 2015, a sum disproportionate to the 6% decline in Canadian mining direct investment abroad. This imbalance indicates that companies are investing capital in project development but are less interested in doing so in Canada. The temptation is to infer that Canada's experience is consistent with all major mining countries, and that reduced investment levels can be attributed to lower commodity prices. While this lower-price environment has influenced company investment decisions, the disproportionate drop in mining investment in Canada suggests other factors are at play.

Eroding mining fiscal competitiveness and an increase in regulatory uncertainty stemming from the 2012 and 2013 federal budgets suggest that policy change is a component in Canada's reduced competitiveness and is distinct from reduced global mining investment flows.

The tangible impacts of recent federal policy changes on Canada's attractiveness as a destination for mineral investment have manifested in several ways, and exploration spending is an important indicator. SNL Metals & Mining data indicate, when factoring in exploration budgets for iron ore, that Canada no longer attracts the single-largest share of total global mineral exploration spending, having conceded first place to Australia. Qualitative evidence also points to adverse impacts on Canada's competitiveness for mineral investment. The 2016 edition of the Fraser Institute's annual survey of mining and exploration companies ranked an Australian jurisdiction as the most attractive for mine exploration ahead of a Canadian one.

The loss of Canada's standing as the second largest mining supply sector globally – a rank that we have had held for years – is another sobering indicator. Perhaps, the most tangible and concerning example, however, comes from the Canadian Environmental Assessment Agency whose data reveal a decline in recent years in the number of mining projects undergoing the federal environmental assessment process.

At the time of writing, only one new project had entered the process in more than a year.

The prevailing view is that the global mining industry's economic prospects are strong over the medium and long term. The question is whether and to what extent Canada will play host to the development opportunities this affords. MAC research has identified upwards of $145 billion in potential investment into Canada given the right domestic investment and regulatory environment. Collectively, however, recent policy changes have made Canada a costlier jurisdiction in which to do mining, and have contributed to growing uncertainty over our reliability as a destination for mineral investment. The ability of decision makers to effectively address these key issues will prove a major determinant in Canada's ability to benefit from the next commodity price upswing.

KEY ISSUES FOR THE CANADIAN MINING INDUSTRY

Canadian regulatory burden. New mines and major expansions must undergo federal reviews and approvals in addition to the review and permitting requirements of their provincial or territorial jurisdiction. The efficiency and predictability of these processes are possibly the single largest investment determinant for mining projects globally, and Canada is persisting in a prolonged period of uncertainty. The regulatory reform of 2012 maintained the federal government's high level of mining project oversight, if not increased it. Under the *Canadian Environmental Assessment Act* (CEAA 2012), for example, the industry has seen a deterioration in federal and provincial coordination and among federal government departments and agencies, which has created delays and uncertainty. There has also been duplication in provincial processes and federal intrusion into provincial jurisdiction, resulting in inefficient 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.

For the reasons above, MAC welcomed the government's review of the federal environmental assessment process, which was launched in 2016.

Photo: Goldcorp, Porcupine Gold Mines, Ontario

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 make policy decisions related to the *Metal Mining Effluent Regulations* (MMER), which underwent a three-year review that concluded in 2015. The industry is hopeful that the outcome of the MMER review will be a clear compliance mechanism for all mining in Canada, with regulations that facilitate growth and economic opportunities while protecting the environment. Proposed amendments to the MMER are expected to be published in 2017.

Strategic infrastructure investment and transportation policy. Since the mining industry is the largest customer group of Canada's transportation sector, it must move products to market efficiently and at competitive prices using modern infrastructure such as ports, highways and railways. Capital spending opens up new regions for development by enhancing the economic viability of a host of projects.

Conversely, Canada's vast geography, and the substantial cost required to overcome it, can be a barrier to developing remote and northern mining projects. This is particularly true for remote and northern regions, where the cost burden for project development is upwards of 2.5 times that of southern Canada.

MAC applauds the government's nation-building infrastructure plan, which was announced on November 1 in the Fall Economic Statement. The plan broadly recognizes the unique infrastructure challenges of remote and northern regions, and includes the creation of the Canada Infrastructure Bank (CIB). The CIB, an arm's-length organization dedicated to increasing investment in growth-oriented infrastructure, will be responsible for investing at least $35 billion from the federal government into large infrastructure projects that contribute to economic growth through loans, loan guarantees and equity investments. Looking forward, ensuring that the CIB has a mandate to facilitate economic development, and the flexibility to accommodate remote and northern projects, is critical to responsibly opening up the North, addressing climate change, and facilitating the government's robust Indigenous reconciliation agenda in these regions.

The human resources challenge. According to the Mining Industry Human Resources Council (MiHR), the Canadian mining industry will require 106,000 new workers over the next decade. This deficit is compounded by the approaching retirement of the industry's skilled core of workers. By 2025, MiHR forecasts that more than 51,000 employees will retire from the sector. As Canada's largest private sector employer of Aboriginal people on a proportional basis, the industry is in a good position to increase Aboriginal employment if the right training and skills programs are developed and maintained. Most Aboriginal communities are located within 200 kilometres of a producing mine or an exploration property. Addressing the human resources challenge will take a large and coordinated effort by the industry, educational institutions and all levels of government in the coming years. The mining industry is well positioned to support the government in its commitment to economic reconciliation with Indigenous peoples.

Innovation and Climate Change. MAC and its members are committed to supporting the transition to a lower carbon future, and to being a constructive partner to the Government of Canada in addressing climate change.

To assist government in the development of an effective pan-Canadian climate change policy, MAC released *Principles for Climate Change Policy Design* in April 2016, which were broadly reflected in the government's pan-Canadian carbon pricing regime, which it announced in October 2016. While a significant step forward, some components of the regime have yet to be determined, including how the government intends to ensure "consistency" across reporting requirements, what role it may play in defining Emissions Intensive and Trade Exposed sectors, and how it will address the unique challenge of climate change in the territories. Ensuring that industry can remain competitive while meaningfully reducing GHG emissions should remain a central consideration for the federal government as it finalizes the roll out of its climate change and innovation agenda policies and associated programs.

Minerals, metals and energy products are essential building blocks of clean and low-carbon technologies, and Canada's mining industry is providing the groundwork for tomorrow's economy. MAC members are also leaders in energy and fuel efficiency, be it through fuel-switching opportunities, energy management process improvements, or adoption of renewable technologies.

The industry is also intensifying its innovation efforts both individually and collaboratively. MAC and its members have participated in the development of the Canada Mining Innovation Council's (CMIC) Towards Zero Waste Mining innovation strategy, which is seeking federal government support. Part of CMIC's focus is to enable strategic innovations to facilitate the industry's transition to a lower carbon future. ■

MINING

ONE INDUSTRY, MANY APPLICATIONS

THE MINING INDUSTRY IS CRUCIAL TO THE EVERYDAY LIFE OF ALL CANADIANS. MINED PRODUCTS ARE REQUIRED TO BUILD HIGHWAYS, ELECTRICAL AND COMMUNICATION NETWORKS, HOUSING, VEHICLES, ELECTRONICS AND MANY OTHER ITEMS ESSENTIAL TO MODERN LIFE.

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."

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, its opportunities, challenges, investments and needs are inseparable from those of broader society. 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 for over a century. 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. ■

SELECTED 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)
- **Other vehicles and tires** (steel, copper, zinc, barium, graphite, sulphur, bromine, iodine)
- **Musical instruments (**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

Global economic growth has been volatile in recent years, with annual growth projections consistently downgraded as market conditions unfolded. Descriptors such as "rebalancing" and "modest and uneven recovery" characterize the global economy as it continues to navigate through a generalized slowdown in emerging market economies, which has resulted in lower commodity prices. Since its January forecast pegged 2016 global economic growth at 3.4%, the International Monetary Fund (IMF) has subsequently revised its forecast downward twice, to 3.2% in April and 3.1% in July. While the original January forecast was made with the caveat that the "projected partial recovery" was vulnerable to geopolitical and economic shocks, the July downgrade was attributed to Brexit and its effect on global financial markets. Looking forward, projected global growth for 2017 is forecast at 3.4%.

Emerging Economies

Emerging market demand has continued to slide, but performance has been uneven across countries. From 2010 through 2015, GDP growth from the IMF's Emerging Market and Developing Economies has fallen significantly, from 7.6% to 4.0% – a low from which the IMF forecasts a modest recovery to 4.1% in 2016 and 4.6% in 2017.

Through 2016, both Brazil and Russia forecast consecutive year-over-year negative GDP growth at 3.3% and 1.2%, respectively. Meanwhile, China's growth (albeit over a much larger base than in previous years) is forecast to continue moderating and is projected at 6.4% in 2016 and 6.2% in 2017. 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 expected to persist in years to come. In contrast, however, is India's economy, which grew by 7.6% in 2015, and is forecast to grow by an annual 7.4% in both 2016 and 2017.

As overall emerging country growth slows, these economies have become less able to pick up the slack in global economic growth resulting from underperforming advanced economies. While advanced economies have shown some positive signs, actual growth is consistently lower than forecast. Without broader economic revitalization in other countries and regions, the slower pace of global economic growth is likely to persist, or further decline.

Performance of Advanced Economies

Uncertainty over the performance of several of the world's advanced economies continues, affecting the short-term global economic outlook. Concerns over the length of the recession in Europe, mixed views on the effectiveness of Japanese economic reforms, uncertainty over the strength of the US economic recovery, and most recently, Brexit, have contributed to weak market confidence and investor hesitancy.

Eurostat, the European Commission's statistics office, reported growth of 2.0% across the European Union in 2015, an increase over previous years. However, the agency forecasts lower growth for 2016 at 1.8%, and the uncertainty surrounding the outcome of Brexit creates additional uncertainty for future predictions. While still high, year-over-year improvement was seen in Europe's unemployment rate, dropping to 9.4% in 2015, and forecast to drop further to 8.5% in 2017. On both measures, however, large discrepancies exist across member states. For example, the lowest unemployment rates were recorded in Germany (4.6%), the Czech Republic (5.1%) and the United Kingdom (5.3%), and the highest rates were in Greece (24.9%) and Spain (22.1%). Despite challenges, these trends are seen by some as important steps – if small and inconsistent – towards economic revitalization.

Japan, the world's third-largest economy, expanded 0.5% in 2015, up from virtually no growth in 2014. Looking forward, growth is forecast at 0.3% and 0.1% in 2016 and 2017, respectively, suggesting a retreat into recession. As the country pursues the government's policy mix of aggressive monetary easing, fiscal spending and structural reforms, analysts remain uncertain as to likelihood for the long-term success of this approach. While expectations are raised for better times ahead – supported by recent growth – a ballooning debt of approximately 230% of GDP and serious demographic issues mean that Japan's challenges remain significant.

Meanwhile, after disappointing second-quarter growth, the US economy is expected to perform better in the remainder of 2016, supported by private consumption and an increase in inventories. Nevertheless, a strong US dollar and prospects of further weakening in the global economy are likely to restrain growth in export-oriented industries. The IMF forecasts US economic growth at 2.2% in 2016 and 2.4% in 2017.

Impacts on the Mining Industry

Commodity price fluctuations have correlated with global economic volatility in recent years, but the global mining sector has shown signs of emerging from a significant downturn in commodity prices.

While analysts agree the upward pressure is largely due to recent Chinese economic stimulus measures, debate continues as to whether the stimulus is credit driven or representative of fundamental demand. At issue is the longevity of the recently witnessed and welcomed upward pressure on prices. What is certain, however, is that the observed transition from a low-price environment has not been felt uniformly across commodities, but is reflected in increased prices for a growing number of them in recent months.

Prices have increased for many commodities as 2016 has unfolded. Nickel has edged upward, rising approximately $0.70 on the pound over the last six months, while iron ore pellets, aluminum, lead and zinc are up approximately 1.5%, 6%, 27%, 45%, respectively, year-over-year. Despite copper persistently fluctuating at five-year lows over the last nine months, analysts proclaim that base metals have entered a bull market.

Precious metals are also a bright spot. Having hit a trough at the turn of the year, both silver and gold have since rebounded. From December 2015 through August 2016, the price of gold climbed monthly, reaching over $250 per ounce, while silver rose nearly $5 per ounce during the same period. As well, by mid-September, spot prices for premium steelmaking coal spiked to more than $200 per tonne from an earlier low of $75 per tonne. This upswing has made premium steelmaking coal the best performing commodity so far in 2016.

Despite these signs of improvement, other commodities remain stubbornly low. Joining copper at five-year lows are uranium and potash. Uranium dropped from a monthly high of $65 per pound in February 2011 to $25 per pound in August 2016. Potash fell from over $483 per tonne in February 2012 to $220 per tonne in August 2016.

Looking forward, the Canadian mining industry's economic prospects are strong over the long term, if not uniform, across all commodities. 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.

These opportunities cannot be taken for granted, however, nor can the robust economic contributions of the sector to Canadians and the Canadian economy. Impending decisions about environmental, Indigenous, transportation, tax and other mineral policies will significantly affect Canada's readiness to capitalize on and benefit from these opportunities when the next upswing begins.

MINING'S CONTRIBUTION TO THE CANADIAN ECONOMY

Mining contributes significantly to the Canadian economy. The direct and indirect wages and employment of approximately 563,000 people across the country (of which 373,000 are direct), taxes and royalties collected by governments, and the capital expenditures required for project development and operation are only some examples of its contribution. 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 2015, the industry's contribution remained within this range at 3.4%.

2015 Contribution

The extractive industry, which combines mineral extraction with oil and gas extraction, contributed $120.4 billion, or 7.3%, to Canada's GDP in 2015 (*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 2015 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): $24.6 billion
- **Stage 2,** primary metal manufacturing (smelting, refining, rolling, extruding, alloying and casting of primary metals): $12.8 billion
- **Stage 3,** non-metallic mineral product manufacturing (abrasives, lime, cement, glass, ceramics): $5.4 billion
- **Stage 4,** fabricated metal product manufacturing (forging, stamping and heat-treating to produce reinforcing bars, fabricated wire, cutlery, tools, hardware): $12.7 billion

The output of these four stages in 2015 totalled $55.6 billion. By comparison, according to Statistics Canada, the oil and gas extraction sector contributed $95.7 billion to GDP. The Canadian Association of Petroleum Producers indicated that on a barrel-per-day basis, approximately 46% of oil sands extraction in 2015 was from mining, the process for which is essentially surface mining. Indirect mining, mining-related support activities and mineral processing augments this sum by $18.9 billion.

Mining in the Provinces and Territories

Mineral production values were down in eight of Canada's 13 provinces and territories year-over-year. Quebec and British Columbia posted the largest drops in absolute value, exceeding $1 billion each. Saskatchewan experienced the single largest absolute gain in production value year-over-year, rising from $7.1 billion to $8.5 billion, while Nunavut posted the largest percentage gain, increasing 32% to $567 million. Overall, total production value is down 4.2%, or just under $2 billion. Although down, this value represents a 52% increase over the last decade, indicating growth over time.

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 2014

Total mining establishments: 1,192

Metals: 72

Non-metals: 1,120

Provinces with the Most Metal Mines

Quebec: 24

Ontario: 19

British Columbia: 8

Main Types of Non-metal Mines

Sand and gravel quarries: 720

Stone quarries: 285

Peat mines: 7

Mining also has significant ties to Canada's major cities. Some of the largest Canadian and international mining companies are headquartered or have 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 4.4% in 2015, falling $1.8 billion from 2014 levels.

VALUE OF MINING IN 2015

Canada-wide: $42.8 billion

Top 4 Provinces

1. **Ontario:** $10.8 billion
2. **Saskatchewan:** $8.5 billion
3. **Quebec:** $7.7 billion
4. **British Columbia:** $5.9 billion

Photo: IAMGOLD, Westwood Gold Mine, Quebec

Over the past decade, Quebec, Newfoundland and Labrador, Saskatchewan and British Columbia have seen the largest growth in mineral production value in absolute terms (*see Figure 4*). For example, Saskatchewan, a leading global producer of potash and uranium, has more than doubled its mineral production value over that time period.

A correlation exists between production values and expenditures on resource development. The top four provinces by production value in 2015 – Ontario, Saskatchewan, Quebec and British Columbia – also led in expenditures on mineral resource development (*see Figure 5*). Of the $9.3 billion invested in mine complex development in Canada, combined spending across these four provinces exceeded $7.4 billion (79% of the total) and ranged from $613 million to $3.4 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% ($388 million) of total 2015 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 12% ($1.2 billion) of total mine complex development expenditure.

The majority of this investment (70%) 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 investment has decreased significantly in recent years, and recent 2016 spending intentions indicate a continuation of this trend:

- $99.3 million in the Northwest Territories, down $0.9 million (0.9%) from $100.2 million in 2015
- $109.9 million in Nunavut, down $105.2 million (49%) from $215.1 million in 2015
- $56.4 million in Yukon, down $16.9 million (23%) from $73.3 million in 2015

This fourth consecutive annual decrease in spending 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.

Payments to Governments

In 2012 (the most recent year in which data are available), the mining industry, including oil sands mining, paid an estimated $6.6 billion to federal and provincial/territorial governments (*see Figure 6*). This total consisted of:

- $3.0 billion in royalties
- $1.2 billion in corporate income tax
- $2.3 billion in personal income tax

Approximately 40% of this amount went to the federal government and 60% to provincial/territorial governments.

Including the fourth stage of mining would add another $1.9 billion to the amount industry paid governments in 2012, bringing the total to $8.5 billion.

It is also worth noting that the oil sands industry pays the Alberta government large sums, as high as $2 billion in some years, in the form of land sales payments. These sums are not included in *Figure 6*.

Also noteworthy is Canada's payment disclosure legislation, the *Extractive Sector Transparency Measures Act*, which came into force in July 2015. The practical effect of the new law means that companies will disclose the payments they make to governments that exceed a $100,000 threshold, creating greater transparency over the taxes, royalties and other forms of disbursement that companies pay. Although the legislation came into force in 2015, the publication of tax payments begins in 2017, meaning future editions of this report will provide more up-to-date information.

MINING PAYMENTS TO CANADIAN GOVERNMENTS TOTALLED $71 BILLION OVER THE YEARS SPANNING 2003 TO 2012.

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 2016 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. However, InfoMine has reported that Australia's identified mining supply sector has surpassed that of Canada's, bumping Canada to third place. This is one of a number of indicators suggesting Canada's attractiveness as a destination for mineral investment is eroding. (See Section 6 of this report for more discussion on investment trends.)

A recent study by the Canadian Association of Mining Equipment and Services for Export found that 913 companies identify as mining suppliers in Ontario alone.

Together, they provide 68,000 additional jobs across the province, and generate 1% of provincial GDP and $1.5 billion in government tax revenue. Similar indirect contributions are made to the governments of other mining provinces.

NUMBER OF MINING SUPPLIERS IN LEADING COUNTRIES

United States: 5,926

Australia: 4,268

Canada: 3,737

Brazil: 3,583

Chile: 1,841

In 2015, $6.8 billion of global mining equity was raised by the Toronto Stock Exchange (TSX) and the TSX Venture Exchange – more than any other stock exchange in the world. Several thousand Canadian brokers, analysts, exchange workers, consultants, trade finance experts and securities lawyers both support and benefit from the mining industry.

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 2016 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.

Knowing that any reduction in mining and mineral-related investment will be associated with a reduction in regional and national social and economic benefits, these tax reforms will arguably make it more difficult for governments to achieve certain stated public policy objectives. This is particularly true for Canada's remote and northern regions, where operating costs are significantly higher and infrastructure is acutely lacking. Having greater access to tax incentives and other government support would help Canada unlock the mineral potential in these areas, and would enable the federal government to meet its socio-economic objective for these regions. ■

FIGURE 1

CANADA'S REAL GROSS DOMESTIC PRODUCT, BY INDUSTRY, 2008-2015

Return to text

($ millions)	2008	2009	2010	2011	2012	2013	2014	2015
All industries	1,478,592	1,429,913	1,476,176	1,524,395	1,552,003	1,584,073	1,623,166	1,640,317
Agriculture	18,083	17,592	17,291	17,637	17,813	20,110	18,925	19,559
Forestry and logging	4,165	3,286	3,794	4,173	4,093	4,424	4,263	4,455
Fishing, hunting and trapping	1,103	1,074	1,141	1,121	1,138	1,181	1,249	1,306
Mining (including milling) and quarrying, and oil and gas extraction	**108,866**	**100,068**	**104,795**	**111,115**	**108,281**	**112,648**	**118,814**	**120,352**
Support activities for mining and oil and gas extraction	11,471	8,314	10,290	12,204	12,445	12,115	13,379	8,765
Electric power, gas and water utilities	37,068	34,888	35,375	36,476	36,124	37,439	37,489	37,218
Construction	104,738	98,211	105,559	109,208	117,567	120,026	121,668	117,121
Manufacturing	177,371	152,564	159,596	165,154	167,793	167,475	172,691	173,406
Trade, wholesale	78,942	73,615	79,144	85,194	87,920	89,384	93,181	94,193
Trade, retail	79,656	77,683	80,009	80,843	81,119	83,739	86,771	88,722
Transportation and warehousing	62,619	60,198	62,620	65,077	65,915	66,626	69,242	71,477
Information and cultural industries	49,025	48,302	49,327	49,954	50,350	50,691	50,627	50,135
Finance and insurance	96,050	95,249	97,260	100,546	102,164	106,212	109,997	115,503
Real estate and rental and leasing	172,618	177,200	182,930	188,680	194,632	200,366	205,977	212,405
Community, business and personal services	203,556	199,763	199,209	204,847	210,206	214,670	219,157	221,849
Public administration	96,296	101,505	104,310	106,165	105,283	104,996	105,919	106,525
Health care and social assistance	98,424	100,702	102,232	103,998	105,614	107,421	109,211	111,242
Educational services	78,541	79,699	81,294	82,003	83,546	84,550	84,606	86,084

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, 2008-2015

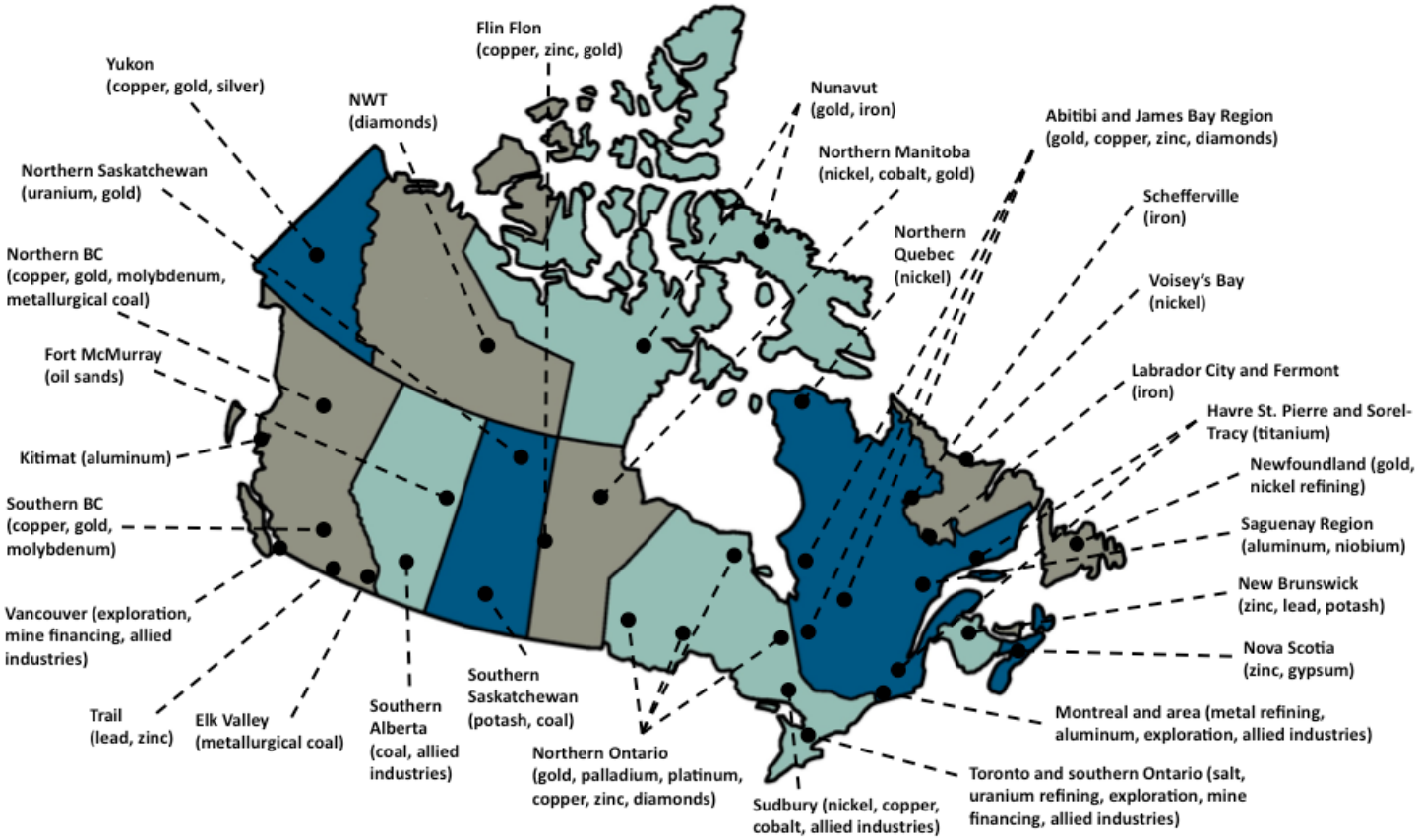
Return to text

($ millions)	2008	2009	2010	2011	2012	2013	2014	2015
Metal mines	17,153	13,316	13,805	16,158	16,249	16,803	17,903	18,342
Non-metal mines	5,035	3,436	4,439	4,759	4,206	4,398	4,621	4,826
Coal mines	1,719	1,438	1,631	1,594	1,620	1,742	1,651	1,458
Total Mining	**23,907**	**18,190**	**19,875**	**22,511**	**22,075**	**22,943**	**24,175**	**24,626**
Primary metal manufacturing	15,248	11,483	12,836	13,598	13,466	13,118	13,446	12,886
Fabricated metal product manufacturing	13,102	11,141	11,592	12,547	13,466	12,957	13,241	12,656
Non-metallic mineral product manufacturing	6,235	5,287	5,417	5,524	5,648	5,315	5,581	5,435
Total Mineral Manufacturing	**34,585**	**27,911**	**29,845**	**31,669**	**32,580**	**31,390**	**32,268**	**30,977**
Oil and gas extraction	84,959	81,878	84,920	88,604	86,206	89,705	94,639	95,726
Petroleum and coal products manufacturing	7,036	7,468	7,044	6,728	6,782	6,657	6,541	6,457
Support activities for mining and oil and gas	11,471	8,314	10,290	12,204	12,445	12,115	13,379	8,765
Total Oil and Gas and Associated Manufacturing	**103,466**	**97,660**	**102,254**	**107,536**	**105,433**	**108,477**	**114,559**	**110,948**

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

FIGURE 3
CANADIAN MINING INDUSTRY CLUSTERS

Return to text



Source: The Mining Association of Canada.

FIGURE 4

VALUE OF CANADIAN MINERAL PRODUCTION BY PROVINCE AND TERRITORY, 2005 AND 2015[P]

Return to text

	2005			2015[P]		
Province/Territory	**($ current millions)**	**(%)**	**RANK**	**($ current millions)**	**(%)**	**RANK**
Ontario	7,438.3	26.5	1	10,761.3	25.2	1
Saskatchewan	3,793.5	13.5	4	8,505.3	19.9	2
Quebec	3,914.2	14.0	3	7,674.6	17.9	3
British Columbia	5,384.2	19.2	2	5,903.5	13.8	4
Newfoundland and Labrador	1,744.5	6.2	6	2,770.2	6.5	5
Alberta	1,463.6	5.2	7	2,574.5	6.0	6
Northwest Territories	1,790.4	6.4	5	1,790.6	4.2	7
Manitoba	1,249.3	4.5	8	1,354.8	3.2	8
Nunavut	3.8	…	13	567.2	1.3	9
New Brunswick	906.6	3.2	9	400.2	0.9	10
Yukon	39.0	0.1	11	246.9	0.6	11
Nova Scotia	304.5	1.1	10	212.3	0.5	12
Prince Edward Island	4.1	…	12	4.6	…	13
Canada	**28,035.9**	**100.0**		**42,766.0**	**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, 2015[P]

Return to text

($ millions)

Province/Territory	Exploration	Deposit Appraisal	Mine Complex Development	Total
Newfoundland and Labrador	25.5	22.0	315.8	363.4
Nova Scotia	4.9	4.7	42.7	52.3
New Brunswick	4.1	4.1	84.6	92.8
Quebec	163.3	56.9	1,454.3	1,674.4
Ontario	266.4	126.9	1,922.8	2,316.1
Manitoba	34.0	1.3	203.5	238.7
Saskatchewan	164.4	93.7	3,440.3	3,698.3
Alberta	3.7	13.7	99.4	116.8
British Columbia	106.4	224.7	613.4	944.4
Yukon	28.0	45.3	13.8	87.1
Northwest Territories	53.9	46.4	819.9	920.1
Nunavut	115.8	99.3	387.0	602.1
Canada	**970.2**	**739.0**	**9,397.4**	**11,106.6**

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.

FIGURE 6

DIRECT REVENUES TO CANADIAN GOVERNMENTS FROM THE MINERAL SECTOR, 2003–2012

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$ millions	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Royalties/Mining Taxes	586	1,336	1,576	2,640	3,967	5,279	2,187	3,176	3,880	3,060	27,687
Corporate Income Tax	1,773	1,943	2,393	4,005	4,213	3,204	1,083	2,408	2,437	1,244	24,702
Personal Income Tax	1,732	1,732	1,731	1,784	1,970	2,047	1,687	1,861	1,987	2,277	18,808
Total	**4,090**	**5,011**	**5,700**	**8,429**	**10,150**	**10,529**	**4,957**	**7,445**	**8,304**	**6,581**	**71,197**
-of which federal	2,609	2,760	2,799	3,707	4,005	3,547	1,905	2,963	3,045	2,471	29,811
-of which provincial	1,481	2,251	2,901	4,722	6,145	6,982	3,052	4,482	5,259	4,110	41,385
Provincial share (%)	36.2	44.9	50.9	56.0	60.5	66.3	61.6	60.2	63.3	62.5	58.1

Source: ENTRANS Policy Research Group study for the Mining Association of Canada.
Note: Most royalty estimates are provided on a fiscal year basis, while the estimates for corporate and personal income taxes are for calendar (taxation) years. The federal share includes federal corporate income and capital taxes, federal personal income taxes paid by mining employees and mining royalties generated in the Northwest Territories and Nunavut. The provincial share includes all royalties and mining taxes to provinces and to the Yukon, provincial corporate income and provincial personal income taxes paid by mining employees.

— 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, nickel and niobium
- Third in cobalt, aluminum and platinum group metals
- Fourth in salt, sulphur and tungsten
- Fifth in diamonds, graphite 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. However, over the past 15 years, Canada has become a top-five producer of gold, cadmium, salt and niobium. Notable is that Canada is third in the world for diamonds, according to value, despite being fifth in production.

Production Values

In 2015, the value of Canadian mineral production decreased slightly – by 2.5% – to $42.8 billion.

This suggests a settling in contrast to the decline from its record high of $50.9 billion in 2011 (*see Figure 7*). Metal and coal values accounted fully for the decline, falling 7% and 20%, respectively, year-over-year. While non-metal values increased nearly 9%, it was not enough to make up the difference across all three categories. This is the second consecutive year that coal's production value has retreated sharply. At $22.5 billion for metal production and $17.2 billion for non-metal production, 2015 totals mark an increase of almost two-thirds over the past decade.

Canada's top 10 minerals and metals (*see Figure 8*) each had production values of more than $1.5 billion in 2015, with five (gold, potash, copper, nickel and coal) at more than $3 billion each. Values for four out of the 10 commodities increased in 2015, with gold leading the charge with a 7% ($400 million) increase year-over-year, followed by several industrial minerals (stone, cement and sand, and gravel). Year-over-year volume production increases for these commodities reflect this as well (*details in Annex 5*). These stronger production values reverse a three-year trend of decline. In contrast, coal fell for the fourth consecutive year, and iron ore for the third. However, recent upticks in price for these commodities in 2016 suggest higher values for the near term.

Together, the top 10 minerals and metals represent $35.6 billion (83%) of Canada's total mineral production value in 2015.

The following paragraphs discuss market developments surrounding a few key minerals.

Uranium

The nuclear industry is gradually recovering from its post-Fukushima slump, but excess capacity is keeping uranium prices at record lows, presenting challenges for uranium mining companies. Following the Fukushima disaster, Japan closed its nuclear reactors, which accounted for almost 10% of the reactors operating globally. In the fallout, several countries announced plans to phase out nuclear power, and in the past three years, several nuclear reactors in the United States were closed as the abundance of affordable shale gas rendered them uncompetitive.

At present, only three of Japan's 43 nuclear reactors are operational. However, nuclear capacity globally is picking up, especially as more countries explore carbon-free nuclear energy as a means of addressing climate change and reducing emissions.

As of April 2016, 31 countries hosted 440 operable nuclear power reactors, with a combined capacity of 385 GWe (gigawatt electric). Simultaneously, 13 countries were constructing an additional 59 new nuclear plants, of which 20 are in China, seven are in Russia and five in India. Over the coming decade, China plans to build more than 60 nuclear plants; the United Kingdom has just signed a deal that could result in 12 new reactors; and South Africa recently launched a massive nuclear tender. Some analysts have suggested that 260 new reactors could be built worldwide by 2030.

Canada, notably Saskatchewan, is a major player in the world's uranium industry. Cameco's McArthur River mine in northern Saskatchewan is the world's largest and highest-grade uranium deposit, with an average ore grade of 21% and annual production of around 8,200 tonnes of uranium oxide. A positive outlook in world uranium demand bodes well for Canada's prominence in this mining sector. Recent bi-lateral trade agreements, including the Canada-India Nuclear Cooperation Agreement, and the Canada-European Union Comprehensive Economic and Trade Agreement, have opened up new markets in Canada and abroad for uranium miners. For example, on April 15, 2015, Cameco and India's Department of Atomic Energy signed a $350 million long-term uranium supply contract.

Oil Sands

The development of western Canada's oil sands is one of the world's biggest economic stories in recent decades. Technological advances, combined with elevated crude oil prices, made the oil sands economically viable to develop, boosting production from 100,000 barrels per day in 1980 to more than two million barrels per day in 2015. While higher oil prices did usher in an era of significant growth in production value, the recent plunge in crude oil prices has had a dampening effect on the sector, with some companies revisiting investment decisions, and all operators aggressively controlling costs and maximizing operational efficiencies.

Canada has the third-largest oil reserves in the world, and 97% (168 billion barrels) of Canada's reserves (173 billion barrels) are in the oil sands. The majority (81%) of world oil reserves are owned or controlled by national governments. Only 20% of total world oil reserves are accessible for private sector investment, 56% of which are found in Canada's oil sands. Given this ratio, the sector has been of significant interest to foreign direct investment.

Despite the challenges that a lower oil price presents for operators, Canada's oil sands remain the primary driver for growth in Canadian crude oil production. Down from last year's forecast of 4 million barrels of oil per day, the oil sands are expected to produce 3.7 million barrels per day by 2030, an increase of more than 1.5 million barrels per day over current production.

Synthetic crude oil accounted for over 25% of Canada's crude oil production volume in 2015, up from 15% a decade earlier (*see Figure 9*). Indicative of the recent downward pressure on oil prices, the absolute value decreased by nearly 40% year-over-year, from $35.4 billion in 2014 to $21.5 billion in 2015.

Metallurgical Coal

Metallurgical coal, or steelmaking coal, is one the principal ingredients in making steel – a fundamental building block of modern society. For example, steel is a crucial input for alternative energy (wind turbines), public transit (light rail) and personal recreation (bicycles), among many other applications. About 770 kilograms of steelmaking coal are required to produce one tonne of steel, and more than 700 million tonnes are used each year in global steel production.

Spot prices for premium steelmaking coal spiked to over $200 per tonne by mid-September 2016, up from as low as $75 per tonne earlier in the year. The catalyst for this upswing was a unilateral decision by the Chinese government to reduce the number of allowable working days at domestic coal mines.

The resulting reduction in domestic Chinese coal supply pushed steelmakers to make up the difference by buying off the spot market, which thrust spot prices higher. It is uncertain whether Beijing will maintain these new regulations in the face of increased steelmaking costs, but some have argued that Chinese policy makers will maintain these cuts as part of the ongoing supply-side rationalization strategy. At the time of writing, Scotiabank commodity analysts were forecasting that prices would fall back to the $100 to $150 per tonne range as existing mining capacity comes online in response to these higher prices.

Potash

Potash plays a central role in helping feed the world's growing population, as approximately 95% of world potash production is used as fertilizer. According to the Food and Agriculture Organization of the United Nations, agricultural production needs to increase by 70% by 2050 to meet the rising demand for food. This rising demand is linked to projections of global population reaching 9.6 billion by 2050. These trends indicate that fertilizer made from potash will play an even greater role in increasing crop yields to meet food demand.

Since Russia's Uralkali quit the Belarusian Potash partnership, uncertainty in the global trade of potash has increased, causing speculation about what market impacts may result. When Uralkali decided to produce at full capacity in 2013, analysts forecasted that potash prices might drop by 25% to $300 per tonne. Since that time, however, downward pressure pushed the price to US $220 per tonne. These developments may have led the Belarusian president, Alexander Lukashenko, to announce his openness to re-forge the Belarusian Potash Company, a potash marketing company. Such a development could bring greater supply discipline to a glutted potash market.

With 10 world-class potash mines, Saskatchewan is the world's largest producer and exporter of the product, despite pricing pressures that have resulted in the temporary suspension of some production. Recent investments by Mosaic at Esterhazy K3 mine ($1.7 billion), K+S Potash Canada ($4.3 billion), and PotashCorp Rocanville at the new Scissors Creek shaft ($3 billion) have bolstered the province's global leadership in potash production. This position may be reinforced by the possible emergence of BHP Billiton as a major player in the province. While a producing Jansen mine would effectively double Canada's total production of potash, the company has stated that any decision to move into production would depend on market realities at the time.

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 10*). 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, 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 11* shows that the production volumes for refined metals over the past 10 years have been mixed. Lead, cobalt and aluminum have increased modestly, while copper, nickel, cadmium 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 is essential.

Other factors 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 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 over 71,000 jobs in 2015. Adding non-metallic mineral product manufacturing increases that number by an additional 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 12%, or 10,200 jobs.

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.

The fallout of the Lac-Mégantic disaster has been a watershed in rail management and regulation. The response to the derailment has resulted in additional restrictions on the transportation of dangerous goods, which affect both railways and shippers. Additionally, Transport Canada, the Canadian Transportation Agency and the House of Commons Standing Committee on Transportation, Infrastructure and Communities have undertaken policy, regulatory and legislative reviews and consultations on the adequacy of Canada's third-party liability and dangerous goods regimes.

Safe Transportation of Dangerous Goods

On June 18, 2015, the *Safe and Accountable Rail Act* received Royal Assent. The legislation enacted:

- A new liability and compensation regime for federally regulated railways, including minimum insurance requirements;
- A compensation fund financed by levies on crude oil shippers;
- Increased information-sharing provisions; and
- Stronger oversight powers for the Minister and Transport Canada inspectors.

The government's goal in pursuing legislative change was to strengthen the third-party railway liability insurance regime to reduce taxpayers' exposure to financial damages from future rail accidents. To achieve this, the reforms standardize the insurance requirements for railways and also for shippers of select dangerous goods.

Recognizing the role it has to play in ensuring the safe movement of dangerous goods, the Canadian mining industry was highly engaged in the reviews and consultations leading to the above reforms, and was pleased that the measures adopted were largely consistent with the industry's position on the issues. Furthermore, the closing of the Tariff 8 regulatory loophole, which permitted railways to unilaterally impose liability on the shipper without oversight by the Government of Canada, was a particularly welcome reform.

The Canadian mining industry prides itself on its safety culture. Beyond engaging responsibly in important public policy matters that impact industry practices, MAC members, notably through commitments made in the Towards Sustainable Mining initiative, invest considerably in emergency response, crisis management and material stewardship, and will continue to do so.

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 2015, shipments of coal, iron ore and other minerals and metals represented 51.4% of total Canadian rail freight revenue (*see Figure 12*). In terms of volume, the mining industry accounted for 32% of total tonnage moved in 2015, which is the largest single volume share of all industries that ship by rail.

TOP COMMODITIES CARRIED BY CANADIAN RAIL IN 2015 (BY TONNAGE)

1. Minerals and metals: 32%
2. Grain: 12%
3. Forest products: 9%
4. Chemicals: 5%

Source: CANSIM Table 404-0002: Railway carloadings statistics, by commodity.

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 Bill C-52, the *Fair Rail Freight Service Act*.

The inadequacy of Bill C-52 – which passed into law in June 2013 – resulted in continued rail service failures. These service failures, experienced across all rail-shipping sectors, resulted in Bill C-30, 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* (discussed below) ahead of schedule.

Most recently, the government extended Bill C-30's provisions for another year, and, at the time of writing, was 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, miners require a reliable logistics supply chain to compete internationally.

2015 Statutory Review of the Canada Transportation Act

On February 25, 2016, the Minister of Transport, the Honourable Marc Garneau, tabled the *Canada Transportation Act* review's final report. MAC has concerns about several of the report's recommendations, including one advocating that government amend the level of service provisions in the Act to "recognize shippers and their collective needs, in the context of the optimal performance of the freight rail system." Amalgamating individual shipper's circumstances and requirements under "collective needs" would erode the common-carrier obligation. In practice, railways would have the discretion to prioritize the needs of some shippers over others.

If this recommendation is enacted, there would be significant repercussions, one of which would be a major weakening of the remedies in the Act available to shippers to challenge poor service delivery. For example, if network efficiency takes precedence over the common carrier obligation, then the remedies available to shippers in the Act would be significantly weakened.

Photo: Rio Tinto/Iron Ore Company of Canada, QNS&L train between Sept Îles and Labrador City

Transportation 2030: Data Regime and Rail Policy

On November 3, 2016 after six months of consultation, Minister Garneau released *Transportation 2030 - A Strategic Plan for the Future of Transportation in Canada*. The announcement was the government's response to the *Canada Transportation Act* Review Panel's Final Report. While focusing on five pillars, across all modes of transportation, several components of the announcement are of particular interest and reflect key transportation policy priorities of the mining industry.

Minister Garneau committed to establish a new data regime to support sound investment decisions by government, and to ensure that data is available to all who operate, oversee, analyze and use the transportation system. With respect to rail freight policy, and with the aim of improving transparency, balance and competition in the rail transportation supply chain, the Minister announced that government will introduce legislation in spring 2017 that will:

- Establish the ability to apply reciprocal penalties between railway companies and their customers in their service level agreements;
- Better define "adequate and suitable service";
- Improve access and timelines for Canadian Transportation Agency decisions; and
- Address the future of the Maximum Revenue Entitlement and extended interswitching.

MAC is encouraged by the government's bold commitments to address issues in the transportation and rail networks. We also recognize that important steps remain to ensure that the measures are developed, enacted and implemented in such a way that they achieve their intended effect.

With respect to the proposed data regime, MAC encourages the government to be thorough in this pursuit, and ensure that both railway performance and capacity data are included for public disclosure in any regime that is established. With respect to suitable and adequate service, MAC strongly recommends that elements of service that railways should provide to shippers be included in any expanded definition. To do so would clarify what shippers can expect for the rates they pay, make interpretations of the relevant sections of the *Canada Transportation Act* clearer for arbitrators in Agency proceedings, and create a more balanced relationship between shippers and railways. MAC will remain a constructive partner as government seeks to implement these measures.

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* (2015), trucks carried nearly $211 billion in Canadian exports in 2015, 11% of which ($23.2 billion) were mining-related products. Trucks carried $298 billion in imports to Canada, 9% of which ($28 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 2015, 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 4.2 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 2015 *Traffic Report*, prepared jointly by the Seaway's management and development corporations, shipments of iron ore, coke and coal represented 30% of total seaway traffic in 2015, with iron ore accounting for the single largest share of any commodity shipped. Total mining products accounted for 43% of total volume.

Steelmaking coal accounted for 27% of the total volume handled at the Port of Vancouver in 2015, which moves shipments to China, Japan and other Asian markets. Fertilizer/potash represents another 10% of the port's volume, and minerals and ores another 10%. All told, mining products account for 66 million metric tonnes, or nearly 71% 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* (2015), Canada transported $167.8 billion in industrial exports by ship to non-US countries in 2015. Of that, base metals ($16.2 billion), metallic ores ($9.3 billion), and non-metallic minerals, coal and stone ($6.8 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 oil 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. ■

FIGURE 7

VALUE OF CANADIAN MINERAL PRODUCTION, 1999-2015[P]

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$ billions	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015[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	22.5
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	17.2
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
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**

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 8

CANADA'S TOP TEN METALLIC AND NON-METALLIC MINERAL PRODUCTS, BY VALUE OF PRODUCTION, 2005 AND 2015[P]

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	Unit of Measure	2005		2015[P]	
		Quantity ($ millions)	$ Value ($ millions)	Quantity ($ millions)	$ Value ($ millions)
Gold	000 kg	120	2,072	153	7,294
Potash (K_2O)[1]	kt	10,140	2,437	11,350	6,661
Copper	000 t	577	2,572	684	4,493
Iron Ore	kt	30,387	2,339	45,954	2,798
Nickel	000 t	193	3,510	226	3,594
Coal	kt	67,551	2,968	61,700	3,111
Diamonds	000 ct	12,314	1,762	11,600	2,133
Sand and gravel	kt	243,440	1,180	239,164	2,056
Cement[2]	kt	14,656	1,661	12,480	1,773
Stone	kt	141,275	1,215	165,091	1,690

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 9

PRODUCTION OF SYNTHETIC CRUDE OIL BY OIL SANDS MINING PLANTS, ALBERTA AND CANADA, BY QUANTITY AND VALUE, 1998-2015

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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
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

Sources: Natural Resources Canada; Statistics Canada.

FIGURE 10
NON-FERROUS SMELTERS AND REFINERIES IN CANADA, 2015

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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

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
Aleris International, Inc.	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
Thompson Creek Mining Limited/Sojitz Moly Resources Inc. (Endako)	Endako	(Pl.)	Fraser Lake	Mo trioxide
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 11

CANADIAN PRODUCTION OF SELECTED REFINED METALS, 2004-2015[P]

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Metals	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015[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
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
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
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
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
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
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

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

FIGURE 12

CRUDE MINERALS AND PROCESSED MINERAL PRODUCTS TRANSPORTED BY CANADIAN RAILWAYS, 2004-2015[P]

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(million tonnes)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015[P]
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
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
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
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**
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

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 OF 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 a marked decline in proven and probable Canadian mineral reserves in all major base metals (*see Figure 13* and *Annex 6*). Since 1980, the most dramatic decline has been in lead (99%), zinc (87%) and silver (84%) reserves, while copper (33%) 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, on the other hand, has ebbed downward, with current levels suggesting continued decline.

The recent bumps in proven and probable gold, silver, zinc and copper reserves correlate to increases in targeted exploration for these metals when their prices were higher. While improvement in reserve levels of certain metals is a welcome change, it is unlikely to signal the start of a longer-term trend that would broaden to include a greater variety of metals and minerals. Recent commodity price declines, and the corresponding difficulties faced by junior exploration companies in raising capital to finance their operations, indicate that concern will continue over the depletion of reserves for the majority of Canada's deposits.

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 geosciences 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 14 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 (*see Figure 15*). This suggests that the bottom of the recent downturn has been reached, and global demand for mining products is once again on the rise.

COMMODITY-SPECIFIC PRICE TRENDS

Gold. Gold prices started 2016 higher in the wake of the Chinese stock market rout and the ripple effects it caused in European and US markets, and continued to rise. From a recent monthly low of US$1,070 per ounce in December 2015, the yellow metal has risen steadily to an eight-month high of US$1,340 per ounce in August, before settling to US$1,299 per ounce in November 2016.

Nickel. After hitting a 13-year monthly low in February 2016 of US$3.77 per pound, nickel seems to have turned a corner. Nickel climbed to a nine-month high of US$4.72 per pound in November 2016.

Zinc. After hitting a six-year low of US$0.69 per pound in January 2016, zinc has steadily increased in value since, reaching a 10-month high of US$1.11 per pound in November 2016. This price point returns zinc to pre-downturn levels of August 2014.

Steelmaking coal. Up from a contract price of $80 per tonne seen earlier this year, spot market prices spiked above $300 per tonne in November 2016. These price gains were born out of a decision by the Chinese government to reduce the number of allowable working days at domestic coal mines to 276 per year from 330 as part of Beijing's supply rationalization strategy. Looking forward, steelmaking coal prices are forecast to average $125 per tonne in 2016, $140 per tonne in 2017, and $120 per tonne in 2018, according to Scotiabank.

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. 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 August 31, 2016, 230 of the firms listed on the TSX are mining companies. Together, they have a combined market value of $273.6 billion and account for $5.9 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 August 31, 2016, the 990 mining companies listed on the TSX-V have a combined quoted market value of $18.1 billion and raised $1.5 billion in equity capital year-to-date.

Junior mining companies are currently facing challenges in raising capital, which is further discussed below.

TSX-LISTED MINING COMPANIES (AUGUST 2016)

On the TSX: 1,220

- **Senior TSX companies:** 230
- **TSX-V companies:** 990

Global Financing

The global mining industry raised $19.8 billion in equity in 2015, up from the year prior. As *Figure 16* shows, while this level of equity is substantially lower than during peak levels of the super-cycle, it nevertheless represents a six-fold increase over the $3.1 billion raised in 2000. In 2015, 53% of all global mining equity financings were done on the two exchanges, comprising 34% 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 2015 ($6.8 billion) shrunk year-over-year to levels not seen since the financial crisis.

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 2016, TSX and TSX-V companies were involved in 6,307 mineral projects worldwide (*see Figure 17*), with more than half of them in Canada and the rest elsewhere. 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.

BREAKDOWN OF TSX AND TSX-V MINING PROJECTS BY LOCATION

Canada: 53% (3,355 projects)

Latin America: 18% (1,134 projects)

United States: 12% (739 projects)

Africa: 8% (493 projects)

Asia: 3% (221 projects)

Australia: 3% (168 projects)

UK and Europe: 3% (168 projects)

Sources: InfoMine, TSX/TSX-V Market Intelligence Group

As the world's largest exchange for financing mineral exploration, the year-over-year increase in TSX and TSX-V issuer projects is an indicator that some ground has been gained despite the challenges facing both the global and Canadian exploration industries. From December 2015 to January 2016, the number of funded mineral projects for listed companies on the TSX and TSX-V increased by 550, or 12% (*see Figure 17*). While positive, this increase is really a recovery from 2014, which saw Canada suffer the single largest drop (1,159 projects) relative to other jurisdictions competing for exploration investment. While Canada remains the single largest destination of funds raised on the TSX, the sharpness of the decline suggests that competition for a shrinking global pool of exploration investment is fierce.

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 – including smelting, refining and manufacturing – will diminish over time, and national and regional economies that benefit from strength in these 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, 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 2015, exploration spending fell for the fourth consecutive year, by 15% to $1.7 billion, breaking the low experienced during the financial crisis in 2009 (*see Figure 18*). From the all-time high of $4.2 billion in 2011, this marks a 60% drop. Spending intentions for 2016 anticipate that investment levels will drop by 18% to $1.4 billion for the year, which would be the lowest level in more than a decade. Actual spending may exceed these intentions, however, in light of improved price performance across a number of commodities over the course of 2016.

Another major issue is the persistent challenges faced by junior mining companies in raising capital. Research by the Prospectors & Developers Association of Canada indicates that total mining-related equity financing activity across all

exchanges fell globally by 20% annually between 2007 and 2014, an absolute decline of 80% over that period (*see Figure 19*). Financing for mineral exploration specifically has fallen even more dramatically. In Q4 2014, only $170 million was raised for mineral exploration on all exchanges, down from a high of $4.5 billion in Q4 2007. The downturn in exploration financing has, not surprisingly, led to steep declines in exploration budgets. SNL Metals & Mining recently calculated that the minerals and metals industry's total budget for non-ferrous metals exploration was US$9.5 billion in 2015, down 20% over 2014 levels and less than half of the record high of $20.5 billion in 2012.

The downturn in financing has been particularly challenging for exploration companies. Financing designated specifically for exploration (raised on Canadian exchanges) fell by 98% from Q4 2007 to Q4 2014. Not surprisingly, working capital has fallen dramatically for companies listed on the TSX-V. According to SNL data (for companies that reported working capital), 231 companies had less than $200,000 in working capital in 2014, and 195 companies had negative figures for the same period.

As a consequence of these financing challenges, exploration's share of the pie has shrunk relative to deposit appraisal, indicating a shift towards defining known deposits and away from the discovery of new ones. Until recently, exploration has historically occupied a larger share of total spending. Spending intentions for 2016 indicate the continued reversal of this trend. As *Figure 20* shows, exploration accounted for 35% of total exploration budgets and deposit appraisal 65%.

Photo: Agnico Eagle Mines Limited, Meliadine Gold Project, Nunavut

For context, the inverse allocation of funding was in place as recently as 2006, with exploration accounting for 65% of funding and deposit appraisal 35%.

Allocation of Investment by Minerals and Metals

Precious metals attracted the lion's share of Canadian exploration spending again in 2015, accounting for 45% overall (*see Figure 21*). Over the last few years, however, the amount allocated to precious metals exploration has dropped significantly, reflecting the broader trend. For example, spending intentions for precious metal exploration in 2011 exceeded $1.8 billion. In 2015, spending intentions were $776 million, representing an absolute drop exceeding $1 billion over five years. This is largely due to significant price fluctuations for gold over the time period, and persisting concerns over global economic growth, as discussed in Section 1 of this report. Noteworthy, however, is the recent strong performance of gold, and the possibility that exploration investment in the search of the yellow metal may increase as a result.

Base metal exploration's share of total investment edged downward year-over-year, slipping to 19% in 2015. When compared to other metals, however, the rate at which investment in base metal exploration has increased over the last decade has not kept pace. For example, investments in uranium and coal have experienced two-fold increases, whereas base metal investment has experienced a modest 10% bump over the last decade. This trend reflects the depletion of Canadian base metal reserves, and the replenishment of reserves 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. Also noteworthy is a significant drop in diamond exploration – by more than half – 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, accounting for 14% of global non-ferrous exploration budgets in 2015 (*see Figure 22*).

Based on data from nearly 3,500 companies, SNL Metals & Mining determined that worldwide exploration investment in 2015 fell to US$8.7 billion for non-ferrous metals. This is a 19% decrease year-over-year, and a near 60% 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, and would have increased the 2015 total by an estimated US$939 million. In 2014, all jurisdictions globally saw exploration budget declines. Canada experienced a 19% decrease in allocations over 2014, marking the fourth year in a row that Canada's allocations have decreased.

When factoring in exploration budgets for 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 in 2015. 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, combined with the Fraser Institute's lower rankings for many Canadian jurisdictions, should sound a warning for Canadian policy makers: all may not be well for Canadian exploration.

CANADA'S ROLE IN GLOBAL EXPLORATION SPENDING IN 2014

- Canadian exploration and mining companies have assets abroad worth more than $170 billion in over 100 countries.
- At 32%, Canadian-headquartered mining and exploration companies accounted for the largest portion of worldwide non-ferrous exploration budgets in 2015.

Sources: SNL Metals & Mining, Natural Resources Canada

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 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.

This gap is slowly closing, however, as a strong cohort of Canadian projects, from the start of a pre-feasibility study to a production commitment, are in the pipeline. More than 100 advanced-stage exploration projects have been identified over the period of 2011 to 2014. These and other projects contribute to the $145 billion in potential mining investment Canada could see over the next five to ten years if the right domestic investment and regulatory environments are in place.

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 opens up new regions for development. The ongoing extension of the Highway 37 transmission line in northeastern British Columbia is a good example of 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 would improve future prospects for the development of gold, diamond and copper projects in the surrounding region. Most recently, the federal government announced a transformative infrastructure plan, which 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 2015, capital spending in the Canadian mining industry accounted for nearly 6% of Canada's total at $14.4 billion. This number was down 4% from the previous year, and the fourth consecutive year that capital spending has fallen (*see Figure 23*). For 2016, capital investment is projected at $13.8 billion, partially reflecting apprehension over the state of global economic growth.

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 23*.

These data lag behind capital expenditure data by one year. However, adding 2014 repair costs (about $3.9 billion) to 2015 capital ($14.4 billion) and exploration ($1.7 billion) spending produces roughly $20 billion in Canadian mineral development investment in 2015.

Figure 23 also shows capital investment in the oil sands, where spending was $22.4 billion in 2015 and is projected to fall to $17 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 at the time of writing.

Current and Future Investments

Saskatchewan produces one-third of the world's potash, drawing on mines that are over 40 years old. Several new projects, however, have either just come online, are in development or have been identified for future development. Significant new investment by Mosaic at Esterhazy K3 mine ($1.7 billion), K+S Potash Canada ($4.3 billion) and PotashCorp Rocanville at the new Scissors Creek shaft ($3 billion) are progressing. Other projects that may advance, subject to market conditions, are Vale Potash Canada's $3.5 billion Kronau Project and BHP Billiton's Jansen mine.

In northern Saskatchewan, Cameco's Cigar Lake mine began production in 2014 and has the world's second-largest high-grade uranium deposit, with grades 100 times the world average. The mine has proven and probable reserves of more than 216 million pounds of U_3O_8, at an average grade of 18.3%. The mine is expected to reach its full production rate of 18 million pounds by 2018. Despite recent downward pressure on prices, the long-term fundamentals for uranium are strong, especially as uranium is the source for carbon-free nuclear energy.

There is still potential in the Canadian diamonds sector, despite the decline in exploration spending in recent years. Stornoway's Renard Diamond Project, located near Monts Otish in north-central Quebec, officially opened in October 2016, becoming Quebec's first diamond mine. As well, the Northwest Territory's newest mine, De Beers' Gahcho Kué diamond mine, also officially opened in September 2016. Encouraging too is the Kennady North Diamond Project in the Northwest Territories, which recently announced a positive valuation, suggesting a population of high-value gem-quality white diamonds. Further valuations and feasibility are needed to assess the project.

Other recent mine openings in Canada include Goldcorp's Éléonore gold mine in the James Bay region of Quebec, Vale's Totten Mine in Ontario, and Baffinland's Mary River Project in Nunavut. The Totten Mine began operating in February 2014, and should produce 2,200 tonnes per day of copper, nickel and precious metals for 20 years once full production is reached, which is expected in 2016. The Éléonore mine, which opened in 2015, produced 268,100 ounces of gold per day over the balance of the year. The Mary River Project, one of the world's richest and largest iron ore deposits, contains roughly 365 million metric tonnes of high-grade ore. The ore can be shipped directly without the processing that produces tailings. Looking forward, New Gold's Rainy River project is expected to start production in mid-2017.

Altogether, an estimated $145 billion worth of mining-related projects have been proposed for Canada in the coming years (*see Annex 7*), and will proceed subject to market and regulatory conditions, demand, and Canada's relative attractiveness as a destination for mineral investment. Billions of dollars in these proposed projects are slated for British Columbia, Alberta, Saskatchewan, Ontario, Quebec, Newfoundland and Labrador, Nunavut and the Northwest Territories. Of particular note is the high interest in northern Canada. Several gold and iron ore projects are proposed for Nunavut, and gold, diamond and rare earth projects are in the works for the Northwest Territories. ■

FIGURE 13
CANADIAN RESERVES OF SELECTED METALS, 1980 - 2013[P]

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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[r]	10,364	2,617	126	4,163	256	5,598	2,148
2013[P]	11,198	2,673	116	3,532	145	5,212	2,158

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 14
METAL PRICES, 2001-2016

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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
2016 (Sept)	$72.12	$2.14	$1,326.03	$56.67	$4.62	$1,928.50	$23.00	$1.04
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	$61.57	$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: Natural Resources Canada.
[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
MONTHLY METAL PRICES - 2016

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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-16	$67.11	$1,097.38	$14.02	$2.02	$3.85	$0.69	$41.25	$34.70
Feb-16	$69.65	$1,199.91	$15.07	$2.08	$3.77	$0.78	$46.18	$32.15
Mar-16	$69.43	$1,246.34	$15.42	$2.24	$3.95	$0.82	$55.52	$28.70
Apr-16	$70.96	$1,242.26	$16.26	$2.20	$4.02	$0.84	$59.58	$27.50
May-16	$70.59	$1,259.40	$16.89	$2.14	$3.94	$0.85	$54.85	$27.25
Jun-16	$72.22	$1,276.41	$17.18	$2.10	$4.04	$0.92	$51.36	$26.70
Jul-16	$73.93	$1,337.33	$19.93	$2.20	$4.65	$0.99	$56.57	$25.45
Aug-16	$74.46	$1,341.09	$19.64	$2.16	$4.70	$1.04	$60.47	$25.25
Sep-16	$72.12	$1,326.03	$19.29	$2.14	$4.62	$1.04	$56.67	$23.00
Oct-16	$75.48	$1,266.57	$17.74	$2.15	$4.66	$1.05	-	$18.75
Nov-16	$78.08	$1,299.00	$18.29	$2.22	$4.72	$1.11	-	-
% Change-to-date	16%	18%	28%	11%	23%	60%	37%	-45%

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 16
MINING EQUITY RAISED - ROLE OF TORONTO STOCK EXCHANGE, 2000–2015

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(US$ billions)

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

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

FIGURE 17

GEOGRAPHIC REACH OF TSX-LISTED COMPANIES, JANUARY 2016

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Location of Mineral Projects	Number	YOY Absolute Change	Percent
Canada	3,355	203	53
Latin America	1,134	88	18
United States	739	80	12
Africa	493	75	8
Asia/Russia/Middle East	221	31	3
Australia	197	62	3
United Kingdom and Europe	168	15	3
Total	**6,307**	**554**	**100**

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

FIGURE 18

MINERAL EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, BY PROVINCE AND TERRITORY, 2006 - 2016[i]

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($ millions) Province/Territory	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015[P]	2016[i]	% Change from 2015 to 2016
Newfoundland and Labrador	100.8	148.0	146.7	54.9	105.2	156.8	199.9	117.2	80.7	47.5	19.6	-58.78%
Nova Scotia	11.0	23.5	21.4	9.0	16.7	13.7	14.6	12.3	7.0	9.6	5.7	-40.23%
New Brunswick	13.4	35.8	32.7	8.1	17.1	27.1	28.0	27.6	29.0	8.2	11.7	42.36%
Quebec	295.1	476.4	526.1	379.3	511.6	833.9	620.7	381.8	317.4	220.1	218.6	-0.69%
Ontario	346.5	571.7	799.3	536.2	853.4	1,067.7	961.5	562.0	468.1	393.3	351.3	-10.68%
Manitoba	52.9	102.6	152.1	97.8	83.5	140.0	105.6	61.4	28.0	35.2	43.9	24.55%
Saskatchewan	235.6	314.0	430.7	311.0	299.4	334.6	411.1	221.7	245.2	258.1	229.9	-10.90%
Alberta	18.7	11.8	20.8	8.3	15.2	47.3	35.2	38.9	26.1	17.4	25.6	47.09%
British Columbia	344.2	470.6	435.4	217.1	374.4	645.1	734.1	493.0	448.9	331.1	228.7	-30.91%
Yukon	106.4	144.7	134.0	90.9	156.9	331.7	233.2	100.6	107.1	73.3	56.4	-23.01%
Northwest Territories	176.2	193.7	147.7	44.1	81.7	93.8	108.7	77.9	101.7	100.2	99.3	-0.91%
Nunavut	210.6	338.0	432.6	187.6	256.7	535.7	422.5	257.6	158.0	215.1	109.9	-48.89%
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**	**1,709.2**	**1,400.8**	**-18.04%**

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 19

FINANCING FOR "EXPLORATION" BY ISSUERS LISTED ON CANADIAN EXCHANGES (TSX, TSXV AND CSE), 2007-2014

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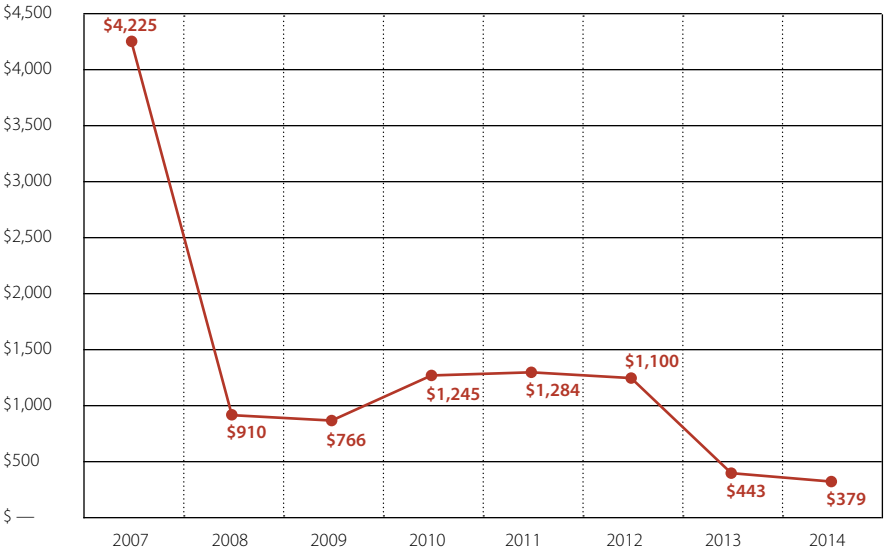

Year	Amount
2007	$4,225,353,386
2008	$909,640,007
2009	$766,141,477
2010	$1,244,593,926
2011	$1,284,488,991
2012	$1,187,792,700
2013	$443,304,071
2014	$378,892,840

Source: Prospectors and Developers Association of Canada

FIGURE 20

MINERAL EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, BY COMPANY TYPE, 2006 - 2016[i]

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Type of Company	2006	%	2007	%	2008	%	2009	%	2010	%
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
Senior	673.5	35.2	926.5	32.7	1,161.7	35.4	833.7	42.9	1,224.9	44.2
Total	**1,911.5**		**2,830.8**		**3,279.5**		**1,944.4**		**2,771.9**	

Type of Company	2011	%	2012	%	2013	%	2014	%	2015[p]	%	2016[i]	%
Junior	2,049.1	48.5	1,847.0	47.7	963.6	41.0	814.3	40.4	572.9	33.5	496.5	35.4
Senior	2,178.3	51.5	2,028.1	52.3	1,388.4	59.0	1,203.2	59.6	1,136.2	66.5	904.3	64.6
Total	**4,227.4**		**3,875.1**		**2,352.0**		**2,017.4**		**1,709.2**		**1,400.8**	

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 21

MINERAL EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, BY TARGET, 2005 AND 2015[p]

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	2005		2015[p]	
	$ millions	% of Total	$ millions	% of Total
Precious metals	535.6	41.0	776.2	45.4
Base metals	303.6	23.3	330.5	19.3
Uranium	91.2	7.0	168.9	9.9
Coal	41.9	3.2	90.3	5.3
Non-metals (excluding diamonds)	17.4	1.3	127.1	7.4
Other metals	50.3	3.9	69.2	4.0
Diamonds	239.6	18.4	118.2	6.9
Iron ore	25.3	1.9	28.8	1.7
Total	**1,304.8**	**100.0**	**1,709.2**	**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 22

TOP COUNTRIES/REGIONS BY NON-FERROUS EXPLORATION BUDGETS, 2015

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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 23

CAPITAL EXPENDITURES IN THE CANADIAN MINING INDUSTRY, 2008 - 2016[i]

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($ millions)	2008	2009	2010	2011	2012	2013	2014	2015[P]	2016[i]
Stage 1 - Total Mineral Extraction	7,349	6,194	9,054	12,163	16,916	15,086	11,115	9,557	9,323
Metal ore mineral extraction	4,373	3,537	5,504	8,108	11,020	9,174	5,298	4,754	5,598
Non-metallic mineral extraction	2,248	2,297	2,853	3,083	4,812	5,243	5,433	4,596	3,532
Coal mining	728	361	697	972	1,085	668	384	207	193
Stage 2 - Primary Metal Manufacturing	1,629	948	1,823	2,936	3,864	3,458	3,332	3,209	2,555
Stage 3 - Non-Metallic Mineral Product Manufacturing	691	581	765	672	572	459	976	917	1,299
Stage 4 - Fabricated Metal Product Manufacturing	734	750	608	729	536	574	640	763	686
Total Mining and Mineral Processing	10,403	8,473	12,250	16,500	21,888	19,577	16,062	14,446	13,863
Non-conventional oil extraction (oil sands)	20,619	10,249	17,113	22,163	26,246	29,029	35,711	22,494	16,986

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.

— SECTION 4 —

THE PEOPLE: EMPLOYMENT, COSTS AND INNOVATION

THE CANADIAN MINING INDUSTRY ACCOUNTS FOR ONE IN EVERY 48 JOBS ACROSS THE CANADIAN ECONOMY AND, PROPORTIONALLY, IS THE LARGEST EMPLOYER OF ABORIGINAL CANADIANS.

MINING INDUSTRY EMPLOYMENT

According to Statistics Canada data, the mining industry directly employed 373,435 people in 2015, accounting for roughly one in every 48 Canadian jobs (*see Figure 24*). When indirect jobs are included, the industry's employment reach increases significantly. According to Natural Resources Canada, the mining industry indirectly employed an additional 189,657 individuals in 2015. Together, the industry's direct and indirect employment exceeds 560,000 jobs.

Overall Employment Numbers

In 2015, 60,565 (16%) of those directly employed in mining worked in Stage 1, mineral extraction (*see Figure 24*). This includes approximately 36,000 workers in metal mining, 18,000 workers in non-metal mining and 6,100 workers in coal mining (*see Figure 25*). While the overall number of people employed in Stage 1 increased slightly year-over-year, employment in mining and quarrying has increased by more than 19% since 2007.

Since 2007, the number of Stage 2 jobs in primary metal manufacturing, also known as smelting and refining, has decreased by 13% (*see Figure 24*). This decrease, however, has not been uniform. Stage 2 employment experienced a significant drop during the economic downturn, rebounded in 2011 and 2012, and tapered off over the last few years. Factors influencing this fluctuation include demand cycles, whether facilities are running at full capacity, technological advancements, the aging and closure of Canadian facilities, and more foreign competition for feedstock to process.

Overall, total direct mining employment fell slightly year-over-year by approximately 1%. Looking back, employment has fluctuated in accordance with market activity. In 2007, peak industry direct employment exceeded 400,000 at the height of the super-cycle, and then fell by nearly 13% during the downturn to 350,000 jobs. Direct employment has since returned to the mean of these extremes.

In the oil sands extraction sector (not shown in *Figure 24* or *Figure 25*), recent data show that Suncor, Syncrude and Shell directly employ approximately 14,000, 5,000 and 3,000 people, respectively, in mining and oil and gas activities. These figures do not include indirect employees, which number in the thousands. Other operating 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 189,657 INDIVIDUALS IN 2015, BRINGING TOTAL EMPLOYMENT TO 560,000 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.

As noted in Section 1 of this report, more than 3,700 companies in Canada supply goods and services to the mining industry, adding many more indirect jobs. According to Natural Resources Canada, the mining industry indirectly employed an additional 189,657 individuals in 2015, amplifying the indirect and induced economic drivers the industry enables from coast to coast to coast.

Women in Mining

A 2015 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 26*). 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 research demonstrates 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 in moving into certain trades at the educational level. 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. Last year, Status of Women Canada announced $495,000 in support of a new project, Addressing Systemic Barriers for Gender Equity in Mining. The project aims to identify and work to mitigate the systemic barriers to women's participation and advancement in the mining industry in Canada.

Now underway, 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 (6%) roughly doubles that of Aboriginal workers in the Canadian workforce (3%), and exceeds the proportion of Aboriginal people in the Canadian population (*see Figure 26*). 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.

THE PROPORTION OF ABORIGINAL WORKERS IN THE MINING INDUSTRY IS ROUGHLY DOUBLE THAT OF ABORIGINAL WORKERS IN THE CANADIAN WORKFORCE.

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 in the mining industry. Furthermore, approximately half of all Aboriginal people are under the age of 25. By 2017, the number of Aboriginal men and women aged 20 to 29 is expected to increase by more than 40% – four times more than the growth rate for the same age group in the general population.

Photo: Agnico Eagle Mines Limited, Meadowbank Mine, Nunavut

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 suitable and adequate 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 2015 report, *Canadian Mining Industry Employment, Hiring Requirements and Available Talent*, estimates that the Canadian mining industry will need to hire 106,000 new workers over the next decade to 2025. These new hires are required to replace retirees and fill new positions to meet baseline production targets (*see Figure 27*). In its report, MiHR also forecasts contractionary and expansionary hiring scenarios. Notably, even in a contractionary scenario, the hiring forecast sees job growth beyond 2015 employment levels (*see Figure 28*).

This workforce shortage is compounded by the wave of the industry's skilled core of workers who are retiring. By 2025, MiHR forecasts more than 51,000 employees will retire from the sector, which represents over 25% of the industry's current workforce. 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 turn-over 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 in the high-demand jobs within mining. In addition, companies need to ensure that new employees have the opportunity to learn from more 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 youth, Aboriginal peoples 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; and**
- **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. Measures from Budget 2016 include 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 indicated would be reviewed in 2017. MAC supports an expansion of this program, which has proved to be a valuable source of funding for Aboriginal skills training initiatives.

On the immigration front, the government has announced a 7% increase (300,000) in its target for permanent resident admissions. As well, the government's proposed Global Skills Strategy commits to helping businesses address their staffing challenges by reducing barriers to labour mobility. The strategy proposes establishing a two-week standard for processing visas and work permits for low-risk, high-skilled talent.

In addition to the funding from Status of Women Canada mentioned above, in 2014, Employment and Social Development Canada provided $3.5 million to MiHR to enhance its Labour Market Information program, which tracks the industry's hiring needs. Budget 2016 included further commitments to ensure that employers have the information they need to make informed decisions. Ensuring that MiHR can continue to inform the mining industry's hiring practices is essential to supporting the industry's employment and skills needs.

Furthermore, this support makes possible crucial research, such as MiHR's recent report, *Strengthening Mining's Talent Alloy*. The report explores diversity and inclusion in the mining industry and how the industry can improve its ability to expand and grow diversity in its hiring practices, ultimately making mining jobs more accessible.

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 planning. (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.

MAC MEMBERS WIN 2015 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.

Canada Trophy for Select Mines

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

Vale's Voisey's Bay Mine is located in a remote area on the northeastern coast of Labrador, on a peninsula bordered by Anaktalak Bay and Voisey's Bay to the south. 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. With such a committed organizational culture at the forefront, 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, northern 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 coastal community of 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.

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 the 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 Annex 8* and *Annex 9* for details).

The average annual pay for a mining worker in 2015 exceeded $115,000, which surpassed the average annual earnings of workers in forestry, manufacturing, finance and construction by a range of $32,000 to $43,000.

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.

Overall Production Costs

Mining operations incur significant production costs. To put them into perspective, Leighton Holdings noted in recent years that a single mining truck tire on the spot market costs more than a Porsche.

The industry's three main production costs – wages, energy (fuel and electricity), and materials and supplies – totalled $4.9 billion, $3.3 billion and $7.7 billion, respectively, in 2014, the most recent year for which data are available (*see Figure 29*). Together, these figures constitute a 3% increase in the cost of mining in Canada year-over-year.

Wages accounted for 13% of the industry's total 2014 production value, while energy accounted for 9%, and materials and supplies represented 20% 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: 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 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. MAC 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, MAC 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 has helped the government achieve its stated economic and Indigenous reconciliation goals in these regions. For this reason, MAC strongly supports the government's nation-building infrastructure plan announced in the 2016 Fall Economic Statement. The plan commits an additional $81 billion through to 2027/28, including the creation of the Canada Infrastructure Bank (CIB). The CIB, an arm's-length organization dedicated to increasing investment in growth-oriented infrastructure, will be responsible for investing at least $35 billion from the federal government into large infrastructure projects that contribute to economic growth through loans, loan guarantees and equity investments.

The plan represents a paradigm shift in the way that trade-enabling infrastructure can be funded in Canada, and establishes a way to address the unique infrastructure challenges of remote and northern regions – a key priority for the mining industry.

While the proposed CIB is well capitalized and bold in vision, attention now turns to the institution's design and implementation. MAC recommends that decision makers look to an existing successful model – the Alaska Industrial Development and Export Authority.

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

In 2013, the most recent year for which data are available, Canadian mining and metals companies invested $677 million in R&D (*see Figure 30*). Mining's investment surpassed that of the machinery sector, the pharmaceutical sector, and the wood products and paper sector. In the same year, the industry employed 4,560 people in R&D (*see Figure 31*). This is more than the pharmaceutical and forestry sectors, which both receive extensive financial and policy support from the government.

The Canada Mining Innovation Council (CMIC), with the active support of MAC and its members, has developed the Towards Zero Waste Mining (TZWM) innovation strategy to fundamentally transform the industry through innovation.

CMIC's TZWM strategy will stimulate mining technology innovation in Canada to achieve zero waste in mining and mineral processing within 10 to 20 years. This will lead to significant reductions in greenhouse gas emissions, water use and tailings discharge, and to significant improvements in energy efficiency, environmental protection and operational productivity.

The various stages of mining present different types of challenges, and therefore require distinct programs to work towards solutions. As a result, CMIC's TZWM strategy is focusing on four key areas:

1. Exploration projects

To more effectively explore in covered areas, at greater depths, in increasingly remote and northern regions of the country, and under harsh climatic conditions through:

- Better methods for ore characterization to help design mines focused on minimal waste extraction throughout mine life;
- State-of-the-art detection techniques from other disciplines (e.g., genomics) to enable more effective targeting of buried deposits;
- New software tools and techniques for data fusion and analysis;
- Refined and better integrated exploration techniques for identifying ore deposit environments under the cover of glacial till that covers much of Canada; and
- New tools and techniques for understanding the secondary migration of key indicator elements and minerals redistributed from buried deposits into the overlying surficial cover.

2. Underground mining projects

To improve productivity and reduce environmental footprint and energy use by:

- Moving to electric vehicles to reduce or eliminate diesel underground;
- Refining the process of separating ore from waste rock to reduce mine tailings and energy use; and
- Improving transportation methods for moving ore and waste rock to reduce emissions and improve energy use.

3. Energy/processing projects

To reduce energy use during the crushing and grinding of rock before it can be processed by:

- Replacing current grinding mill technology; and
- Developing new and innovative ways to process tailings.

4. Environmental stewardship projects

To reduce the environmental footprint of mining and improve water use by:

- Reducing or eliminating water use in ore processing, and further improving water treatment methods;
- Improving methods for water quality monitoring;
- Developing ways to share baseline water quality data in online, geospatial formats; and
- Improving methods for the management, reclamation and closure of tailings facilities.

MAC welcomes the Government of Canada's commitment to invest $1.2 billion to support innovation in mining and other resource sectors.

The TZWM strategy is directly aligned with the government's innovation, climate change and clean tech priorities. To support the strategy, CMIC is seeking a $50 million investment from the federal government over five years. Each government dollar will be matched by a mix of in-kind and cash contributions from industry.

CMIC is to mining what COSIA is to oil and gas and FPInnovations is to forestry. CMIC incorporates an open innovation business model that comprises all members of the supply chain, including academia, government and other laboratories, startups, small and medium-sized enterprises, Fortune 500 companies, Indigenous-operated businesses, and mining companies, to solve specific, industry-defined challenges through innovation.

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 about the industry. ■

FIGURE 24
EMPLOYMENT IN THE CANADIAN MINING AND MINERAL MANUFACTURING INDUSTRIES, 2007-2015

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Year	Mining and Quarrying	Support Activities for Mining	Non-metallic Mineral Product Manufacturing	Primary Metal Manufacturing	Fabricated Metal Product Manufacturing	Total Mining, Support Activities, and Mineral Processing
2007	50,925	19,515	58,250	81,740	190,680	401,110
2008	54,780	21,850	55,070	82,960	180,030	394,690
2009	48,830	18,810	52,215	66,015	164,250	350,120
2010	52,670	22,350	54,150	70,570	161,075	360,815
2011	56,330	29,985	53,490	78,980	165,465	384,250
2012	58,420	33,395	54,390	68,480	169,570	384,255
2013	56,155	29,460	54,315	72,975	163,610	376,515
2014	60,215	28,800	55,810	71,970	161,480	378,275
2015	60,565	26,265	56,335	71,460	158,810	373,435

Source: Statistics Canada, CANSIM Table 383-0031.

FIGURE 25
EMPLOYMENT IN THE MINERAL EXTRACTION STAGE, 2007-2015

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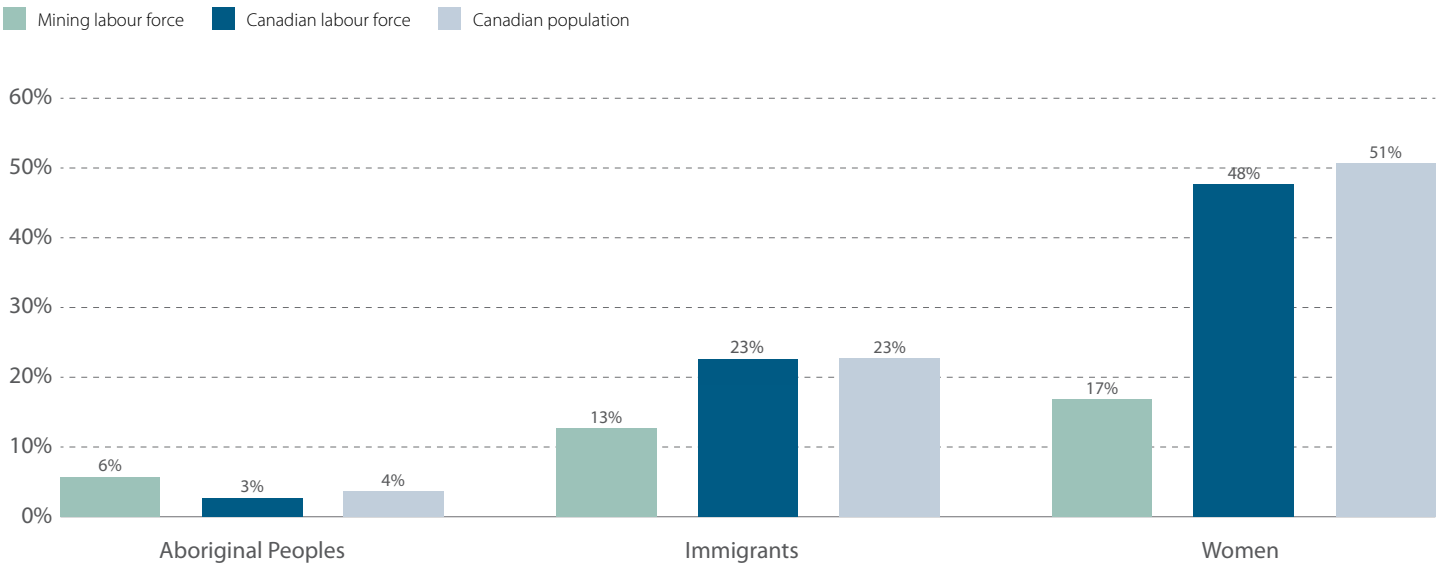
Year	Metal	Non-metal	Coal	Total
2007	27,020	18,970	4,935	50,925
2008	28,480	20,985	5,315	54,780
2009	23,955	19,360	5,515	48,830
2010	25,520	20,825	6,325	52,670
2011	28,220	21,615	6,495	56,330
2012	31,005	20,890	6,525	58,420
2013	31,720	18,325	6,110	56,155
2014	35,855	17,730	6,630	60,215
2015	36,390	17,990	6,185	60,565

Source: Statistics Canada, CANSIM Table 383-0031.

FIGURE 26
DIVERSITY IN CANADA'S MINING LABOUR FORCE, 2011

Return to text



Sources: Mining Industry Human Resources Council; Statistics Canada.

FIGURE 27
CANADIAN MINING INDUSTRY EMPLOYMENT AND HIRING FORECAST SCENARIOS, 2016-2025

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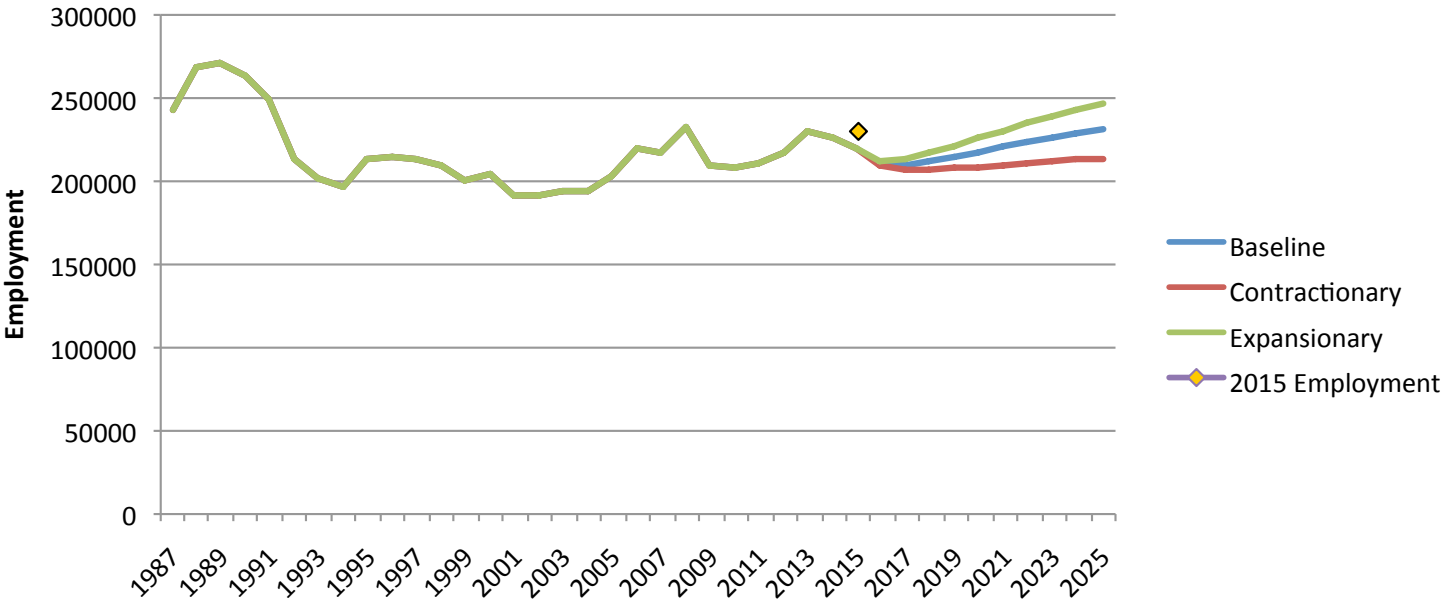
Year	Net Change in Employment	Retirement	Non-Retirement Separation	Cumulative Hiring Requirements
Contractionary	-6,330	48,600	41,830	84,110
Baseline	11,640	51,030	43,800	106,490
Expansionary	27,740	53,260	45,600	126,590

Sources: Mining Industry Human Resources Council; Canadian Mining Industry Employment, Hiring Requirements and Available Talent 10-year Outlook, 2015.

FIGURE 28

CANADIAN MINING INDUSTRY FORECAST HIRING SCENARIOS, 2015-2025

Return to text



Source: Mining Industry Human Resrouces Council.

FIGURE 29
SELECTED COSTS OF PRODUCTION IN THE MINERAL INDUSTRY [1], 2014

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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	72	2,943,988	1,883,079	5,232,716	22,829,256
Non-metallic Mining and Quarrying	1,120	1,405,468	935,120	1,772,276	12,253,574
Coal	21	504,051	456,083	717,020	3,341,651
Total mineral industry	**1,307**	**4,853,507**	**3,274,282**	**7,722,012**	**38,424,480**

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.

FIGURE 30
R&D EXPENDITURES BY MINING AND SELECTED INDUSTRIES, 2013[P]

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($ millions)	2013[P]
Industry	
Mining and related support activities	191
Primary metals–ferrous	30
Primary metals–non-ferrous	208
Fabricated metal products	188
Non-metallic mineral products	60
Total	**677**
Other sectors:	
Oil and gas extraction	1,393
Motor vehicles and parts	F
Wood products and paper	212
Machinery	556
Aerospace products and parts	1,573
Pharmaceutical and medicine	403
Total manufacturing	**6,753**
Total all industries	**16,032**

Source: Statistics Canada, Catalogue no. 88-202-X.
Note: The projected figures in the Catalogue are revised annually by Statistics Canada and can therefore differ year over year.
F denotes "too unreliable to be published."
[P] Preliminary.

FIGURE 31
NUMBER OF PERSONS ENGAGED IN R&D, 2013[P]

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($ millions)	Professionals	Technicians	Other	Total
Industry				
Mining–extraction	312	166	73	550
Primary metals–ferrous	117	x	x	243
Primary metals–non-ferrous	319	x	x	524
Fabricated metal products	1,331	1,180	230	2,740
Non-metallic mineral products	275	195	32	503
Total	**2,354**	**1,541**	**335**	**4,560**
Other sectors:				
Oil and gas extraction	775	280	235	1,290
Motor vehicles and parts	1,057	581	237	1,875
Wood products and paper	495	505	118	1,116
Machinery	3,552	2,331	478	6,362
Aerospace products and parts	3,535	X	X	7,015
Pharmaceutical and medicine	1,582	1,348	192	3,122
Total manufacturing	**33,703**	**14,709**	**5,167**	**53,570**
Total all industries	**89,165**	**33,551**	**9,615**	**132,331**

Source: Statistics Canada, Catalogue no. 88-202-X.
[P] Preliminary.
X denotes "suppressed to meet the confidentiality requirements of the Statistics Act"

— 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 now 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 32*.

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 November 2015, TSM achieved an important milestone with the Finnish Mining Association's (FinnMin) adoption of TSM for its members' operations in Finland. This was the first time that a mining association outside of Canada officially signed on to the program. Most recently, in October 2016, the Argentinean Chamber of Mining Entrepreneurs (CAEM) adopted TSM. Argentina's adoption of TSM represents a significant step forward in cooperation on responsible mining standards between Canada and a very significant mining jurisdiction in Latin America.

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 23 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.

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

- Tailings management
- Energy use and greenhouse gas emissions management
- Aboriginal and community outreach
- Crisis management planning
- Biodiversity conservation management
- Safety and health

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 2016, 62 facilities reported their 2015 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 2016 *TSM Progress Report*, which is available on the MAC website.

Tailings Management

Tailings impoundments 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 33*). 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 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.

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 Shell's 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 Shell 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.

MAC members started reporting on this protocol in 2012 on an aggregate basis and, in 2013, facility-level reporting on this protocol began. There was notable improvement in results year-over-year. In 2015, 71% of facilities achieved a Level A or higher for biodiversity conservation reporting, compared to 68% in 2013 (*see Figure 34*). While aggregate results indicate improvement across all three indicators year-over-year, it is clear there is still work to be done to improve performance going forward.

IN 2015, 66% OF FACILITIES ACHIEVED A LEVEL A OR HIGHER FOR BIODIVERSITY CONSERVATION REPORTING, COMPARED TO 47% IN 2012.

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.

It is noteworthy that the requirements TSM practitioners must meet to obtain a Level A for the Energy Use and GHG Emissions Management Protocol are greater than those for obtaining ISO 50001 certification.

While ISO is a more broadly recognizable program globally, this comparison may help readers contextualize the extent of the commitment that MAC members undertake in pursuit of energy and GHG management excellence.

In 2013, the protocol was revised, condensing 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.

Historical data from 2006 to 2012 are available in the 2014 *TSM Progress Report*. *Figure 35* shows the 2013, 2014 and 2015 performance for the three indicators.

In 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.

IN 2015, 94% OF FACILITIES REPORTED A LEVEL A OR HIGHER FOR HAVING A COMPREHENSIVE ENERGY USE AND GHG EMISSIONS REPORTING SYSTEM, COMPARED TO 87% IN 2014

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.

Federal Climate Change Policy

In October 2016, the federal government committed to reducing GHG emissions to 17% below 2005 levels by 2020, and to 30% below these levels by 2030. The government also announced its pan-Canadian pricing on carbon pollution regime, which includes policy principles that are broadly consistent with MAC's. The regime sets a pan-Canadian benchmark for carbon pricing, including the implementation of a price on carbon pollution, across all provincial and territorial jurisdictions, which will start at a minimum of $10 per tonne in 2018, and rise by $10 a year to reach $50 per tonne in 2022.

While a significant development, some components of the regime have yet to be determined, including how the government intends to ensure "consistency" across reporting requirements, what role it may play in protecting Emissions Intensive and Trade Exposed (EITE) sectors, and how it will address the unique challenge of climate change in the territories. These elements are important to ensuring that industry can remain competitive while meaningfully reducing GHG emissions. For example, if EITE sectors, like mining, are not protected, carbon leakage will result – shifting production and the associated benefits from countries that are taking action on climate change to those that are not. It is, therefore, critical that the federal government carefully consider the roll out of its climate change plan, including related infrastructure and innovation agenda policies and associated programs over the course of 2017.

Mineral Extraction GHG 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 1.1% of the country's total GHG emissions in 2014 (*see Figure 36*).

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 innovation 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 more reliant on more expensive diesel fuel than their centrally located counterparts. 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 GHG Emissions Profile

About 20% of the oil sands reserves are close enough to the surface to be mined, while about 80% are accessible through in-situ treatment. While mining causes a larger land disturbance, in-situ methods are generally more energy intensive. Studies in recent years have indicated that well-to-wheels GHG emissions from oil sands crude oil average 11% higher than the average crude oil refined in the United States, with oil sands mining in the lower emissions range and in-situ processes in the higher range.

Well-to-wheels emissions include those produced during crude oil extraction, processing, distribution and engine combustion.

Despite the higher GHG emissions per barrel, direct emissions from the oil sands themselves contribute a relatively small amount to global anthropogenic GHG emissions. The most recent estimate of global GHG emissions is for 2010, in which approximately 49 gigatonnes of CO_2 equivalent were emitted. According to Canada's 2014 National Inventory Report, Canada emitted 732 megatonnes of CO_2 equivalent in 2014. Of this, 68 megatonnes came from oil sands activity, accounting for 9.2% of Canada's GHG emissions.

While this is a sizeable contribution to Canada's GHG emissions, Canada is a small contributor to total global emissions, accounting for approximately 1.5%. At approximately 0.1% of total global emissions in 2010, even a drastic decrease in the emissions from the oil sands sector will do relatively little to reduce world GHG emissions in the absence of significant reduction efforts from other countries.

Oil sands production has a track record of continuous improvement in emissions reduction. Between 1990 and 2012, GHG emissions associated with every barrel of oil sands crude produced have been reduced by 28%.

For oil sands mining, GHG emissions reductions have been driven through innovations such as hydrotransport and efficiency improvements in bitumen extraction, upgrading, and natural gas-fired cogeneration for electricity and steam.

CANADA'S OIL SANDS INNOVATION ALLIANCE (COSIA)

COSIA is a good example of industry collaboration on environmental issues. The alliance brings together 13 of the largest companies involved in Canada's oil sands, representing almost 90% of oil sands production, and focuses on performance improvements for four key environmental challenges: tailings, water, land and GHG emissions.

Member companies have agreed to break down some of the barriers of funding, intellectual property and human resources that sometimes impede the discovery and implementation of breakthrough technologies in these areas. COSIA is building and expanding on the progress made in recent years by several industry research and development organizations. By setting clear environmental goals, and working together to achieve real solutions, this new and larger alliance is taking collaboration and sustainable development to the next level.

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.

Mining and Natural Gas

Miners who 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, which is also more expensive (*see Figure 37*).

This places natural gas in a good position to help miners reduce their energy costs and their carbon and other emissions when it is viable to switch.

Stornoway Diamond Corporation's Renard Diamond Project is a recent example of a mining company embracing the natural gas opportunity. In October 2013, the company announced positive results from a feasibility study on the viability of a power plant fuelled by liquefied natural gas. The study demonstrated the substantial benefits of this option, in terms of reduced annual operating costs and environmental emissions, compared to a diesel genset option. Highlights of the study included:

- **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, or 6.6%.**
- **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 Sept-Îles operation. The pilot is expected to mitigate 4,800 tonnes of CO_2 equivalent over 2016 by displacing 4.7 million litres of heavy fuel oil. 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, miners 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 been made towards the development of liquid natural gas engines for heavy vehicles. In 2016, Teck piloted the use of liquefied natural gas (LNG) as a fuel source in six blended LNG/diesel haul trucks at its Fording River steelmaking coal operation in southeastern British Columbia. This was the first such use of LNG at a Canadian mine site and the company continues to explore the use of LNG as an alternative haul truck fuel source to reduce GHG emissions and costs.

Mining and Renewable Energy

Renewable energy technologies and their economics continue to improve. Renewable power is appealing to miners 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, miners are giving the benefits of renewable 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.

A recent International Renewable Energy Agency report noted that the average 2014 LCOE for wind, solar and biomass technologies in North America was $0.07, $0.13 and $0.08 per kilowatt hour, respectively.

While attractive, these average prices do not account for additional capital costs associated with remote development. They also vary based on the quality of the renewable resource. Just as miners need to go where the viable deposits are located, renewable generation is contingent on the strength and reliability of the renewable asset. This restriction prevents renewable 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 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.

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.

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.

COAL'S ROLE IN A SUSTAINABLE SOCIETY

About 770 kilograms of steelmaking coal (metallurgical coal not thermal coal) are required to produce one 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.

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.

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. In 2013, for example, over 22 million Canadians had 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.

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 183 parties, 52 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.

ABORIGINAL RELATIONS AND BENEFIT AGREEMENTS

Mining companies have developed progressive relationships with many Aboriginal communities. Given the proximity of many Aboriginal communities to mining operations, and the large number of Aboriginal youth, there is significant potential to create stronger and mutually beneficial partnerships between Aboriginal Canadians and the mining industry.

Proportionally, the mining industry is the largest private sector employer of Aboriginal people in Canada. This can be partly attributed to the nearness of 1,200 Aboriginal 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. This geographical proximity makes for strong connections, but more can be done to enhance relationships between industry and Aboriginal communities. (See Section 4 of this report for more discussion.)

Over the past decade, the Canadian mining industry has increasingly embraced the signing of impact benefit agreements (IBAs) or other agreements (such as community and impact benefit agreements, community benefit agreements, and community participation agreements) between mining companies and Aboriginal people.

Such agreements have helped mining companies garner local support for their projects, provided a local workforce, and facilitated Aboriginal participation in the mining sector and the benefits that flow from it. While earlier agreements typically contained provisions for employment and training, more recent IBAs promote business opportunities through set-aside contracts and joint ventures. They also consider social and cultural matters, provide for environmental monitoring, set up funding arrangements and dispute resolution mechanisms, and include direct payment and resource-sharing arrangements, among other provisions.

Since the groundbreaking 1974 Strathcona Agreement, Natural Resources Canada estimates that 335 bilateral agreements (IBAs or other agreements at the exploration stage) have been signed for 198 mining projects in Canada, and that 265 of them remain active.

ABORIGINAL PERSPECTIVE ON IMPACT BENEFIT AGREEMENTS

Aboriginal economic development corporations (EDCs) are the economic and business development arm of a First Nations, Métis or Inuit government, and are a major economic driver in Aboriginal communities. The Canadian Council for Aboriginal Business published a survey of 50 EDCs across Canada. Of those surveyed, 32% of respondents stated they had benefited from IBAs through community-negotiated provisions for contracting and subcontracting to local Aboriginal businesses. Participants in the survey noted that IBAs ensured that members of their communities could gain access to employment and training opportunities, and that EDCs gained first access to all contracting opportunities.

Progressive agreements, such as the EKATI mine project agreement in the Northwest Territories and the Raglan agreement in Quebec, have provided Aboriginal communities with jobs, skills training, profit-sharing and environmental benefits.

In addition to these agreements, the industry has taken proactive policy positions on issues such as resource revenue-sharing, which supports greater participation of Aboriginal people, 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 Te 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 Aboriginal 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 First Nations communities across the province. This year, the Ktunaxa Nation Council and Teck Resources have 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 Aboriginal Canadians has largely been positive, several public policy issues currently 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 Supreme Court of Canada, in its recent decision on the Tsilhqot'in First Nation's claim, recognized Aboriginal title, a first in Canadian law. It also provided clarity on the criteria needed to demonstrate title and the rights and obligations that flow from that, and, in the process also identified where title was found not to exist.

The Court clearly recognizes that, in some circumstances, the right to title can be limited by the Crown. So, there is no absolute veto under Canadian law, even in the case where title has been proven. But for the Crown to place limits on Aboriginal title, it has to demonstrate both a compelling

Photo: Suncor Energy, Fort McMurray, Alberta

public interest for the project and ensure that future Aboriginal generations will not be deprived of the benefit of the land were the project to go ahead – a very significant test. At its core, the decision embodies the balancing act between empowering and limiting the authority of both Aboriginal people and governments. The Canadian mining industry believes it is a significant decision that provides much more clarity going forward.

In May 2016, the federal government adopted, without qualifications, the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and is currently developing a framework for its implementation in consultation with Indigenous groups. The government has since stated on many occasions 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.

The Canadian mining sector has a proven track record of working towards and maintaining positive and respectful relationships with affected Indigenous communities.

Building constructive relationships with Indigenous communities, pursuing understanding and shared commitments through formal agreements is of great importance to our industry and is considered 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 vast majority of projects undergoing environmental assessment under CEAA 2012 (*see Figure 38*). 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 federal and provincial coordination and among federal government departments and agencies, which has created delays and uncertainty. There has also been duplication in provincial processes and federal intrusion into provincial jurisdiction, resulting 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.

For the reasons above, MAC welcomed the government's review of the federal environmental assessment process, which was launched in 2016. 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 make policy decisions related to the *Metal Mining Effluent Regulations* (MMER), which underwent a three-year review that concluded in 2015. The industry is hopeful that the outcome of the MMER review will be clear compliance mechanism for all mining in Canada, with regulations that facilitate growth and economic opportunities while protecting the environment. Proposed amendments to the MMER are expected to be published in 2017. ■

FIGURE 32

MAC MEMBER COMPANY APPLICATION OF INTERNATIONAL STANDARDS AND PROGRAMS

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MAC MEMBER COMPANY APPLICATION OF INTERNATIONAL STANDARDS AND PROGRAMS	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	IFC Social and Environmental Performance Standards	Dow Jones Sustainability Index	Jantzi Social Index	Responsible Jewellery	International Cyanide Code	Kimberley Process
INTERNATIONAL INITIATIVES																			
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		✓	✓		✓	✓	✓	✓			✓	✓	✓	✓				✓	
COMPANIES HEADQUARTERED OUTSIDE OF CANADA WITH CANADIAN OPERATIONS																			
Glencore		✓		✓	✓	✓	✓	✓			✓	✓	✓	✓	✓				
De Beers Canada Inc.**	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓			✓		✓
Newmont Mining Corporation		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	
Rio Tinto		✓				✓		✓	✓		✓	✓	✓	✓	✓		✓		✓
ArcelorMittal				✓	✓		✓				✓								

*Applied at international facilities.
**TSM is applied at international facilities, but results are not reported publicly.

Sources: MAC Member Companies, TSM Progress Report 2016.

FIGURE 33
TSM TAILINGS MANAGEMENT

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TAILINGS MANAGEMENT ASSESSMENTS
PERCENTAGE OF FACILITIES AT A LEVEL A OR HIGHER 2006, 2014 AND 2015

Sources: MAC Member Companies, TSM Progress Report 2016.

FIGURE 34
TSM BIODIVERSITY CONSERVATION MANAGEMENT

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BIODIVERSITY CONSERVATION MANAGEMENT ASSESSMENTS PERCENTAGE OF FACILITIES AT A LEVEL A OR HIGHER 2012, 2014 AND 2015

Sources: MAC Member Companies, TSM Progress Report 2016.

FIGURE 35
TSM ENERGY USE AND GHG EMISSIONS MANAGEMENT

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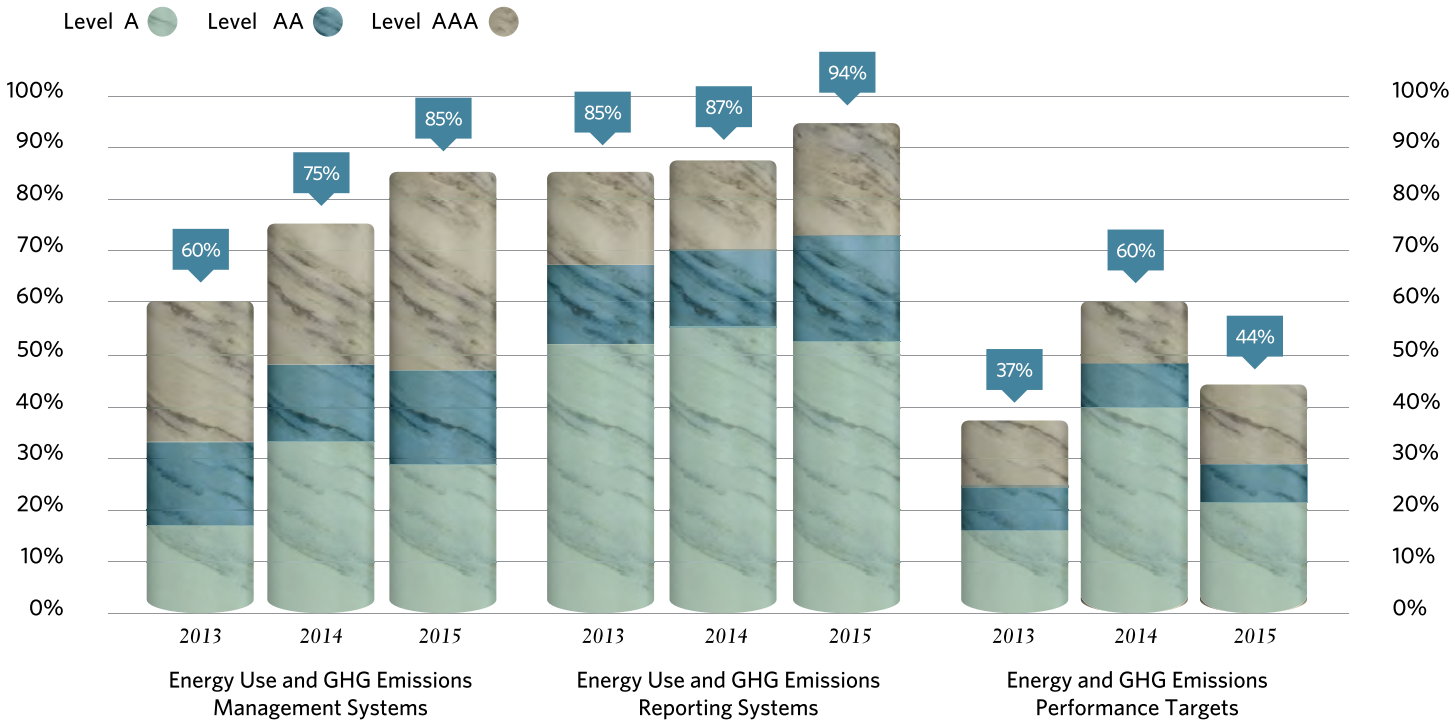
ENERGY USE AND GHG EMISSIONS MANAGEMENT ASSESSMENTS PERCENTAGE OF FACILITIES AT A LEVEL A OR HIGHER 2013, 2014 AND 2015



Sources: MAC Member Companies, TSM Progress Report 2016.

FIGURE 36
MINING INDUSTRY ENERGY AND GHG EMISSIONS DATA, 1990 AND 2014

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	1990	2014
Canadian economy		
Canadian energy use (PJ)	9,608	11,698
Energy used by broader industry (PJ)	2,400	3,577
Canadian GHG emissions (mt)	592	737
Direct GHG emissions by all industries (mt)	99.1	171.1
Metal and non-metal mining		
Total energy use (PJ)	143	150
Share of Canadian energy use (%)	1.48	1.3
Total GHG emissions (Mt CO2e)	8.6	8.0
Share of Canadian GHG emissions (%)	1.5	1.1

Source: Canadian Industrial Energy End-Use Data Analysis Centre (CIEEDAC) Report, 2016.
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 37
ENERGY COMMODITY PRICES ($/mmBTU), 2000-2016

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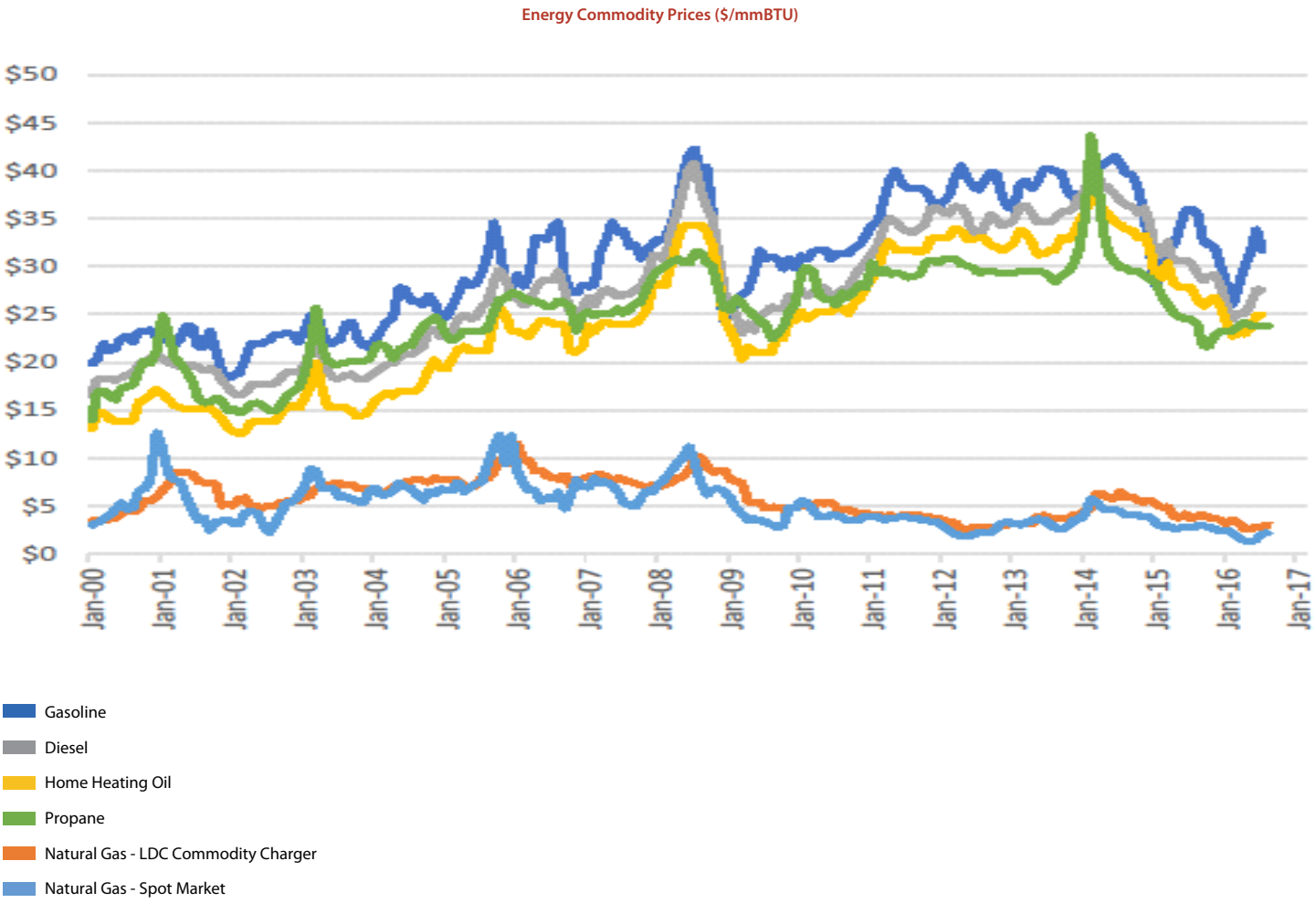

Source: Statscan 326-0009, Kent Group, Canadian Gas Association.

FIGURE 38

CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY REGISTRY AS OF OCTOBER 11 2016

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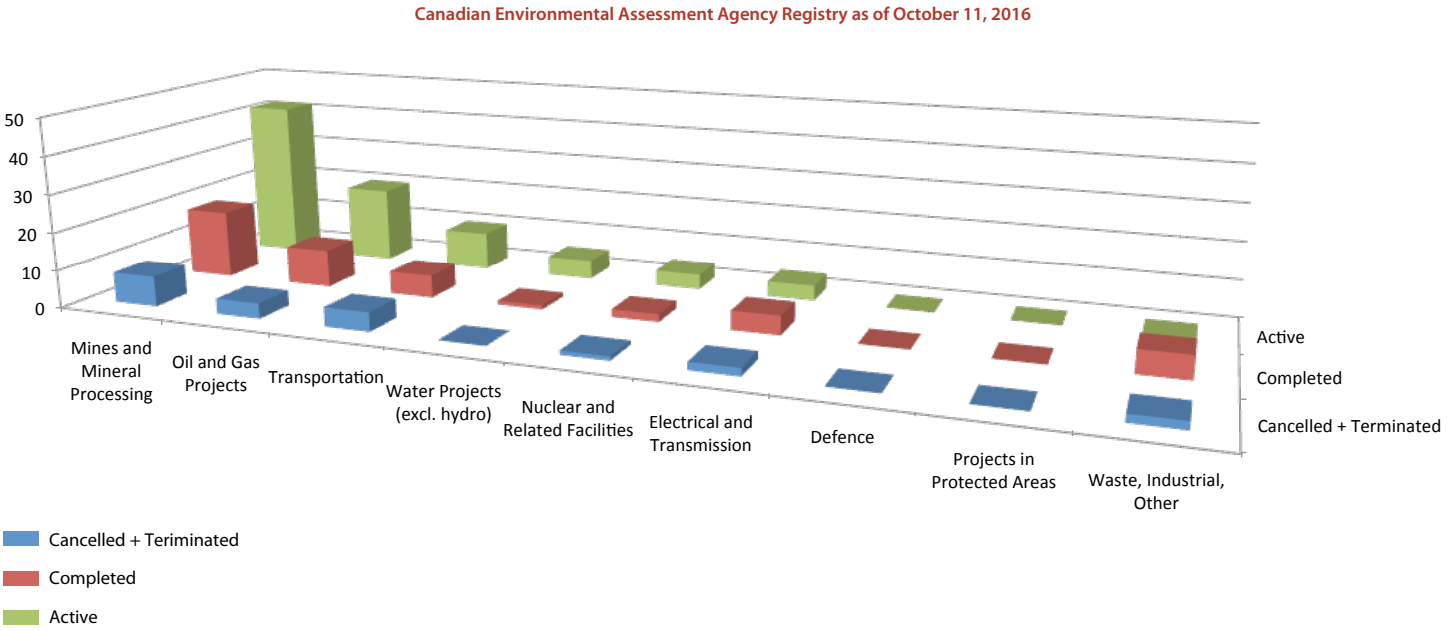


Source: Canadian Environmental Assessment Agency.

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 $169.7 billion in 2014, up 7.5% year-over-year, accounting for 66% of total Canadian mining assets (*see Figure 39*). By comparison, this figure is nearly double that of Canadian mining assets at home, which amounted to $87.7 billion.

As geographic indicators, Africa and Latin America, respectively, were the top two continental destinations for Canadian international mining assets.

Africa experienced the greatest growth (13.3%) in 2014. The most notable changes were located in:

- **Zambia.** First Quantum Minerals continued to develop the Sentinel copper mine and to expand the Kansanshi mine, which is the largest copper mine in Africa.
- **Madagascar.** Sherritt International owns a 40% stake in, and is the operator of, the Ambatovy nickel-cobalt project, which achieved commercial production in early 2014. SNC-Lavalin also held a 5% stake in this project, which it divested in 2015.

In Latin America, the overall value grew by 4.8% to $90.5 billion, which accounted for 53% of CMAA.

Four of the top five countries (Chile, Mexico, Argentina, Peru, and the Dominican Republic) contributed to the gains:

- **Argentina.** Goldcorp continued to develop the Cerro Negro gold project.
- **Peru.** Hudbay continued to develop the Constancia copper-gold-molybdenum mine.
- **Chile.** Lundin Mining acquired 80% ownership of the Candelaria copper-gold-silver mining complex.
- **Panama.** First Quantum Minerals continued to develop the Cobre Panama copper 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 $801 million for African mining projects in 2013 and $969 million 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 $1.0 trillion in 2015 (*see Figure 40*). Of that, the mining sector accounted for $62.6 billion, or 6%.

It is noteworthy that the annual outward flow of the metallic minerals and metal products sector is comparable to the value of domestic Canadian mining assets.

The sector's share of CDIA was down for the second consecutive year, dropping 18% from $77.1 billion to $62.7 billion, with the largest portion of that drop (15%) projected in 2015. Reflecting downward pressure on commodity prices over the same period, a reduction in investment is to be expected as companies reduce expenditure to more effectively manage cash flows and balance sheets. What is more revealing, and is discussed further below, is how the drop in foreign direct investment in Canada's mining sector has fallen disproportionately when compared to the industry's mining investment abroad.

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.

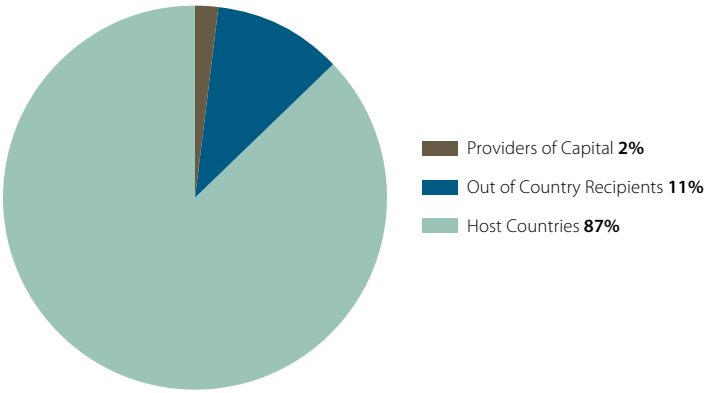
It has been estimated that approximately 80% of all money spent in building and operating a mine is spent in the host country through wages, local procurement and payments to various levels of government. This estimate is supported by research conducted by MAC in 2016. Using methodology developed by the World Gold Council, MAC surveyed its members on their 2015 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. Eight MAC member companies – representing 38 producing operations and 23 non-producing operations, and employing 53,842 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 61 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$12.3 billion, with US$10.7 billion (or 87%) being spent in the host country.

AN ANALYSIS OF EIGHT MAC MEMBERS' INTERNATIONAL OPERATIONS AND DEVELOPMENT PROJECTS REVEALED THAT 87% OF COMPANY EXPENDITURES WERE SPENT WITHIN 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 69% of the total. The second largest beneficiaries are governments that receive taxes and royalties that mining companies pay, accounting for 12% of the total. For example, the in-jurisdiction expenditure within Peru, based on data from the mining operations included in this survey, was US$1.2 billion, with payments to suppliers accounting for US$937.4 million.

Recipients of Expenditures



Beneficiaries within Host Countries

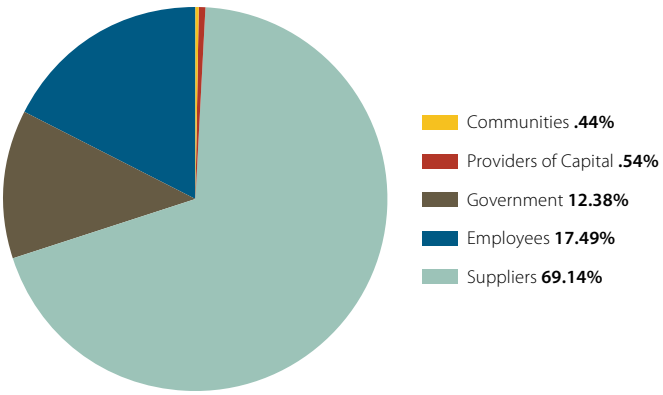


Figure 41 summarizes the consolidated survey data for 21 national jurisdictions and demonstrates that the broader economic contributions mining generates extend far beyond mining project taxes and royalties.

CANADA'S MINERAL TRADE

Despite showing a trade deficit in the third and fourth stages of mining in 2015, the sector as a whole maintained a surplus of $16.1 billion (*see Figure 42*). 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 nearly 15% between 2007 and 2015, but experienced a year-over-year drop of 2%. Exports of mineral products for the first three stages of mining remained robust in 2015, at $77 billion, 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 43*).

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 10*). 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

Imports for all the first three stages of mining remained virtually unchanged year-over-year, totalling $43.7 billion. Stage 4 edged upward by 5%, continuing a long-standing trend for the products of this stage. Combined, the four stages totalled $79.9 billion in imports. Of Canada's total mineral imports by value in 2015, approximately 50% came from the United States, which equalized the balance of trade between the two countries for minerals and metals (*see Annex 11*).

CANADA'S TRADE POLICIES

The Canadian mining industry boasts a significant international presence. Its reliance on international market demand for its products makes the industry a major stakeholder in the trade policies, programs and services that Canada's Department of Global Affairs facilitates.

Canada's trade agenda has expanded aggressively in recent years, giving Canadian miners greater flexibility to expand into new and emerging markets, or to export their products more freely to an increasing number of destinations. MAC supports the following policy developments and, where appropriate, provides input to Canadian policy makers and negotiators.

Comprehensive Economic and Trade Agreement with the European Union

In the fall of 2016, Prime Minister Trudeau and EU leaders held a ceremonial signing of the Comprehensive Economic and Trade Agreement (CETA). Final ratification is still required by the European Parliament and the legislatures in each EU member country. Upon implementation, the new agreement will eliminate 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%; and**
- **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.

Trans-Pacific Partnership

In October 2015, the Government of Canada announced the conclusion of Trans-Pacific Partnership (TPP) negotiations.

At the time of writing, the government was reviewing the text of the agreement and had not committed to ratification.

MAC remains supportive of this agreement, especially since Canada's largest peer mining competitor, Australia, is party to it.

The TPP is the largest free trade agreement in history, involving a 12-nation market of nearly 800 million customers, whose total GDP exceeds $30 trillion.

Canada's exports of metals and minerals to TPP countries were worth an average of $158.6 billion per year from 2012 to 2014. Through the reduction of tariffs, operators in Canada stand to gain significantly with TPP partners:

- **Japan:** tariffs of up to 7.9%
- **Vietnam:** tariffs of up to 40%
- **Malaysia:** tariffs of up to 50%
- **Australia:** tariffs of up to 5%
- **New Zealand:** tariffs of up to 10%
- **Brunei:** tariffs of up to 20%

Beyond tariff elimination and reduction, the agreement would also address numerous challenges that companies currently face in getting products, people and services across borders on a day-to-day basis. As one of Canada's largest outward investing sectors, the mining sector would benefit from the greater certainty, transparency and foreign investment protection that the TPP offers. Participating in the TPP is important because it would enable the mining industry to remain competitive on the global stage.

Trade Relations with China

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 $4.6 billion in 2015, more than 5% of our overall total.

Canada does not have a free trade agreement with China, despite its growing importance to our trade and economic well-being. The absence of an agreement between the two nations has led to several economically damaging protectionist measures, including the introduction of a 3% tariff on steelmaking coal products and challenging regulatory barriers to trade.

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.

Given this reality and China's importance to Canada's future, MAC encourages the Government of Canada to focus on enhancing economic and diplomatic relations, and to explore a possible free trade deal.

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 33 FIPAs in place, 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.

Investment in Latin America

Eight of Canada's 33 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. It is noteworthy that, as of 2013, Canadian companies held nearly $70 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 of the nine FIPA negotiations currently in negotiation are 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 account for approximately 10% of FDI annually. When isolated from this total, however, the mining component most recently peaked in 2013, and has since declined to levels not seen since the financial crisis. Year-over-year decreases from 2014 to 2015 indicate a reduction in mining FDI exceeding 50%, from $21.0 billion to $10.4 billion (*see Figure 40*).

CANADA'S COMPETITIVENESS FOR MINERAL INVESTMENT

A region's regulatory and fiscal environments are major considerations when companies decide where to invest their exploration and development dollars. They also directly influence that region's ability to attract new mineral investment. Several indicators can be used to test Canada's competitiveness for new and highly mobile global mineral investment. As the following discussion suggests, there are signs that Canada may not be as competitive as it as it once was.

Photo: Vale, Totten Mine, Ontario

As noted above, mining's share of FDI in Canada dropped by more than 50% year-over-year in 2015. However, within the same timeframe, mining's share of CDIA experienced only a 6% decline, indicating that mining investment is increasingly going outside of Canada. Given the recent downturn, it is tempting to link reduced mineral investment flows into Canada exclusively to lower commodity prices; however, indicators show that they are only partly responsible.

Mining's eroding fiscal competitiveness and an increase in regulatory uncertainty, stemming primarily from the 2012 and 2013 federal budgets, suggest that policy change is a factor in Canada's reduced competitiveness and is distinct from reduced global mining investment flows.

The tangible impacts of recent federal policy changes on Canada's attractiveness as a destination for mineral investment has manifested in several ways. Data from the Canadian Environmental Assessment Agency reveal a decline in projects undergoing the federal environmental assessment process in recent years.

Additionally, at the time of writing, only one new project has entered the process in more than a year (*see Figure 44*).

Exploration spending is another important indicator. When factoring in exploration budgets for iron ore, SNL Metals & Mining data indicate that Canada no longer attracts the single-largest share of total global mineral exploration spending, having conceded first place to Australia in 2015. Furthermore, Natural Resources Canada estimates that overall investment for the more vulnerable off-mine-site exploration work in Canada will decline to approximately $680 million from a high of $2.8 billion in 2011 – its lowest level in a decade.

There is also qualitative evidence that supports the theory that Canada's competitiveness for mineral investment has been adversely impacted. The 2016 edition of the Fraser Institute's annual survey of mining and exploration companies, which included input from 449 respondents, named Western Australia as the most attractive jurisdiction for mine exploration – a position typically held by a Canadian jurisdiction.

The survey assesses how mineral endowments and public policy factors such as taxation and regulation affect exploration investment. Given the predominant role of major mining companies in financing exploration and project development, the survey's focus on exploration investment serves as a barometer of how these companies perceive and weigh the relative attractiveness and competitiveness of different jurisdictions.

Photo: Syncrude, Fort McMurray, Alberta

The survey presents data on 109 jurisdictions worldwide, from every continent except Antarctica, and includes sub-national jurisdictions in Canada, Australia, the United States and Argentina. After all factors are considered, only two of the top 10 jurisdictions are in Canada, which is fewer than in the past:

1. Western Australia
2. Saskatchewan
3. Nevada
4. Ireland
5. Finland
6. Alaska
7. Northern Territory (Australia)
8. Quebec
9. Utah
10. South Australia

The Policy Perception Index (PPI) also serves as a report card to governments on the attractiveness of their mining policies. The index is composed of survey responses to policy factors that affect investment decisions. Policy factors examined include uncertainty concerning the administration of current regulations, environmental regulations, regulatory duplication, the legal system, the taxation regime, uncertainty concerning protected areas and disputed land claims, infrastructure, socio-economic and community development conditions, trade barriers, political stability, labour regulations, quality of the geological database, security, and labour and skills availability.

The PPI rankings from 2015, include three Canadian jurisdictions in the top 10:

1. Ireland
2. Wyoming
3. Sweden
4. Saskatchewan
5. Finland
6. Nevada
7. Alberta
8. Western Australia
9. New Brunswick
10. Portugal

The correlation between the top-ranked jurisdiction, overall, and the top-ranked jurisdictions for mining policy attractiveness indicates that mineral wealth alone is not enough to attract investment for developing or sustaining a domestic mining industry.

Although several Canadian jurisdictions ranked favourably overall in the Fraser Institute survey and on the PPI, the absence of the federal government's mining policies as an indicator in the survey is noteworthy. Whether the omission is intentional or not, it would be valuable to see how the federal government's mining policy attractiveness compares with competing jurisdictions in the survey.

The above discussion underscores the need for good public policy to facilitate sustainable mineral development in Canada. At stake is a substantial engine of the Canadian economy, the largest (and in many regions, the only) economic driver of remote and northern regions and, proportionally, the largest private sector employer of Indigenous Canadians.

BUSINESS RISKS FACING THE GLOBAL MINING INDUSTRY

Mineral products are strategically important to countries with large or growing infrastructure and manufacturing sectors. Additionally, many countries and governments earn needed revenues from the industry.

On the backdrop of the recent downturn in mineral and metal prices, the balance of challenges and opportunities facing companies continues to shift. In assessing this changing landscape, companies must make strategic decisions to navigate and balance the risks, rewards and opportunities before them.

EY'S TOP 10 BUSINESS RISKS FOR MINING AND METALS (2016–2017)

1. Cash optimization
2. Capital access
3. Productivity
4. Social license to operate
5. Transparency
6. Switch to growth
7. Access to energy
8. Joint ventures
9. Cybersecurity
10. Innovation

Cash optimization, capital access and productivity are seen as the top three business risks, according to EY's *Top 10 business risks facing mining and metals 2016–2017* report. Limited pricing and demand visibility as a result of ongoing market volatility are challenging mining and metals companies as they plan for the future. Cash is king once again as companies seek to maintain balance sheet liquidity and implement plans to maximize operational cash flow for long-term profitability.

Capital raising continues to be an issue in the sector and, in 2015, was down by about 10% year-over-year. There was a sharp decline in loan finance to the sector, and most loans were used for refinancing existing facilities rather than going into new projects. As the risk of default has increased, banks are only extending trade and long-term financing at an increased cost to those mining and metals companies with sufficient security to back the debt. With limited access to capital, companies are looking at alternative sources of finance and portfolio realignment options.

Productivity remains in the top three risks as many miners are still struggling to make further improvements, particularly in asset productivity.

The focus on "volume at any cost" during the mining boom generated a focus on "production at any cost." Often this meant that mines had to be larger. Scaling up these structures made them more complex to run and resulted in silos and diminished connectivity within operations. An integration gap within businesses emerged, and dealing with it requires an end-to-end approach for long-term improvements in productivity. ■

FIGURE 39

THE GEOGRAPHICAL DISTRIBUTION OF CANADA'S MINING ASSETS, 2014

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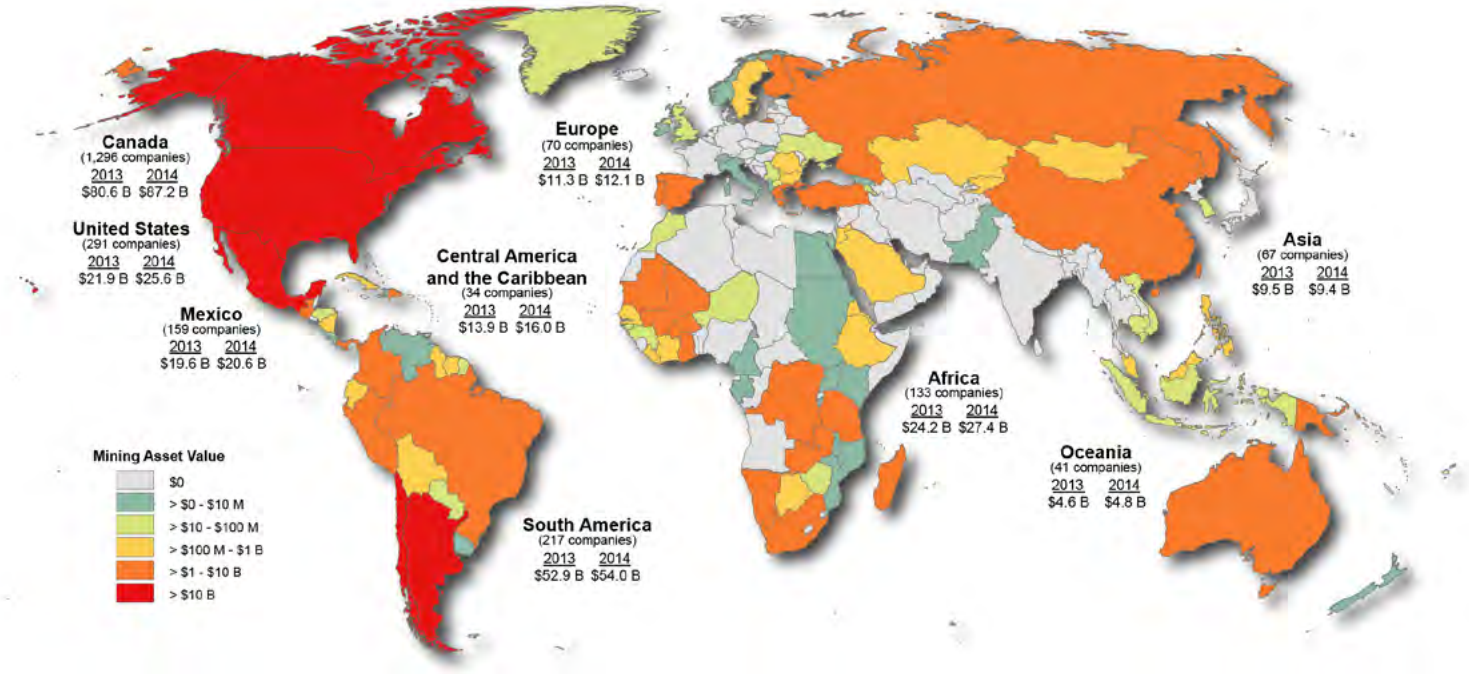

Source: Minerals and Metals Sector, Natural Resources Canada.

FIGURE 40

CANADIAN MINERAL INDUSTRY DIRECT INVESTMENT ABROAD AND FOREIGN DIRECT INVESTMENT STOCKS, 1999-2015[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	825,303	719,574	74,502	21,011	5,297	8,086	4,973	29,151	1,888	2,857
2015[p]	1,005,227	768,467	62,685	10,440	6,007	10,192	6,150	19,621	2,212	2,978

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

FIGURE 41
MINING COMPANY INVESTMENT IN HOST COUNTRIES, 2015

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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	719.88	653.97	90.84%	52.94	491.38	107.72	1.93	0	894	2,922
Australia	128.88	128.71	99.87%	11.69	81.29	35.65	0.07	0	0	313
Brazil	482.5	408.77	84.72%	55.97	294.56	57.43	0.81	0	559.4	3,071
Burkina Faso	601.06	601.06	100%	-39.1	640.16	*	0	0	487.1	*
Chile	500.61	464.06	92.70%	2.5	360.24	97.18	4.14	0	751.1	1,638
China	305.56	301.18	98.57%	55.6	139.54	44.8	2.33	58.92	384.21	2,618
Dominican Republic	601.88	413	68.62%	213.05	154.59	44.43	0.93	0	1,332.00	4,415
Finland	220.95	220.95	100.00%	14.33	176.63	29.99	0	0	0	653
Ghana	294.28	222.5	75.61%	37.1	140.81	42.91	1.68	0	302.3	2,220
Greece	289.09	246.98	85.43%	46.82	164.25	33.28	2.63	0	38.12	782
Mauritania	431.28	241.64	56.03%	36	143.6	60.17	1.87	0	249.4	3,471
Mexico	399.84	398.71	99.72%	57.22	289.65	51.02	0.81	0	20.41	2,769
Papua New Guinea	229.31	121.25	52.88%	15.47	71.71	32.55	1.51	0	0	4,028
Peru	1,271.82	1,204.66	94.72%	155.86	937.43	97.39	13.98	0	1,239.51	8,243
Romania	32.14	23.6	73.42%	1.07	20.12	2.3	0.11	0	0	*
Russia	505.35	456.78	90.39%	190.4	191.28	74.52	0.59	0	883.2	2,899
Saudi Arabia	33.19	17.62	53.09%	0.08	13.19	4.35	0	0	0	*
Suriname	291.62	291.62	1	-22.3	313.92	*	0	0	350.6	*
Turkey	496.8	368.1	74.09%	95.8	243.52	27.82	0.96	0	443.61	2,015
USA	3,906.76	3,493.33	89.42%	216.75	2,276.73	987.25	12.6	0	3,884.40	8,029
Zambia	604.37	532.65	88.13%	140.84	330.76	59.97	1.08	0	501	3,756
Total	**12,347.16**	**10,811.14**	**87.56%**	**1,338.10**	**7,475.37**	**1,890.73**	**48.02**	**58.92**	**11,969.75**	**53,842.00**

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 42
BALANCE OF CANADA'S MINERAL TRADE, 2015

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Stage	Domestic Exports ($)	Total Exports ($)	Total Imports ($)	Balance of Trade ($)
Stage I	26,134,782	26,231,668	7,933,867	18,297,801
Stage II	34,668,083	35,114,633	14,736,229	20,378,404
Stage III	16,108,127	17,220,009	21,075,596	-3,855,587
Stage IV	15,049,156	17,576,251	36,230,032	-18,653,781
Total	**91,960,148**	**96,142,561**	**79,975,724**	**16,166,837**

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 43
MINERAL AND METAL PRODUCT IMPORTS AND DOMESTIC EXPORTS, 2007-2015

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($ millions)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015 Percentage of Canada's Total Trade
Mineral and Metal Imports										
Stage I	7,778	9,147	6,984	7,709	8,964	8,309	7,221	7,926	7,934	1.48%
Stage II	7,674	9,362	7,742	12,379	15,719	14,267	13,727	14,984	14,736	2.75%
Stage III	19,195	21,389	14,994	18,358	21,393	21,340	20,472	22,163	21,076	3.93%
Stage IV	27,599	28,784	25,020	27,668	30,614	31,186	31,602	34,411	36,230	6.76%
Stage I - IV	**62,246**	**68,682**	**54,740**	**66,113**	**76,690**	**75,101**	**73,022**	**79,484**	**79,976**	**14.93%**
Metals	52,469	57,341	45,378	55,856	65,707	63,812	61,482	66,708	66,115	12.34%
Non-metals	8,444	9,417	8,149	8,896	9,785	10,076	10,637	11,649	12,655	2.36%
Coal and Coke	1,332	1,924	1,212	1,361	1,198	1,213	903	1,127	1,205	0.23%
Total Imports of Goods	**407,301**	**433,999**	**365,359**	**403,701**	**446,666**	**462,072**	**475,661**	**512,084**	**535,604**	**100.0**
Mineral and Metal Domestic Exports										
Stage I	18,092	28,700	19,747	24,533	32,424	29,207	27,322	27,090	26,135	5.43%
Stage II	32,395	30,861	21,876	31,810	36,674	32,303	32,780	34,398	34,668	7.20%
Stage III	16,352	17,265	10,984	13,269	15,535	14,935	14,951	15,544	16,108	3.34%
Stage IV	13,221	13,347	10,084	10,545	11,286	11,638	11,847	12,390	15,049	3.12%
Stage I - IV	**80,060**	**90,173**	**62,690**	**80,156**	**95,919**	**88,082**	**86,899**	**89,422**	**91,960**	**19.09%**
Metals	66,250	67,096	47,272	61,412	72,787	67,512	67,986	71,694	72,633	15.08%
Non-metals	10,647	16,712	10,338	12,518	14,766	13,803	13,107	13,186	15,512	3.22%
Coal and Coke	3,163	6,365	5,080	6,227	8,366	6,767	5,806	4,543	3,816	0.79%
Total Domestic Exports of Goods	**419,944**	**455,337**	**334,448**	**374,015**	**419,035**	**428,049**	**443,620**	**492,123**	**481,702**	**100.0**

Sources: Natural Resouces Canada; Statistics Canada.

FIGURE 44

MINING PROJECTS ADDED TO THE CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY REGISTRY

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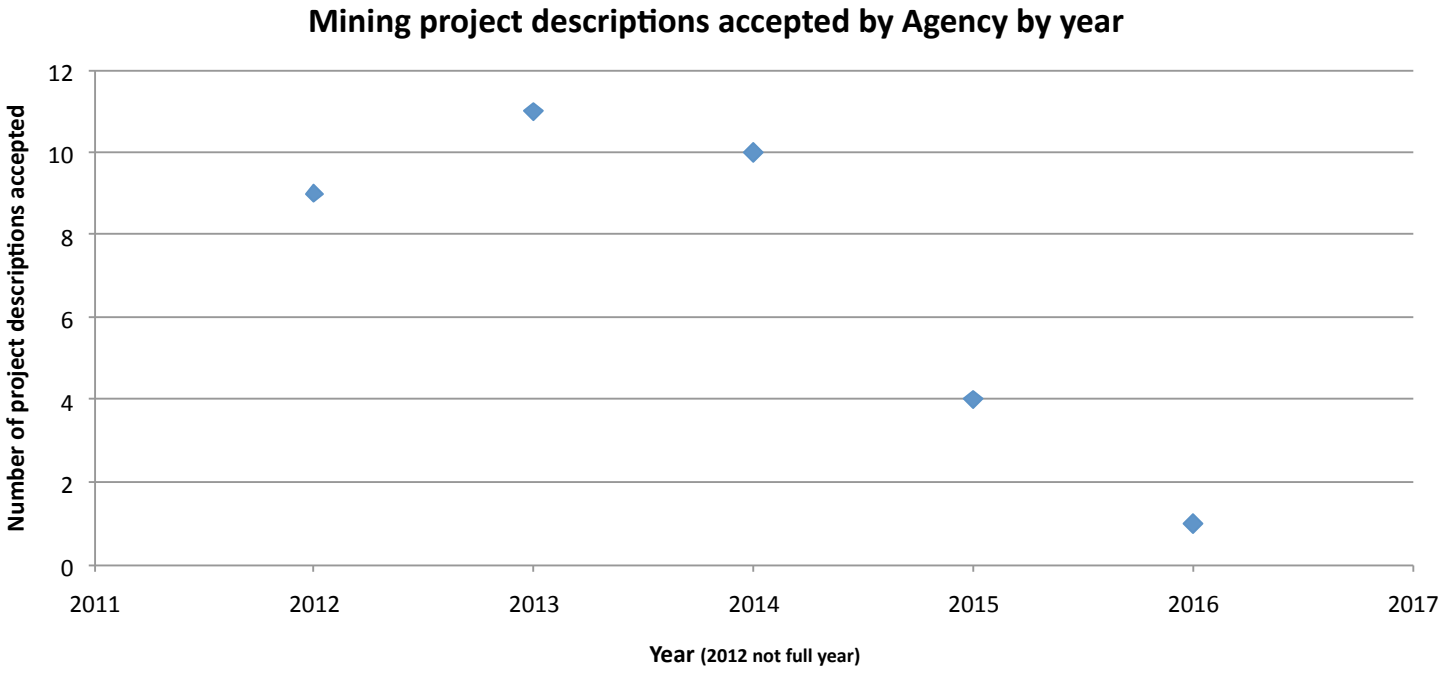

Source: Canadian Environmental Assessment Agency.

ANNEX 1
PRODUCING MINES IN CANADA, 2015

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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	Au, Cu
Rambler Metals and Mining PLC	Ming	(U.)	Baie Verte	Cu, Au, Ag, Zn
Anaconda Mining Inc.	Pine Cove	(P., C.)	Baie Verte	Au
Teck Resources Limited	Duck Pond	(P., C.)	Millertown	Cu, Zn
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
Iron Ore Company of Canada (IOC)	Plateau Dolomite	(P.)	Labrador City	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
Quebec				
Rio Tinto, Fer et Titane inc.	Tio	(P.)	Havre-Saint-Pierre	Ilmenite
Cliffs Natural Resources Inc.	Bloom Lake	(P., C.)	Fermont	Fe
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.	Monique	(P.)	Val-d'Or	Au
Richmont Mines Inc.	Beaufor	(U.)	Val-d'Or	Au, Ag
QMX Gold Corporation	Lac Herbin	(U., C.)	Val-d'Or	Au, Ag

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
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
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
Holcim (Canada) Inc.	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
Ontario				
Detour Gold Corporation	Detour Lake	(P., C.)	Matagami	Au
St Andrew Goldfields Ltd.	Holt	(U., C.)	Timmins	Au, Ag
St Andrew Goldfields Ltd.	Holloway	(U.)	Timmins	Au, Ag
Kirkland Lake Gold Inc.	Macassa	(U., C.)	Kirkland Lake area	Au, Ag
Primero Mining Corp.	Black Fox	(P., U., C.)	Matheson	Au
St Andrew Goldfields Ltd.	Taylor	(U.)	Cochrane	Au
Alamos Gold Inc.	Young-Davidson	(P., 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
Wallbridge Mining Company Limited	Broken Hammer	(P.)	Sudbury	Cu, Ni, PGM
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, Ag
Northern Sun Mining Corp.	Redstone	(C.)	southeast of Timmins	Ni
Lake Shore Gold Corp.	Bell Creek	(U., C.)	Timmins	Au
Vale Canada Limited	Creighton	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Vale Canada Limited	Gertrude	(P.)	Sudbury	Ni, Cu, Co, PGM, Au
Goldcorp Inc.	Dome	(U., C.)	Timmins	Au
Goldcorp Inc.	Hollinger	(P., U., C.)	Timmins	Au
Vale Canada Limited	Ellen	(P., U.)	Sudbury	Cu, Ni
First Nickel Inc.	Lockerby	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
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

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
KGHM Polska Miedz S.A.	McCreedy West	(U.)	Sudbury	Cu, PGM, Au, Ag
Vale Canada Limited	Totten	(U.)	Worthington	Ni, Cu, Co, PGM, Au
Lake Shore Gold Corp.	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	Williams	(U., P., 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
Holcim (Canada) Inc.	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	(P.)	Hagersville	Gypsum
E.C. King Contracting Ltd.	Owen Sound	(P.)	Owen Sound	Dolomitic lime
Lafarge Canada Inc.	Woodstock	(P.)	Woodstock	Limestone
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.)	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
Manitoba				
Tantalum Mining Corporation of Canada Limited	Tanco	(U., C.)	Lac-du-Bonnet	Cs
San Gold Corporation	007	(U.)	Rice Lake	Au
San Gold Corporation	Hinge	(U.)	Rice Lake	Au
San Gold Corporation	Rice Lake	(U., C.)	Bissett	Au
Vale Canada Limited	Thompson	(U., P., C.)	Thompson	Ni, Cu, Co, PGM
Vale Canada Limited	Birchtree	(U.)	Thompson	Ni, Cu, Co, PGM
HudBay Minerals Inc.	Snow Lake	(C.)	Snow Lake	Cu, Zn
HudBay Minerals Inc.	Lalor Lake	(U.)	Snow Lake	Cu, Zn, Au, Ag
HudBay Minerals Inc.	Reed	(U.)	Snow Lake	Cu, Zn
HudBay Minerals Inc.	777	(U.)	Flin Flon	Cu, Zn, Au, Ag
HudBay Minerals Inc.	Flin Flon	(C.)	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
Lehigh Cement Company	Mafeking	(P.)	Mafeking	Limestone

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Saskatchewan				
Claude Resources Inc.	Santoy	(U.)	Santoy Lake	Au
Claude 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
Big Quill Resources Inc.	Wynyard	(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	(U., Plant)	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	Aurora	(P.)	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
Canexus Chemicals Canada Ltd.	Bruderheim	(solution mining)	Bruderheim	Salt
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	(P., Plant)	Exshaw	Limestone, lime
Prairie Creek Quarries Ltd.	Cougar Ridge	(P., Plant)	Rocky Mountain House	Limestone
Lafarge Canada Inc.	Exshaw	(P., Plant)	Exshaw	Limestone
Burnco Rock Products Ltd.	Clearwater	(P., Plant)	Clearwater River	Limestone
Graymont Inc.	Fish Creek	(P., Plant)	Nordegg	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)
Keephills Aggregate Company Ltd.	Burtonsville	(P.)	Burtonsville	Coal (thermal)
Transalta Corporation	Highvale	(P.)	Seba Beach	Coal (thermal)
Coal Valley Resources Inc.	Coal Valley	(P.)	Edson	Coal (thermal)

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Teck Resources Limited	Cardinal River	(P.)	Hinton	Coal (metallurgical)
Up Energy Development Group Ltd.	Grande Cache	(P., U.)	Grande Cache	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
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
Avino Silver & Gold Mines Ltd.	Bralorne-Pioneer	(C.)	Whistler	Au
Thompson Creek Mining Limited	Mt Milligan	(P., C.)	Fort St James	Cu, Au
Nystar NV	Myra Falls	(U., C.)	Buttle Lake	Zn, Cu, Au, Ag
Huckleberry Mines Ltd.	Huckleberry	(P., C.)	Houston	Cu, Mo, Au
Imperial Metals Corporation	Red Chris	(P.)	Kinaskan Lake	Au, Ag, Cu
Banks Island Gold Ltd.	Yellow Giant	(U., C.)	Prince Rupert	Au
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
Imasco Minerals Inc.	Crawford Bay	(U.)	Crawford Bay	Dolomite, limestone
Imasco Minerals Inc.	Lime Creek	(U.)	Lost Creek	Limestone
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 Mining Company Inc.	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)

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Yukon				
Yukon Zinc Corp.	Wolverine	(U., C.)	Ross River, Watson Lake	Zn, Ag, Cu, Pb, Au
Capstone Mining Corporation	Minto	(P., C.)	Pelly Crossing	Cu, Au, Ag
Northwest Territories				
North American Tungsten Corporation Ltd.	CanTung	(U., C.)	Cantung	W
Diavik Diamond Mines Inc.	Diavik	(U., Plant)	Lac de Gras	Diamonds
Dominion Diamond Corporation	Ekati	(U., Plant)	Lac de Gras	Diamonds
De Beers Canada Inc.	Snap Lake	(U., Plant)	Snap Lake	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 are clay products, peat, and most construction materials (most stone, sand and gravel).
Included are operations that produced during 2015.

ANNEX 2

MINING ESTABLISHMENTS IN CANADA, BY MINERAL, PROVINCE OR TERRITORY, 2014

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	NL	PE	NS	NB	QC	ON	MB	SK	AB	BC	YT	NT	NV	TOTAL
Metals														
Iron Ore	2	-	-	-	3	-	-	-	-	-	-	-	-	5
Gold & Silver Ore	1	-	-	-	14	13	1	1	-	-	-	-	1	31
Lead-zinc ore	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Nickel-copper ore	1	-	-	-	2	4	1	-	-	-	-	-	-	8
Copper, copper-zinc ore	2	-	-	-	2	1	1	1	-	7	1	-	-	15
Uranium	-	-	-	-	-	-	-	5	-	-	-	-	-	5
Other Metals	-	-	-	-	3	1	1	-	-	1	-	1	-	7
Total metals	**6**	**-**	**-**	**-**	**24**	**19**	**4**	**7**	**-**	**8**	**2**	**1**	**1**	**72**
Non-metals														
Diamonds	-	-	-	-	-	1	-	-	-	-	-	3	-	4
Gypsum	-	-	3	1	-	-	-	-	-	1	-	-	-	5
Peat	1	1	1	24	29	-	5	1	7	1	-	-	-	70
Potash	-	-	-	1	-	-	-	9	-	-	-	-	-	10
Salt	-	-	2	-	1	4	-	3	1	-	-	-	-	11
Sand and gravel	3	-	6	9	73	260	18	61	210	79	1	-	-	720
Stone	2	-	16	9	87	112	8	-	24	27	-	-	-	285
Shale, Clay and other refractory minerals	-	-	1	-	2	2	-	1	1	1	-	-	-	8
Other non-metals	-	-	-	-	3	1	-	1	-	2	-	-	-	7
Total non-metals	**6**	**1**	**29**	**44**	**195**	**380**	**31**	**76**	**243**	**111**	**1**	**3**	**-**	**1,120**

Sources: Natural Resources Canada; Statistics Canada.
- Nil

ANNEX 3

CANADIAN PRODUCTION OF LEADING MINERALS BY PROVINCE AND TERRITORY, 2015[p]

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	GOLD		POTASH (K_2O)[1]		COPPER		NICKEL		COAL	
	KILOGRAMS	$000	KILOTONNES	$000	TONNES	$000	TONNES	$000	KILOTONNES	$000
Newfoundland	743	35,500	-	-	43,691	286,917	50,848	808,733	-	-
Prince Edward Island	-	-	-	-	-	-	-	-	-	-
Nova Scotia	-	-	-	-	-	-	-	-	-	-
New Brunswick	-	-	x	x	-	-	-	-	-	-
Quebec	49,717	2,373,913	-	-	45,802	300,781	53,452	850,152	-	-
Ontario	70,394	3,361,249	-	-	194,735	1,278,827	96,702	1,538,050	-	-
Manitoba	3,117	148,812	-	-	39,995	262,644	24,939	396,662	-	-
Saskatchewan	2,333	111,414	x	x	977	6,418	-	-	x	x
Alberta	30	1,432	-	-	-	-	-	-	x	x
British Columbia	12,364	590,377	-	-	342,392	2,248,487	-	-	x	x
Yukon	2,881	108,273	-	-	16,418	107,817	-	-	-	-
Northwest Territories	-	-	-	-	206	1,350	-	-	-	-
Nunavut	11,781	562,541	-	-	-	-	-	-	-	-
Canada	**152,747**	**7,293,510**	**11,350**	**6,661,020**	**684,215**	**4,493,242**	**225,941**	**3,593,597**	**61,700**	**3,111,192**

	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	20,274	x	-	-	2,535	12,006	-	-	8,849	71,015
Prince Edward Island	-	-	-	-	x	x	-	-	x	x
Nova Scotia	-	-	-	-	2,143	14,811	x	x	8,569	85,407
New Brunswick	-	-	-	-	2,691	13,298	-	-	6,596	53,131
Quebec	25,680	x	-	-	17,856	100,977	2,628	410,243	38,616	452,418
Ontario	-	-	650	406,959	89,601	591,464	5,297	631,602	70,143	732,533
Manitoba	-	-	-	-	12,784	84,801	-	-	13,770	131,566
Saskatchewan	-	-	-	-	10,980	107,314	-	-	-	-
Alberta	-	-	-	-	73,800	859,798	x	x	7,749	72,306
British Columbia	-	-	-	-	25,060	260,601	x	x	9,749	84,222
Yukon	-	-	-	-	x	x	-	-	x	x
Northwest Territories	-	-	10,950	1,725,559	x	x	-	-	x	x
Nunavut	-	-	-	-	-	-	-	-	-	-
Canada	**45,954**	**2,798,399**	**11,600**	**2,132,517**	**239,164**	**2,056,410**	**12,480**	**1,772,763**	**165,091**	**1,690,465**

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, 2015

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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	38,800	11,000	7,400	6,500	4,200	3,000
(mine production)	% of world total		28.4	19.1	16.8	10.8	7.7

			Kazakhstan	Canada	Australia	Niger	Russia
Uranium (metal content)	t	60,496	23,800	13,325	5,654	4,116	3,055
(mine production) (2013)	% of world total		39.3	22.0	9.3	6.8	5.0

			Philippines	Canada	Russia	Australia	New Caledonia
Nickel (mine production)	t	2,530	530	240	240	234	190
	% of world total	89.8	20.9	9.5	9.5	9.2	7.5

			Brazil	Canada			
Niobium (mine production)	t	56,000	50,000	5,000			
	% of world total		89.3	8.9			

			South Africa	Russia	Canada	Zimbabwe	United States
Platinum group metals (metal content)	kg	386,000	198,000	103,000	33,000	22,500	16,200
	% of world total		51.3	26.7	8.5	5.8	4.2

			Congo	China	Canada	Russia	Australia
Cobalt (mine production)	t	124,000	63,000	7,200	6,300	6,300	6,000
	% of world total		50.8	5.8	5.1	5.1	4.8

			China	Russia	Canada	India	UAE
Aluminum (primary metal)	000 t	58,300	32,000	3,500	2,900	2,350	2,340
	% of world total		54.9	6.0	5.0	4.0	4.0

			China	United States	Russia	Canada	Germany
Sulphur, elemental (mine production)	000 t	70,100	11,000	9,300	7,300	6,000	3,800
	% of world total		15.7	13.3	10.4	8.6	5.4

			RANK OF FIVE LEADING COUNTRIES				
		WORLD	1	2	3	4	5
			China	United States	India	Canada	Germany
Salt (mine production)	000 t	273,000	70,000	48,000	17,000	12,500	12,500
	% of world total		25.6	17.6	6.2	4.6	4.6

			China	Vietnam	Russia	Canada	Bolivia
Tungsten (mine production)	t	87,000	71,000	5,000	2,500	1,700	1,200
	% of world total		81.6	5.7	2.9	2.0	1.4

			Russia	Botswana	D.R.C.	Australia	Canada
Diamonds (precious)	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

			China	Australia	Russia	United States	Canada
Gold (mine production)	t	3,000	490	300	242	200	150
	% of world total		16.3	10.0	8.1	6.7	5.0

			China	India	Brazil	Turkey	Canada
Graphite	000 t	1,190	780	170	80	32	30
	% of world total		65.5	14.3	6.7	2.7	2.5

			China	United States	Chile	Peru	Mexico
Molybdenum (Mo content)	t	267,000	101,000	56,300	49,000	18,100	13,000
(mine production)	% of world total		37.8	21.1	18.4	6.8	4.9

			China	Australia	Vietnam	South Africa	Mozambique
Titanium concentrate	000 t	5,610	900	720	540	480	450
(Ilmenite)	% of world total		16.0	12.8	9.6	8.6	8.0

			Chile	China	Peru	United States	Congo
Copper (mine production)	000 t	18,700	5,700	1,750	1,600	1,250	990
	% of world total		30.5	9.4	8.6	6.7	5.3

			RANK OF FIVE LEADING COUNTRIES				
		WORLD	1	2	3	4	5
			Australia	Brazil	China	India	Russia
Iron ore (mine production)	000 t	2,210	824	428	264	129	112
	% of world total		37.3	19.4	11.9	5.8	5.1

			China	Australia	Peru	United States	India
Zinc (mine production)	000 t	13,400	4,900	1,580	1,370	850	830
	% of world total		36.6	11.8	10.2	6.3	6.2

			Mexico	China	Peru	Australia	Chile
Silver	t	27,300	5,400	4,100	3,800	1,700	1,600
	% of world total		19.8	15.0	13.9	6.2	5.9

			China	United States	India	Australia	Indonesia
Coal (primary) 2014	000 t	8,022,548	3,747,491	916,236	668,383	491,162	470,787
	% of world total		46.7	11.4	8.3	6.1	5.9

Sources: U.S. Geological Survey (USGS); International Energy Association; Kimberley Process.

ANNEX 5

MINERAL PRODUCTION OF CANADA, 2009-2015[p]

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METALLIC MINERALS		2009		2010		2011		2012		2013		2014		2015[p]	
	Unit	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
Antimony	t	54	318	x	x	x	x	x	x	148	1,562	4	45	1	6
Bismuth	t	87	1,615	91	1,759	136	3,346	110	2,370	103	2,006	4	97	2	32
Cadmium	t	322	1,055	2,403	9,644	1,516	4,135	247	500	160	316	129	276	69	107
Calcium	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cesium	t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Cobalt	t	2,275	102,241	2,644	125,144	3,741	146,768	3,698	114,604	4,005	118,114	3,907	137,844	4,152	153,039
Copper	t	470,347	2,766,112	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	684,215	4,493,242
Gold	kg	96,573	3,448,639	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	152,747	7,293,510
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	31,728	2,673,757	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	45,954	2,798,399
Iron, remelt	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lead	t	71,377	140,041	62,397	138,022	62,548	166,003	62,014	127,438	22,895	50,506	3,579	8,288	321	741
Lithium	t	x	x	x	x	x	x	x	x	x	x	x	x	-	-
Magnesium	t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	t	9,116	x	8,524	x	8,543	x	8,936	x	7,956	186,788	9,358	259,876	2,787	47,656
Nickel	t	132,471	2,213,597	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	225,941	3,593,597
Niobium (Columbium)	t	4,169	x	4,298	x	4,551	x	4,705	x	4,916	x	5,774	x	5,753	x
Platinum group	kg	10,925	258,242	9,864	260,304	22,337	749,572	22,490	644,195	25,465	767,363	31,386	1,058,992	35,042	1,154,530
Selenium	t	131	7,633	97	8,001	128	17,500	145	16,656	138	10,411	142	8,879	154	9,152
Silver	t	609	328,201	570	381,086	582	658,514	657	659,005	620	489,872	472	320,274	371	240,903
Tantalum	t	29	x	-	-	-	-	-	-	40	12,698	-	-	-	-
Tellurium	t	16	2,817	8	1,913	9	3,167	10	1,540	8	895	8	1,066	9	1,017
Tungsten	t	2,506	48,378	364	7,370	2,466	73,707	2,554	88,436	3,017	86,293	2,708	84,331	2,114	56,536
Uranium	t	10,133	1,358,144	9,927	1,230,182	9,017	1,307,174	9,520	1,197,441	7,889	806,418	9,780	933,583	14,807	1,513,248
Zinc	t	669,879	1,265,402	609,567	1,356,287	591,004	1,281,887	601,514	1,171,147	412,277	811,361	322,605	771,026	263,209	616,435
Total, Metallic Minerals		**..**	**15,474,941**	**..**	**21,358,783**	**..**	**25,569,557**	**..**	**23,558,411**	**..**	**23,497,305**	**..**	**24,225,029**	**..**	**22,502,195**

NON-METALLIC MINERALS		2009		2010		2011		2012		2013		2014		2015[p]	
	Unit	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
Barite	000 t	16	4,443	21	6,500	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	10,831	1,413,826	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	12,480	1,772,763
Chrysotile	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Clay products [2]	000 t	..	132,902	..	148,907	..	135,422	..	136,502	..	122,577	..	118,012	..	124,309
Diamonds	000 ct	10,946	1,684,304	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	11,600	2,132,517
Gemstones	t	22	2,759	35	4,966	42	2,941	178	3,217	554	4,607	6,919	5,991	11,304	9,110
Graphite	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Gypsum [3]	000 t	3,568	55,749	3,046	47,771	2,449	34,632	1,832	24,987	1,837	25,872	1,793	25,474	1,633	21,125
Lime	000 t	1,613	238,508	1,863	288,787	1,937	294,909	1,965	316,322	1,856	308,127	1,995	344,816	1,812	329,514
Magnesite	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Marl	000 t	x	x	x	x	-	-	-	-	-	-	-	-	-	-
Mica	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Nepheline syenite	000 t	527	53,354	603	57,304	602	58,377	586	61,892	646	72,911	654	83,805	621	65,729
Peat	000 t	1,214	266,634	1,286	260,664	1,139	213,359	1,277	238,018	1,173	213,798	1,178	249,078	1,190	252,283
Phosphate	000 t	x	x	x	x	x	x	x	x	x	x	-	-	-	-
Potash (K_2O) [4]	000 t	4,297	3,431,147	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	11,350	6,661,020
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	1,192	47,661	1,503	66,372	1,620	84,280	1,517	85,256	2,331	80,064	2,011	90,441	2,089	98,931
Salt	000 t	14,676	578,618	10,278	602,607	12,757	697,404	10,820	487,686	12,244	655,848	14,473	752,321	14,719	803,624
Sand and gravel	000 t	201,678	1,361,664	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	239,164	2,056,410
Serpentine	000 t	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Soapstone, talc, pyrophyllite	000 t	56	19,701	100	26,125	116	25,244	130	30,249	175	34,223	90	38,985	164	53,287
Sodium sulphate	000 t	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Stone [3]	000 t	153,038	1,503,455	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	165,091	1,690,465
Sulphur, elemental	000 t	6,435	16,499	6,247	298,990	5,970	637,250	5,594	581,611	5,624	342,937	5,252	326,335	5,210	390,252
Sulphur, in smelter gas	000 t	543	77,817	610	70,903	638	116,022	665	132,230	677	129,197	590	100,125	568	113,748
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		**..**	**11,552,034**	**..**	**14,699,276**	**..**	**17,839,820**	**..**	**16,471,421**	**..**	**15,477,138**	**..**	**15,778,620**	**..**	**17,152,579**

MINERAL FUELS		2009		2010		2011		2012		2013		2014		2015[p]	
	Unit	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
Coal	000 t	62,935	4,406,365	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	61,700	3,111,192
Total Mineral Fuels		**62,935**	**4,406,365**	**68,152**	**5,540,967**	**67,113**	**7,471,408**	**66,471**	**5,880,836**						

	2009		2010		2011		2012		2013		2014		2015[p]	
TOTAL MINERAL PRODUCTION	**. .**	**31,433,340**	**..**	**41,599,026**	**..**	**50,880,785**	**..**	**45,910,667**	**..**	**43,861,247**	**..**	**43,913,961**	**..**	**42,765,966**

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, 1978-2013

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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[r]	10,364	2,617	126	4,163	256	5,598	2,148
2013[p]	11,198	2,673	116	3,532	145	5,212	2,158

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

PROPOSED CAPITAL INVESTMENT BY THE CANADIAN MINING INDUSTRY

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Company	Project	Province	($ millions) Capital Investment
Coalspur Mines Ltd.	Vista' Thermal Coal Mine	AB	500
Canadian Natural Resources Ltd. (CNRL)	Project Horizon	AB	2,100
Fort Hills Energy Corp. (SuncorEnergy Inc. / Total SA / Teck)	'Fort Hills' Oil Sands Mine	AB	13,500
Shell Canada	Athabasca Oil Sands Project Debottleneck Phase 1 (withouth Pierre River Mine Cap Cost)	AB	2,000
SilverBirch Energy/Teck Resources	'Equinox' Oil Sands Mine (Lease 14)	AB	5,750
SilverBirch Energy/Teck Resources	'Frontier' Oil Sands Mine Phase 1	AB	20,000
Suncor Energy Inc. / Total SA	Voyageur	AB	4,400
Syncrude Canada	Mildred Lake	AB	3600
Syncrude Canada Ltd.	Aurora	AB	2,335
KGHM Ajax Mining Inc.	Ajax Copper-Gold Mine	BC	795
Snip Gold Corporation	Bronson Slope Metal Mine	BC	257
Nova Gold/Teck	Galore Creek	BC	5,200
Pretivim	Bruce Jack Gold-Silver Mine	BC	746.9
Canadian Dehua	Gething Coal	BC	1,360
Cardero	Carbon Creek	BC	878
New Gold	Blackwater Gold	BC	1,865
AuRico Gold	Kemess Underground Project	BC	452
Avanti Mining Inc.	Kitsault Molybdenum Mine	BC	1,000
Seabridge Gold Inc.	KSM (Kerr-Sulphurets-Mitchell) Copper-Gold Mine	BC	6,000
Capstone Mining Corp.	Kutcho Copper-Zinc-Silver-Gold	BC	2,13.5
Teck Coal Ltd.	Line Creek Coal Mine Expansion	BC	140
Pacific Booker Minerals Inc.	Morrison Copper-Gold Mine	BC	516.68
Fortune Minerals	Arctos Anthracite Project	BC	788
HD Mining	Murray River Underground Coal Mine	BC	668
Taseko Mines Ltd.	New Prosperity Gold-Copper Mine	BC	1,500

Teck Coal Ltd.	Quintette Coal Mine	BC	500
Compliance Coal Corp.	Raven Underground Coal Mine	BC	150
Anglo American	Peace River Coal	BC	320
Copper Fox Metals	Schaft Creek	BC	3,256
Spanish Mountain Gold Ltd.	Spanish Mountain	BC	755.9
Columbia Yukon Explorations	Storie molybdenum Mine	BC	390
Hard Creek Nickel	Turnagain Nickel Project	BC	2,308
Cline Mining Corporation	Crown Mountain Coal Project	BC	370
Victory Nickel	Minago Nickel Mine	MB	596
Winston Resources Inc.	Elmtree Property Gold Mine	NB	8
Northcliff Resources Ltd.	Sisson Tungsten-Molybdenum Mine	NB	579
IOC (Rio Tinto operator)	Wabush 3	NL	250
Canada Fluorspar	St. Lawrence fluorspar mine reactivation	NL	100
Alderon Resources Corp.	Kami Iron Ore Project	NL	1,270
Morien	Donkin Coal Project	NS	500
TMAC	Hope Bay	NU	642
Baffinland Iron Mines	Mary River	NU	750
Mountain Province Diamonds Inc. and De Beers	Gahcho Kue	NWT	1,000
Canadian Zinc	Prairie Creek	NWT	193
Avalon Rare Metals	Thor Lake - Nechalacho	NWT	1,575
Fortune Minerals	Nico	NWT	347
Tyhee Resources	Yellowknife Gold	NWT	150
Canadian Malartic	Hammond Reef Gold Mine	ON	1,500
Noront Resources Inc.	Eagle's Nest Multi-metals Mine	ON	609
Vale	Sudbury	ON	2,000
Bending Lake Iron Ore	Josephine Cone Mine	ON	900
IAMGOLD	Cote Lake Gold Mine	ON	1,200
New Gold	Rainy River Gold Mine	ON	885
Goldcorp	Red Lake	ON	885

Goldcorp	Porcupine	ON	335
Goldcorp	Musselwhite	ON	390
Treasury Metals	Goliath Gold Project	ON	200
Northern Iron	Griffith Iron	ON	1,600
KGHM International	Victoria Mine	ON	750
Adriana Resources Inc.	Lac Otelnuk Iron Mine	QC	13,000
Matamec	Kipawa	QC	316
Arriane Resources	Lac à Paul	QC	1,214
Critical Elements Corp	Rose Tantalum Mine	QC	269
Royal Nickel Corp.	Dumont Nickel Project	QC	1,200
Stornoway Diamond Corporation	Renard Diamond Mine	QC	946
Champion Iron Mines	Fire Lake North	QC	1,400
Ungava	Hopes Advance Iron Mine	qC	2,850
Mine Arnaud Inc.	Arnaud Apatite Mine	QC	750
Western Troy Capital Resources Inc.	MacLeod Lake Molybdenum-Copper	QC	210
Strateco Resources Inc.	Matoush Project	QC	310
Métaux BlackRock Inc.	BlackRock Vanadium Iron Titanium Mine	QC	600
BHP	Jansen Potash Mine	SK	13,000
AREVA Resources Canada Inc.	Midwest Uranium Mining and Milling	SK	435
Encanto	Muskowekwan Potash Mine	SK	2,800
Shore Gold Inc.	Star-Orion South Diamond Mine	SK	1,900
		Total	**145,029**

Note: The information in this table refers to investments proposed over the coming decade and is drawn from government websites, company websites, and various media. It was last updated in July 2015. The progress that will be made on advancing these projects wll be affected by market forces. Some will likely be delayed or cancelled. In this sense, the list should be referenced as an indicator and not an ascertion of project development.

ANNEX 8

EMPLOYMENT COUNT AND ANNUAL COMPENSATION IN THE CANADIAN MINING, SMELTING AND REFINING INDUSTRIES, 2007-2015

Return to text

	Number of Employees (000)	Compensation per Job[1] ($)
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	31,720	143,411
2014	35,855	130,355
2015	36,390	126,889
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	18,325	96,909
2014	17,730	106,151
2015	17,990	109,078
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	6,110	139,968
2014	6,630	140,887
2015	6,185	127,921

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	51,420	97,786
2014	51,050	100,736
2015	50,360	109,608
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	107,575	113,486
2014	111,265	113,536
2015	110,925	116,212

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 9

TOTAL COMPENSATION PER JOB, BY SELECT CANADIAN INDUSTRIAL SECTOR, 2007-2015

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	78,151	113,486	69,727	73,935	70,616
2014	80,176	113,536	71,413	75,663	74,783
2015	83,926	116,212	72,960	78,415	78,289

Sources: Statistics Canada; Natural Resources Canada.

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

ANNEX 10

DOMESTIC EXPORTS OF MINERALS AND MINERAL PRODUCTS, BY COMMODITY AND COUNTRY OF DESTINATION, 2015

Return to text

($)

METALS	U.S.A.	European Union (EU-28)	China	Japan	Other Countries	Total
Aluminum	9,369,981,087	306,606,006	252,154,553	114,223,702	451,951,165	10,494,916,513
Antimony	166,656	94,062	-	-	1,916	262,634
Barium	-	-	-	-	28,138	28,138
Beryllium	31,258	-	-	-	-	31,258
Bismuth	202,803	-	-	-	9,139	211,942
Cadmium	237,182	868,107	1,069,885	70,714	185,968	2,431,856
Calcium metals	155,247	6,478	1,228	15,666	647,024	825,643
Chromium	24,825,670	-	-	-	35,170	24,860,840
Cobalt	48,612,407	80,665,056	5,009,030	85,903,925	111,243,836	331,434,254
Copper	3,108,715,906	582,084,180	1,163,524,830	916,991,936	1,100,028,760	6,871,345,612
Gold	4,549,196,325	9,486,154,575	202,633,174	185,242,613	3,168,657,228	17,591,883,915
Iron and steel	11,873,287,302	230,550,648	129,710,490	16,492,831	1,340,221,909	13,590,263,180
Iron ore	305,172,391	1,717,880,140	553,114,406	350,974,874	645,384,193	3,572,526,004
Lead	700,091,229	8,130,675	18,192,036	1,335,199	23,936,280	751,685,419
Lithium	49,828	113,238	134,168	-	27,563	324,797
Magnesium and magnesium compounds	60,193,044	275,260	108,887	18,446	251,970	60,847,607
Manganese	368,351	1,107,109	-	-	378,219	1,853,679
Mercury	656,917	3,400	-	-	962,035	1,622,352
Molybdenum	45,501,180	20,324,164	-	7,150	7,124,317	72,956,811
Nickel	1,020,735,440	2,024,937,875	465,086,013	133,411,066	1,758,442,281	5,402,612,675
Niobium	82,253,818	104,319,613	32,734,094	4,678,666	41,909,453	265,895,644
Platinum group metals	1,125,600,426	87,819,656	49,385	7,250,652	7,471,814	1,228,191,933
Rare earth metals	423,957	-	-	-	423,803	847,760
Selenium	600,299	3,051,964	5,845,544	66,106	714,093	10,278,006
Silicon	164,582,557	5,499,072	723,597	400	10,222,039	181,027,665
Silver	1,580,317,902	36,254,620	13,380,930	22,742,621	82,177,751	1,734,873,824
Tantalum	482,783	339,817	-	-	87,904	910,504
Tellurium	3,476,844	17,447,823	-	223,385	1,665,258	22,813,310
Tin	40,980,717	3,191,734	134	6,287	1,660,607	45,839,479
Titanium metal	69,530,009	11,586,637	323,747	853,338	10,684,186	92,977,917
Tungsten	42,431,633	30,172,560	255,129	15,041	1,816,234	74,690,597
Uranium and thorium	776,564,247	606,333,626	150,845,797	17,325,937	188,750,243	1,739,819,850
Vanadium	129,418,192	243,519,158	48,198,668	40,725,920	20,706,323	482,568,261
Zinc	1,591,965,605	16,896,144	24,802,780	4,322,321	103,799,571	1,741,786,421
Zirconium	2,817,262	7,479,669	8,160,909	-	1,513,951	19,971,791
Other metals	4,323,001,908	971,863,766	88,578,849	87,913,904	745,734,368	6,217,092,795
Grand Total	**41,042,628,382**	**16,605,576,832**	**3,164,638,263**	**1,990,812,700**	**9,828,854,709**	**72,632,510,886**

($)

NON-METALS	U.S.A.	European Union (EU-28)	China	Japan	Other Countries	Total
Abrasives	285,518,126	11,504,151	7,169,011	9,761,356	22,797,135	336,749,779
Boron	1,387,963	336,554	98,738	-	1,526,253	3,349,508
Bromine	157,216	623	-	10,145	8,281	176,265
Cement	829,740,868	4,693,049	1,931,296	386,492	17,355,882	854,107,587
Chlorine and chlorine compounds	166,328,707	1,328,874	923,035	-	7,411,667	175,992,283
Chrysotile (Asbestos)	1,614,788	39,655	7,473	943	1,854,831	3,517,690
Clay and clay products	21,023,296	14,316,951	1,451,937	38,136	7,623,543	44,453,863
Diamonds	92,126,786	1,220,301,682	249,852	1,328,760	1,054,650,530	2,368,657,610
Dolomite	25,114,870	-	-	-	7,498,535	32,613,405
Feldspar	-	30,000	-	-	-	30,000
Fluorspar	7,544,649	527,510	508,221	228	871,832	9,452,440
Glass and glassware products	572,952,540	28,295,265	4,378,391	1,403,096	22,063,684	629,092,976
Granite	44,890,802	1,638,874	914,401	39,084	1,480,430	48,963,591
Graphite	45,203,812	6,467,220	574,280	1,716,320	4,440,529	58,402,161
Gypsum	90,744,116	346,045	40,557	37,457	1,004,980	92,173,155
Iodine	3,261,092	373,829	6,324	-	190,255	3,831,500
Lime	67,995,926	-	4,452	-	264,521	68,264,899
Limestone flux and other limestone	22,451,151	5,364,466	1,909,417	-	13,318,206	43,043,240
Marble, travertine and other calcareous stones	24,807,566	1,880,626	451,818	-	608,767	27,748,777
Mica	10,727,011	607,993	108,994	2,064,100	1,590,769	15,098,867
Mineral pigments	151,468,794	835,606	618,049	33,129	9,429,972	162,385,550
Nepheline syenite	103,665,540	954,015	693,273	882,381	4,410,630	110,605,839
Pearls	1,223,835	-	382	-	387,572	1,611,789
Peat	415,691,348	601,933	355,495	10,925,070	20,481,009	448,054,855
Phosphate and phosphate compounds	84,940,053	3,143,851	209,586	784,749	10,455,648	99,533,887
Potash and potassium compounds	3,605,715,071	16,031,443	705,416,403	1,737,692	2,530,490,897	6,859,391,506
Salt and sodium compounds	662,719,522	6,263,555	4,368,166	32,781,217	64,547,748	770,680,208
Sand and gravel	71,235,243	10,274	200	1,962	9,219,457	80,467,136
Sandstone	226,477	5,734	-	-	-	232,211
Silica and silica compounds	76,998,155	5,007,648	481,474	160,786	2,696,364	85,344,427
Slate	5,148,186	4,809,870	-	187,316	101,429	10,246,801
Sulphur and sulphur compounds	299,330,969	2,144,807	131,840,409	-	337,501,490	770,817,675
Talc, soapstone and pyrophyllite	52,565,696	7,262	504,852	-	127,896	53,205,706
Titanium oxides	230,766,977	12,430,256	2,513,796	56,911	31,188,221	276,956,161
Other nonmetals	669,300,404	16,458,947	9,147,661	2,494,490	41,676,097	739,077,599
Other structurals	191,295,493	6,998,059	1,504,142	285,550	27,585,113	227,668,357
Total Non-metals	**8,935,883,048**	**1,373,756,627**	**878,382,085**	**67,117,370**	**4,256,860,173**	**15,511,999,303**

MINERAL FUELS	U.S.A.	European Union (EU-28)	China	Japan	Other Countries	Total
Coal	462,760,173	361,963,726	570,266,066	963,179,239	1,443,406,495	3,801,575,699
Coke	13,657,237	-	4,000	-	406,559	14,067,796
TOTAL MINERAL FUELS	**476,417,410**	**361,963,726**	**570,270,066**	**963,179,239**	**1,443,813,054**	**3,815,643,495**
TOTAL MINING DOMESTIC EXPORTS	**50,454,928,840**	**18,341,297,185**	**4,613,290,414**	**3,021,109,309**	**15,529,527,936**	**91,960,153,684**

Sources: Natural Resouces Canada; Statistics Canada.
- Nil.
Note: 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 11

TOTAL IMPORTS OF MINERALS AND MINERAL PRODUCTS, BY COMMODITY AND COUNTRY OF IMPORT, 2015

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NON-METALS	U.S.A.	European Union (EU-27)	China	Mexico	Other Countries	Total
Aluminum	3,879,156,432	359,902,876	613,540,826	37,670,813	1,695,683,335	6,585,954,282
Antimony	1,067,064	710,921	12,748,773	153,738	3,201,049	17,881,545
Barium	4,402,424	1,697,564	1,613,455	-	98,327	7,811,770
Beryllium	593,531	4,312	-	99,960	474	698,277
Bismuth	1,672,700	238,240	1,992,062	-	152,136	4,055,138
Cadmium	3,606,008	8,022,222	5,065,329	-	3,547,666	20,241,225
Calcium metals	59,016,471	5,813,943	937,146	145,814	1,210,813	67,124,187
Chromium	6,129,620	10,551,195	5,958,419	511,782	60,974,484	84,125,500
Cobalt	21,973,901	14,242,088	13,796	-	16,744,759	52,974,544
Copper	1,802,922,543	165,358,568	163,752,618	111,998,678	979,140,882	3,223,173,289
Gallium	92,850	4,272	123,778	-	5,952	226,852
Germanium	7,260,944	706,059	1,565,242	472	4,802,337	14,335,054
Gold	1,659,959,288	1,447,270,529	3,522,654	216,655,715	6,366,347,733	9,693,755,919
Hafnium	38,156	8,463	258,211	-	8,600	313,430
Indium	546,320	349,490	137,017	-	35,561	1,068,388
Iron and steel	14,032,432,295	2,622,732,954	3,266,360,220	1,109,143,351	3,456,491,738	24,487,160,558
Iron ore	667,583,905	19,694,849	8,047	580	4,383,353	691,670,734
Lead	233,989,286	8,263,466	7,836,767	29,111,146	123,033,981	402,234,646
Lithium	28,611,813	6,926,018	13,503,465	405,480	37,477,735	86,924,511
Magnesium and magnesium compounds	69,438,714	8,442,882	187,830,045	988,061	15,368,687	282,068,389
Manganese	158,399,434	12,408,432	28,674,150	7,756,677	174,891,359	382,130,052
Mercury	779,439	6,138,702	460,563	28,401,792	5,812,332	41,592,828
Molybdenum	65,570,193	5,168,997	2,836,038	1,291,525	5,815,857	80,682,610
Nickel	406,476,097	197,367,639	11,708,420	1,433,176	174,844,723	791,830,055
Niobium	26,461,212	1,851,106	415,231	-	33,629,471	62,357,020
Platinum group metals	111,439,612	36,060,075	62,894	124,907	198,753,622	346,441,110
Rare earth metals	361,657	1,097,337	1,829,285	-	199,082	3,487,361
Rhenium	12,059	-	-	-	-	12,059
Selenium	324,842	477,804	5,764	168,863	3,639,016	4,616,289
Silicon	8,642,359	185,086	22,149,424	67,977	51,935,757	82,980,603
Silver	1,019,295,457	249,896,044	46,693,499	145,659,542	1,159,668,740	2,621,213,282
Strontium	41,847	429,150	3	345,257	4,800	821,057
Tantalum	640,672	63,915	50,379	382	64	755,412
Tellurium	1,960,627	396,100	1,107	-	9,160,301	11,518,135
Thallium	3,014	-	-	-	-	3,014
Tin	19,381,513	1,214,275	8,246,582	340,400	61,851,357	91,034,127
Titanium metal	105,362,428	17,847,222	17,381,297	24,348	63,558,498	204,173,793
Tungsten	11,934,502	2,375,929	4,068,611	3,142	2,539,827	20,922,011
Uranium and thorium	107,130,762	22,051,234	215,924	1,628	458,740,776	588,140,324
Vanadium	3,367,342	7,937,989	892,374	-	14,441,730	26,639,435
Zinc	444,368,559	24,379,068	4,738,341	73,930,435	295,355,531	842,771,934

Zirconium	55,704,848	4,719,739	160,000	-	3,452,521	64,037,108
Other metals	6,099,494,687	1,382,529,792	2,565,271,227	1,597,666,840	2,478,310,470	14,123,273,016
Grand Total	**31,127,647,427**	**6,655,536,546**	**7,002,628,983**	**3,364,102,481**	**17,965,315,436**	**66,115,230,873**

NON-METALS	U.S.A.	European Union (EU-27)	China	Mexico	Other Countries	Total
Abrasives	223,971,819	115,764,318	47,436,157	9,814,990	119,420,859	516,408,143
Arsenic	61,583	71	101,098	-	9,422	169,855
Barite and witherite	13,922,815	544,596	9,842,597	202,023	6,223,312	33,172,460
Boron	25,189,653	1,849,113	3,290,493	-	15,802,498	47,853,495
Calcium (Industrial minerals)	2,802,059	23,048	-	616	1,112,951	4,460,725
Cement	545,680,627	53,210,840	71,960,605	5,272,494	97,482,228	794,708,064
Chlorine and chlorine compounds	110,175,600	8,779,718	11,846,198	2,088,528	6,452,041	139,340,587
Chrysotile (Asbestos)	121,130,102	7,933,910	9,598,518	2,561,840	14,000,873	156,935,396
Clay and clay products	386,123,457	281,808,287	487,067,360	88,382,005	174,168,515	1,422,560,063
Diamonds	93,133,542	40,888,051	4,604,563	-	425,283,990	541,083,003
Dolomite	19,078,118	45,275	163,070	-	46,030	19,294,048
Feldspar	970,919	477	-	-	49	974,501
Fluorspar	20,948,334	2,341,823	6,494,844	31,513,286	3,284,032	71,219,678
Glass and glassware products	2,082,441,738	278,742,677	493,811,029	185,124,101	122,902,620	3,192,838,701
Granite	12,882,672	22,044,399	28,405,252	151,416	89,571,090	149,624,880
Graphite	234,070,263	113,897,096	150,659,438	4,702,442	45,604,609	545,058,457
Gypsum	193,407,396	1,642,103	688,665	5,418,901	359,109	201,520,763
Iodine	6,342,273	44,239	3,191	-	11,853,242	18,402,201
Lime	55,151,759	1,106,049	1,777	-	20,713	56,291,193
Limestone flux and other limestone	32,244,452	479,652	2,258,236	-	967,737	35,309,781
Marble, travertine and other calcareous stones	16,593,085	41,175,509	38,674,236	2,595,958	54,006,337	151,201,732
Mica	4,390,031	1,939,037	171,931	2,595,958	1,432,946	8,246,339
Mineral pigments	152,691,774	41,071,092	5,534,165	18,077	15,104,781	216,090,433
Nepheline syenite	181,563	-	-	-	10,523	187,375
Olivine	930,877	1,894,429	29,885	802	838,624	4,011,473
Pearls	11,746,896	2,226,978	23,596,068	74,945	6,904,054	45,202,559
Peat	12,628,896	1,125,842	14,115	417	3,079,124	18,076,480
Perlite	17,127,609	2,870,527	53	348	-	20,073,903
Phosphate and phosphate compounds	747,400,894	13,794,733	12,112,727	10,134,949	135,990,439	958,704,075
Potash and potassium compounds	102,014,781	10,652,435	5,616,467	537,918	15,185,486	133,639,345
Salt and sodium compounds	484,259,232	39,456,285	51,938,192	19,983,941	90,234,138	685,107,386
Sand and gravel	17,836,142	45,907	990,765	86,636	297,908	19,296,771
Sandstone	1,494,502	69,296	302,745	-	5,367,224	5,882,533
Silica and silica compounds	326,449,598	18,948,010	38,330,218	4,459,538	11,255,728	400,902,956

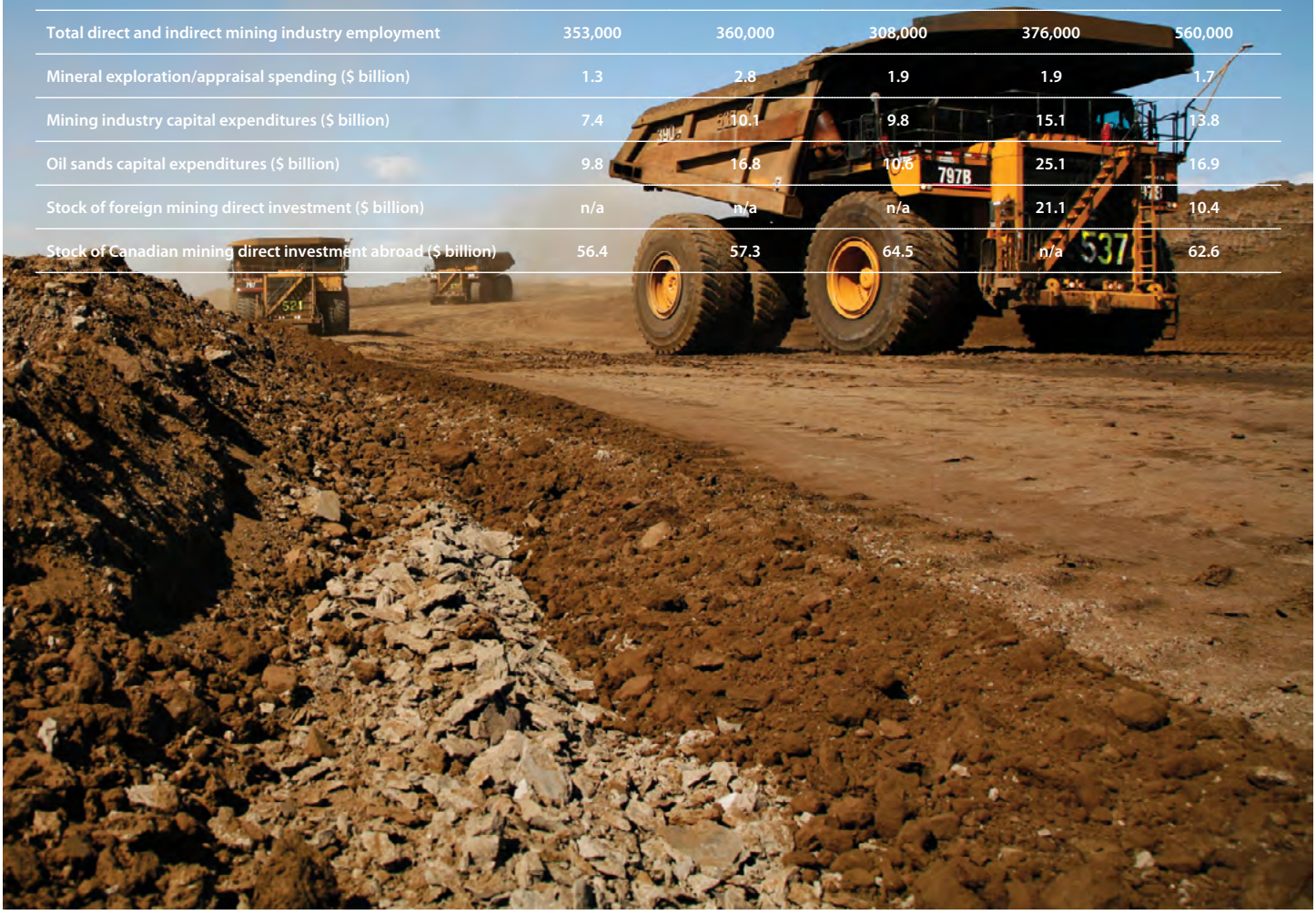
Slate	2,375,699	146,219	6,178,959	98	2,192,416	11,486,320
Sulphur and sulphur compounds	29,822,943	2,096,614	1,496,753	-	2,982,414	33,998,243
Talc, soapstone and pyrophyllite	13,891,444	995,257	87,094	-	324,111	15,323,639
Titanium oxides	193,219,004	15,859,436	19,488,158	18,979,464	15,777,960	262,056,255
Vermiculite	2,178,508	5,724	24,191	-	1,228,751	3,550,383
Other nonmetals	1,184,536,187	106,716,891	51,209,849	27,982,768	92,109,015	1,488,840,417
Other structurals	106,896,306	21,722,624	57,499,492	3,103,636	28,249,621	226,370,809
Total Nonmetals	**7,608,395,152**	**1,253,958,587**	**1,641,529,154**	**425,788,095**	**1,617,137,520**	**12,655,475,420**

MINERAL FUELS	U.S.A.	European Union (EU-27)	China	Mexico	Other Countries	Total
Coal	769,618,092	2,813,453	5,898,550	202,402	206,009,947	984,542,444
Coke	198,887,137	2,169,734	13,841,775	-	5,905,526	220,804,172
TOTAL MINERAL FUELS	**968,505,229**	**4,983,187**	**19,740,325**	**202,402**	**211,915,473**	**1,205,346,616**
TOTAL MINING IMPORTS	**39,704,547,808**	**7,914,478,320**	**8,663,898,462**	**3,790,092,978**	**19,794,368,429**	**79,976,052,909**

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

THE CANADIAN MINING INDUSTRY AT A GLANCE

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



n/a—not available

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