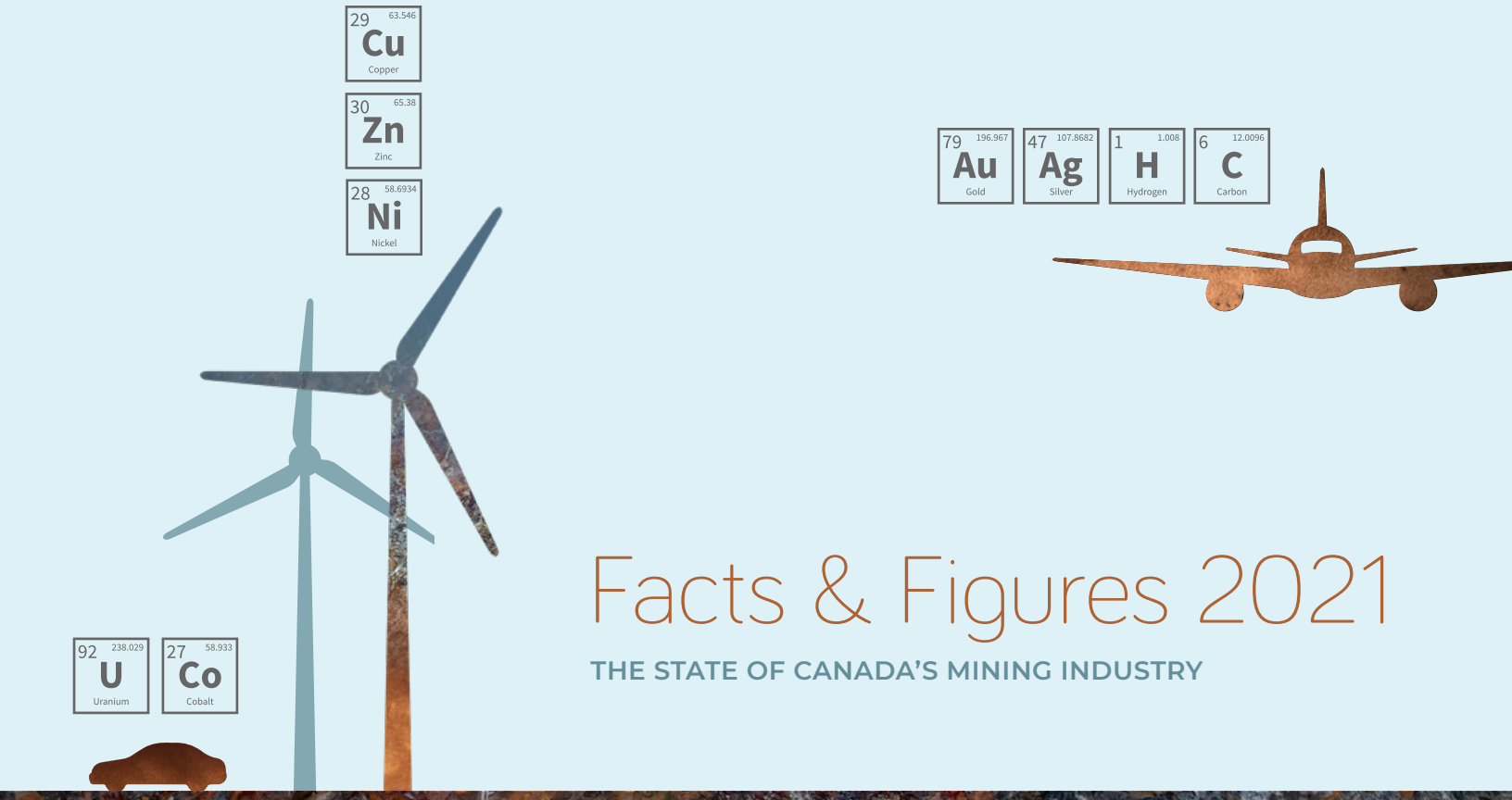


Facts & Figures 2021

THE STATE OF CANADA'S MINING INDUSTRY

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 2020, though some from prior years and some from 2021. Dollar amounts are expressed in Canadian dollars unless noted otherwise.

Author: Brendan Marshall, Vice President, Economic and Northern Affairs

Acknowledgments: This report could not have been prepared without the significant assistance of the dedicated staff of the Minerals and Metals Sector at Natural Resources Canada. Special thanks are also extended to Cynthia Waldmeier from MAC and Monique Laflèche.

Contents

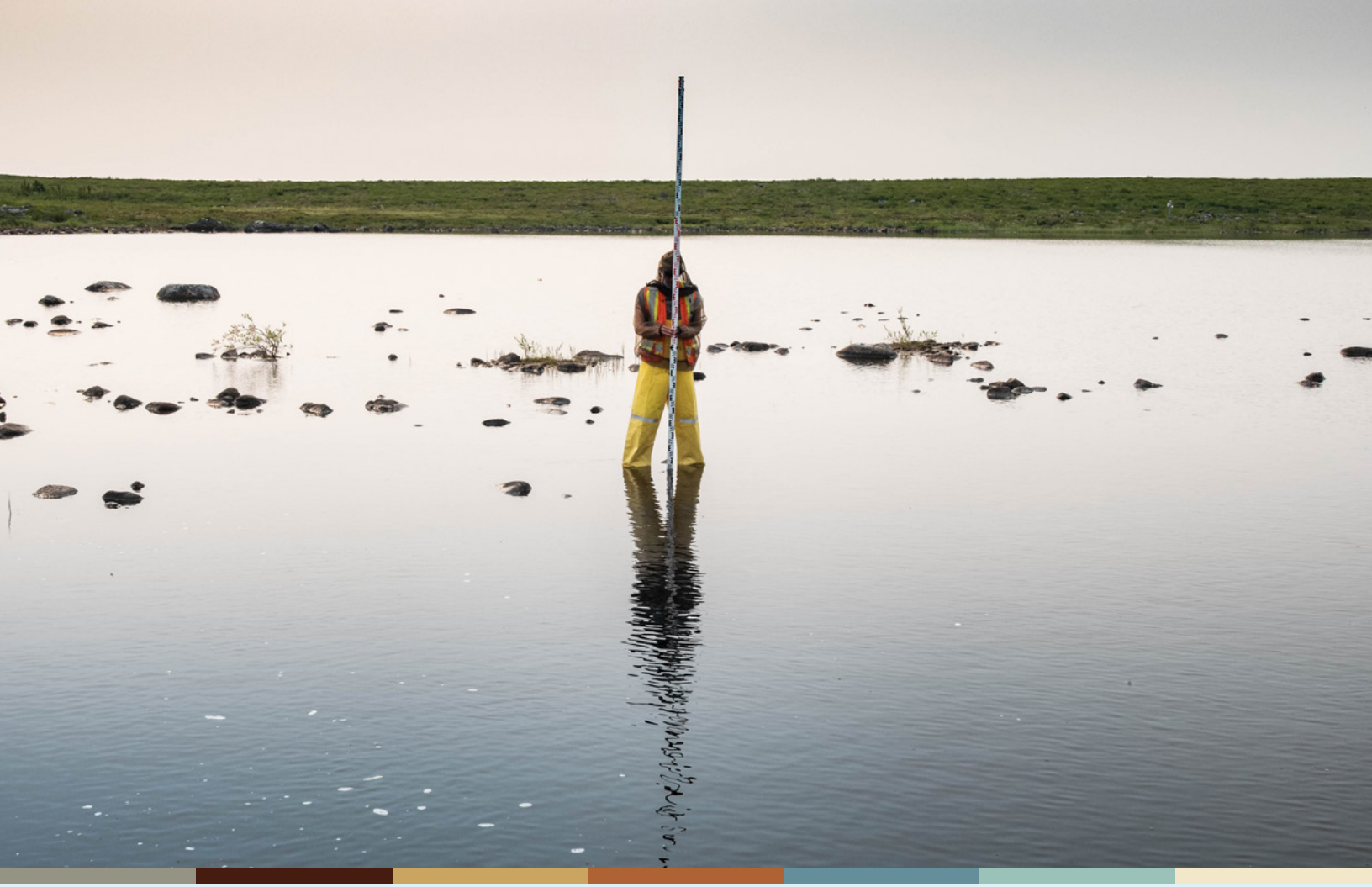
State of the Industry and Key Issues

As the world addresses the ongoing impacts of COVID-19, there is no doubt that the pandemic continues to loom large over all facets of our lives. COVID-19 has impacted all industries to some degree, and Canada's mining sector was not immune to its effects, but the past two years have highlighted the resiliency of the industry in the face of unprecedented challenges. As the supplier of the materials required for the manufacture of products essential for Canadians, it has been critical that supply chains stay open so that mined products are readily available for the people and businesses who rely on them. With minerals and metals, like gold, copper, carbon, zinc, uranium and nickel, being required inputs for healthcare and communications technologies, the mining industry continues to play an essential role in pandemic recovery efforts.

Globally, Canadian mining operations have withstood COVID-19 better than many peers in other jurisdictions, with companies adapting their health and safety policies to accommodate risks, build confidence, and ultimately return to production with comparably limited disruption. As people and their families continue to get vaccinated and follow public health guidelines, there is optimism in the mining sector that a return to normalcy may be ahead in 2022.

Alongside COVID-19, the other dominant issue facing the world today is climate change and the need for a lower-carbon future. Given that mining literally supplies the materials needed to build the tech that will lower our GHG footprint the question is not whether we require minerals and metals to reach our climate goals, but rather the extent to which Canada will be the supplier the world needs.

Our industry provides the building blocks for clean tech like wind turbines, solar panels, nuclear energy and EV batteries and there is no question that the world needs mining in order to achieve a greener future. At the same time, Canadian mining companies are increasingly recognizing the role they must play in lessening their carbon footprint and are taking the initiative to embrace innovative technologies and practices to do just that.



There are plenty of reasons why these materials should be mined in Canada. Our country produces some of the lowest carbon intensity mineral and metal products anywhere in the world and can and should play a much more significant role in providing the materials the world needs to get to net-zero. As a resource rich nation that sets the global standard of excellence in sustainable mining practices through the Mining Association of Canada's internationally recognized *Towards Sustainable Mining*® initiative, countries want us for how we go about our business, how we work with communities and raise standards. This program has received international attention with nine mining associations outside of Canada, including most recently Australia and Colombia, having adopted it to support meeting society's needs for minerals, metals and energy products in the most socially, economically and environmentally responsible way. There is no doubt that Canada is one of the safest jurisdictions for mining in the world, and we are recognized for bringing these standards and practices wherever we go.

As demand for minerals and metals continues to grow, there is also an increasing focus on what are referred to as "critical minerals" – vital in aerospace, defence, healthcare, telecommunications, computing and an array of innovative technologies. More than just rare earth elements, critical minerals encompass several minerals and metals critical to the functioning of both our economies and our livelihoods. One of the most frequently referenced benefits of enhancing Canada's critical minerals supply is due to the role these materials play as

essential inputs in low-carbon technologies. Another is the fact that our allies in Europe and the US need reliable supplies from countries with strong ESG credentials and few countries can meet this need better than Canada.

ECONOMIC CONTRIBUTION

The mining industry has contributed greatly to Canada's economic strength. The industry directly employs over 377, 000 workers across the country in mineral extraction, smelting, fabrication and manufacturing, and indirectly employs an additional 315,000 people. Proportionally, the mining industry is also the largest private sector employer of Indigenous peoples, providing over 16,500 jobs. In 2020, the minerals sector directly and indirectly contributed $107 billion, or roughly 5%, to Canada's total nominal GDP.

Mining's value to Canada doesn't stop at Canada's borders, however. Canada's mining sector has investments in over 100 countries worldwide and travelling with and working for the sector are the thousands of Canadian mining supply and services companies. Internationally, Canada is one of the leading mining countries and one of the largest producers of minerals and metals. Valued at $102 billion in 2020, mineral exports accounted for 21% of Canada's total domestic exports, selling a diversified array of minerals and metals abroad.

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 are the world's number one mining and exploration listing venues, where 34%, or $7.5 billion, of global mining equity capital was raised in 2020.

Other evidence of the industry's vast economic reach is that mining is the single largest industrial customer group of Canada's railways and is a major user of Canada's ports. Annually, the industry accounts for approximately 50% of total rail freight revenue generated and is the largest single shipping sector by volume by both rail and marine modes.

A STATE OF TRANSITION

Canada has long been the dominant global mining nation—in mineral production, mining finance, mining services and supplies, and sustainability and safety. However, there are signs that this leadership position is slipping, which has the potential to jeopardize Canada's ability to seize new opportunities for growth. While 2020 saw a modest increase in the value of mining projects planned and under construction from 2020 to 2030 (by $2 billion year-over-year), the total 10-year projected value ($82 billion) remains nearly 50% below the 2014 level of $160 billion.

Critical to bolstering the industry's domestic and international leadership is a predictable and consistent domestic policy and regulatory environment, with proactive and bold policy to position the country for longer term success. This is particularly important now more than ever given the opportunity before Canada to supply the materials, specifically critical minerals, needed for the low-carbon transition.

FEDERAL POLICIES AND CANADIAN MINING COMPETITIVENESS

As the federal government continues to weigh when and how best to bolster the economy in support of ongoing COVID-19 recovery efforts, MAC and its members recommend focusing on the following areas to position Canada for critical minerals success:

Economic Development, Regulatory Certainty and Investment Competitiveness

Acknowledging there is fierce global competition for finite exploration and mine development investment dollars, that Canada's economy is dependent on foreign direct investment, and that tax competitiveness and regulatory certainty are critical determinants of Canada's investment attractiveness, it is essential that a number of critical measures be considered. These include the effective and efficient regulation of the mining industry, including sound implementation of the federal *Impact Assessment Act*, access to prospective lands, and continued and expanded investments in remote and northern infrastructure.

Advancing the Participation of Indigenous Peoples in the Minerals Sector

The Canadian mining industry is a leader in Indigenous engagement, exemplified in part through the over 500 agreements signed between mining and exploration companies and Indigenous communities or governments. Governments can support enhanced participation of, and partnerships with, Indigenous communities in the sector through foundational social investments in areas such as health, education and housing, and by targeting funding for skills training and entrepreneurship to assist Indigenous peoples in securing employment and business development opportunities generated by the industry.

Environment

The Canadian mineral exploration and mining industry is well-positioned to play a pivotal role in the low-carbon economy as the provider of the raw materials necessary for innovation in many other sectors. For the federal government's "Mines to Mobility" strategy to work, policy must bolster and strengthen Canada's critical mineral supply chains in all regions of Canada, both on and off grid. Addressing climate change, while preventing carbon leakage, is critical to ensuring Canada's "best-in-class" mining sector becomes a supplier of choice to meet global demand for raw materials in the most sustainable and environmentally responsible way possible. Respecting the country's biodiversity also continues to be a priority for the sector and ensuring appropriate approaches to conserving species at risk will play a pivotal role in Canada's exploration and mining future.

Science, Technology and Innovation

Geoscience and innovation continue to be focal points for the mineral exploration and mining sector. Federal, provincial and territorial governments should expand rigorous geological studies across Canada, particularly for mapping of remote regions in greater detail. Innovation, in everything from autonomous vehicles and mine electrification, to rare earth separation and manufacturing, is increasingly

important to the sector. By investing in these technologies and providing financial support to catalyze private sector innovation investments, real progress can be made in energy efficiency, environmental protection, business productivity and greater independence in all aspects of critical minerals development and the advanced manufacturing that depends on them.

Skills Training

Investments in human resources and skills training are essential for the sector. Increasing collaboration between governments, industry and educational institutions to ensure new entrants to the mining industry have the required skills is particularly important. It is also essential that governments work together to enhance support for initiatives focused on equity, diversity and inclusion in the mineral exploration and mining sector.

Global Leadership

Supporting the Canadian mining industry, including the continued expansion of market access through free trade and investment agreements, is critical to its future success. Canada is a global leader in responsible business conduct, and its leading practices should be promoted by governments to advance Canada's development goals and expand the benefits that exploration and mining activity brings to communities around the globe. The federal government should continue to work with the private sector, including Canadian exploration and mining companies operating abroad, to leverage Canadian development activities and realize better outcomes for communities.

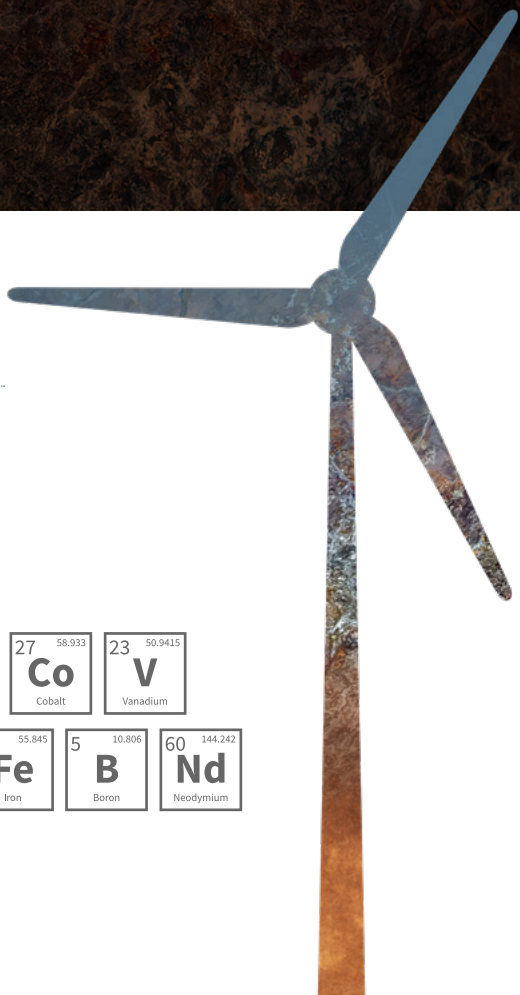
Minerals and Metals are Essential to Our Lives

The COVID-19 pandemic is undoubtedly the defining global health crisis of our time. Throughout, the Canadian mining industry's priority remains on protecting the health and safety of employees and the communities near its operations, while continuing to responsibly generate the jobs, wealth and critical products that support Canadian prosperity.

PRODUCTS THAT RELY ON MINING

WIND TURBINES

When we explore for minerals and metals we are finding renewable sources of energy too: Way up in northern Quebec, Glencore's Raglan Mine is replacing diesel fuel with wind power. The wind turbine and energy storage facility – the first in Canada – has helped reduce the mine's greenhouse gas emissions and has the potential to transform the Arctic's energy landscape.



66 162.500 Dy Dysprosium
6 12.0096 C Carbon
28 58.6934 Ni Nickel
27 58.933 Co Cobalt
23 50.9415 V Vanadium
29 63.546 Cu Copper
14 28.084 Si Silicon
30 65.38 Zn Zinc
42 95.95 Mo Molybdenum
3 6.938 Li Lithium
26 55.845 Fe Iron
5 10.806 B Boron
60 144.242 Nd Neodymium

PRODUCTS THAT RELY ON MINING

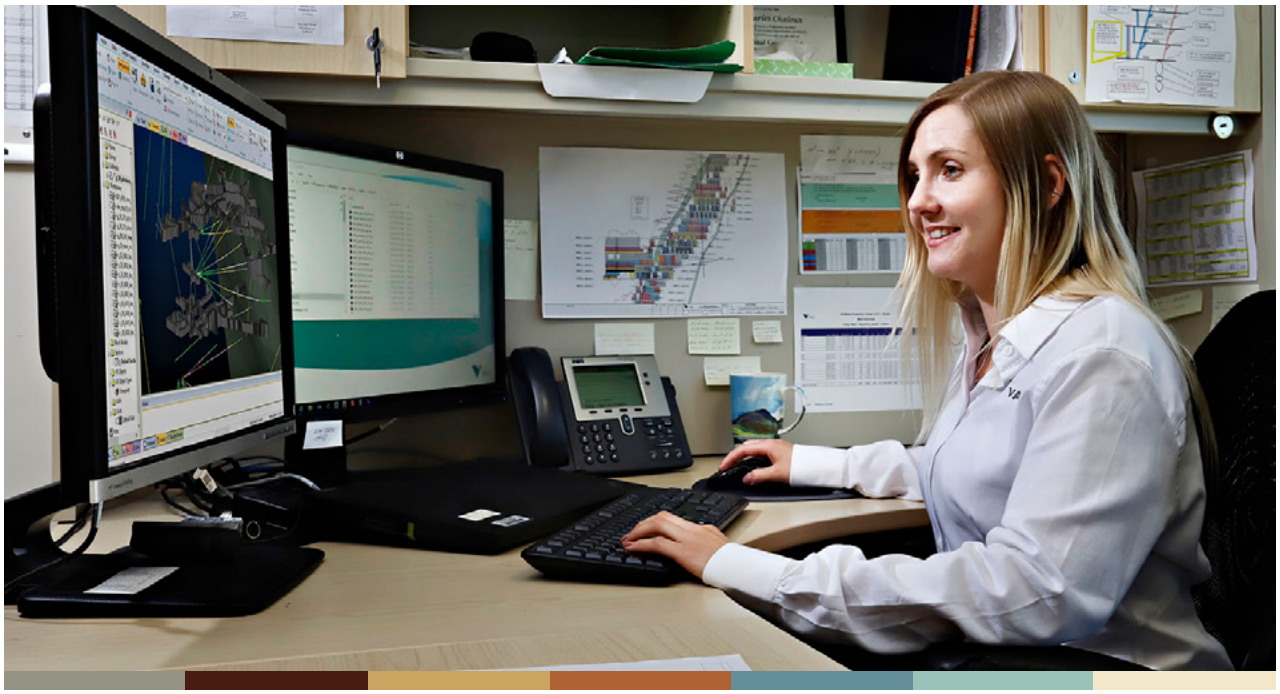
- **Healthcare**
  gold, copper, aluminum, carbon, uranium, zinc
- **Solar panels**
  copper, iron ore, titanium, silver, gallium, indium
- **Batteries**
  nickel, cadmium, lithium, cobalt
- **Circuitry**
  gold, copper, aluminum, steel, lithium, titanium, silver, cobalt, tin, lead, zinc
- **Smartphones**
  silicon, boron, lead, barium, strontium, phosphorus, indium, gold
- **Electric cars**
  copper, lithium, aluminum, nickel, cadmium, cobalt, zinc
- **Wind turbines**
  steelmaking coal, iron ore, copper, nickel
- **Energy**
  uranium, oil sands, petroleum products
- **Musical instruments**
  copper, silver, steel, nickel, brass, cobalt, copper, iron, aluminum
- **Sports equipment**
  graphite, aluminum, titanium, calcium carbonate, sulphur

Our modern lives depend on mining. From the critical minerals and energy needed to build and propel clean transportation, to the materials without which smartphones, computers and digital connectivity would be impossible, to the inputs for critical medical equipment needed to combat COVID-19, such as rapid test kits, personal protective equipment and antimicrobial surfaces, the world needs responsible mining.

Because the mining industry is vital to daily life and Canada's future, the relationship between the opportunities and challenges it faces and the public policies and regulations that govern its activities must be understood by decision makers. Historically, Canada has profited from low-cost mineral and metal products, good jobs and significant wealth development opportunities – benefits that Canadians overwhelmingly want to persist into the future. With demand for minerals and metals expected to grow as both the Canadian and global economy recover from the COVID-related downturn, and clean-technology development accelerates, Canada's mining industry is proud to be recognized as a responsible producer, providing global leadership in corporate social responsibility and environmental stewardship.

SECTION 1

Mining and the Canadian Economy



The social mobility limitations essential to combatting the COVID-19 pandemic – and the associated economic and supply-chain constraints – were disruptive on a global scale unprecedented in a generation, remain ongoing in varying degrees within Canada and internationally, and are likely to persist for the foreseeable future. Year-over-year, however, due largely to the herculean efforts to procure, distribute and deliver COVID-19 vaccinations en masse, the return to economic and domestic normalcy is closer than at any point since the pandemic began.

Just as economies are not immune to shocks, the mining industry is not unique in experiencing and needing to adapt to the social and economic consequences of COVID-19. The industry in Canada – compared to its counterparts in other jurisdictions and other industrial sectors within Canada – has rebounded more quickly. What follows is an overview of economic developments and indicators that help contextualize the economic trajectory of Canada's mining sector since the outset of the pandemic and into the future.

GLOBAL ECONOMIC TRENDS

COVID-19 caused the biggest global economic downturn since the Great Depression in the 1930s. In the autumn of 2020, the International Monetary Fund (IMF) released its October 2020 World Economic Outlook, entitled: *A Long and Difficult Ascent*. The near-term outlook was calling for global

growth at 4.4%, and an estimated loss of $3.94 trillion in economic activity around the world. When juxtaposed against tens of trillions (and counting) of dollars in stimulus spending to prevent economic collapse, the extent of the impact that COVID-19 has had on the global economy takes greater shape.

While distressing, retrospectively, global economic growth shrank less than expected in 2020 (by -3.1%), and recent growth in 2021 – projected at 5.9% – exceeds last year's expectations by 0.7%. While the economic volatility caused by COVID-19 was massive – akin to roughly a lost year of global economic growth – the extent of the damage has not proven to be as bad as originally anticipated. This suggests that stimulus programs enacted by governments around the world were largely successful when measured against their economic objective of staving off worst-case economic scenarios, and positioning economies for a more rapid rebound than otherwise would have been possible.

Concurrent with this economic contraction was a massive – if temporary – decline in GHG emissions. The first half of 2020 saw an unprecedented decline in CO_2 emissions – larger than during the financial crisis of 2008, the oil crisis of 1979, or even World War II. An international team of researchers has found that in the first six months of this year, 8.8 % less carbon dioxide was emitted than in the same period in 2019 – a total decrease of 1,551 million tonnes. This sharp linkage between general economic activity and carbon emissions has motivated governments around the world to develop programs to build back better, a key component of which is accelerating action on climate change, with targeted policy proposals to advance cleaner economic activities, including technology development and deployment.

Looking ahead, global economic recovery is projected to continue, with growth forecast at 4.9% in 2022. As public health restrictions are relaxed in countries with elevated vaccination uptake, economic demand has accelerated. Supply has been slower to respond, causing upward pressure on prices for everything from groceries to automobiles. While price pressures were widely expected by central bank governors to subside in 2022, recent updates have included revisions on inflation in their messaging as prospects remain uncertain and global supply chain congestion persists.

CANADIAN ECONOMIC OUTLOOK

In its July 2021 Monetary Policy Report, the Bank of Canada forecasted growth of about 6% this year, slowing to about 4 ½ % in 2022 and 3 ¼ % in 2023. This represents a significant turnaround from the economic depth due to COVID in spring 2020. At its lowest point, according to the Conference Board of Canada, Canada's real GDP had fallen 18% from February 2020's (pre-COVID) level, three million Canadians were out of work (amounting to a 15.6% decline in employment), and total hours worked plummeted a staggering 28%.

To support Canadians and businesses adversely affected by the pandemic, the federal government deployed its largest annual federal spending program in the post-war era. The goal, through liquidity programs, emergency benefits and wage subsidies, was to help bridge Canadians and businesses adversely affected by the economic contraction back to more normal economic circumstances. An important consideration, too, was ensuring that affected businesses were supported to enable an expedient resumption of operations as containment policies were gradually lifted and affected segments of the economy permitted to reopen. These policies – many of which were developed and deployed in the spring of 2020 – have persisted in various shapes and forms over the course of the pandemic.

As of September 2021, the national unemployment rate had returned to 6.9% – just below the level seen prior to the pandemic, suggesting a rebalancing as economic momentum accelerates. While positive, other structural employment challenges persist, with nearly 400,000 Canadians classified as "long-term unemployed" – roughly twice the number since February 2020 – having been without work for a period in excess of six months. Undoubtedly, as the pandemic has changed the nature of work in some industries dramatically, and with certain segments of the economy in some regions still operating under public health capacity restrictions, more time is needed for certain employment demographics to re-equilibrate.

Ongoing pandemic and economic uncertainty continues to weigh on fiscal policy makers, whose decisions on how, when, and for how long to stimulate the economic recovery carries much weight. On the backdrop of recent increases in

sovereign debt – amassed by government programs designed to support their citizens through the disruption – new spending is juxtaposed against an economic recovery that is gaining momentum, but uneven across economic sectors, and on the backdrop of inflationary risks and significant global supply chain disruption, both of which have the potential for destabilizing effects. Balancing fiscal fundamentals while investing wisely toward a meaningful economic recovery will be the key focus of economic decision makers over the next 24 months, and critical to this success is ensuring policy coherence across the federal government to maximize optimal outcomes for the allocation of limited resources.

CANADIAN MINING INDUSTRY OUTLOOK

The effect of the pandemic on the Canadian mining industry was initially dramatic, but has abated as markets stabilized, as the sector was deemed essential by governments across Canada, and as public health guidance was safely normalized into day-to-day mine operations. While every Canadian mining operation was directly affected by COVID-19, with impacts varying depending on product and region – some of which remain ongoing – the most dramatic implications have subsided. Looking forward, while risks remain, the current stability the industry is experiencing vis-à-vis the pandemic is anticipated to persist so long as major outbreaks are prevented in Canada through continued vaccination uptake and consistent adherence to public health guidance.

Over the last 15 months as mining operations normalized, and as economies continue to gradually re-open, pent-up demand for raw materials has driven a sustained market rebound which some analysts have likened to a commodity super cycle. Prices for aluminum and nickel have reached 10-year monthly highs, while iron ore, gold and copper have reached all-time monthly highs, according to the World Bank's IndexMundi.

These buoyant commodity market dynamics are juxtaposed against a backdrop of dynamic economic and geopolitical factors that are anticipated to persist and evolve over the coming months and years, including:

- increasing geopolitical tension that is magnifying the precariousness of existing sources of critical minerals
- massive projected demand increases in the volume of raw materials needed to address climate change
- a persisting global supply chain disruption causing delays and shortages on the delivery of a myriad of goods and services

In response to these factors a growing body of federal policy actions that recognize the criticality of the Canadian mining industry to Canada's future prosperity – both domestically and internationally – has taken shape. Increasingly, the mining industry's importance to federal climate, Indigenous reconciliation and clean technology manufacturing policy objectives is crystallizing. Similarly, in relation to security and national defense contexts with Canada's international partners, the sector is increasingly understood as being of national strategic interest. Relevant policy actions include:

- The development, publication and ongoing role out of the Canadian Minerals and Metals Plan

> "China alone accounts for 80% of the US's Rare Earth Elements (REE) imports, 63 and 98% of the EU's, without which wind energy would not be possible. On the semiconductor supply chain, realisation of China's publicly-stated intent to 'reunify' with Taiwan by 2049 could also be a destabilising influence, given that Taiwan's largest chipmaker (TSMC) has 55% of the global market share."
>
> - *G7 ECONOMIC RESILIENCE PANEL REPORT*

- The publication of the Canadian Critical Minerals list
- The establishment of ongoing international critical minerals dialogues with the US, the EU, and other allies
- The addition of critical minerals and critical minerals supply chains to updated Guidelines on the National Security Review of Investments under Section 38 of the *Investment Canada Act*

Within this policy context, the establishment and expansion of the "mines to mobility" electric vehicle and battery supply chain objective into the revamped $8 billion Strategic Innovation Fund (SIF) as one of three priority pillars is indicative of the commitment to success. Investments to establish a Critical Minerals Centre of Excellence, initial R&D supports for rare earth element processing, and 2021 national campaign commitments to double the Mineral Exploration Tax Credit for listed critical minerals and to refocus SIF to prioritize battery grade material manufacturing underscore the renewed recognition of the sector's importance to Canada's future. These policy and programmatic decisions were made in concert with announced investments by First Cobalt, Ford, Chrysler and General Motors – in partnership with the federal and Ontario governments – to secure both battery and electric vehicle manufacturing in Canada. Most recently, announcements by Lion Electric, Britishvolt and StromVolt have built off this momentum.

> "Today, the discussion starts about how we use our lithium in Quebec; our nickel in Sudbury; our cobalt in northern Ontario; our aluminum from Quebec and British Colombia – to put Canadians to work."
>
> - JERRY DIAS, PRESIDENT, UNIFOR

To support this objective, the Mining Association of Canada (MAC) partnered with 15 other groups in the development of Clean Energy Canada's *Turning Talk into Action: Building Canada's Battery Supply Chain*, complete with recommendations on what additional policy and programmatic actions are required for Canada to succeed. Since then, the group has formed the Canadian Battery Task Force – in which MAC remains engaged – to advance these and new perspectives held to be critical for Canada's success. Of central importance is ensuring current policy incoherence between competing emissions abatement and clean technology manufacturing objectives is resolved. Doing so is essential to creating the investment confidence, regulatory certainty, and supply-chain resilience needed for Canada to succeed.

The provinces are also taking action in the critical minerals space. For example, the government of Quebec is pursuing its Plan for the Development of Critical and Strategic Minerals. This five-year initiative is intended to promote the development of minerals used in daily technologies such as cell phones and laptops, green energy technologies such as solar panels, nuclear energy and wind turbines, as well as technologies in the health sector. The plan lists eight critical minerals – minerals essential for the economy in limited supply including copper, tin and zinc – and 12 strategic minerals – minerals used in key sectors of the province's economy, such as battery minerals like cobalt, nickel and lithium – that will be specifically prioritized. The government will invest $90 million through 2025 in advancing geoscientific knowledge, providing financial support for exploration and R&D, and supporting companies in their development projects. Similar policy developments are being advanced by the governments of Ontario, Saskatchewan, Alberta and British Columbia.

The above initiatives are part of a broader trend of investments and economic transformation taking place globally. As the world more broadly transitions to a lower carbon economy, demand for a number of minerals and metals is going to increase substantially. A recent World Bank Group report, *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition* finds that the production of minerals, such a graphite, lithium and cobalt, could increase by nearly 500% by 2050, to meet the growing demand for clean energy technologies. It estimates that over 3 billion tons of minerals and metals will be needed to deploy wind, solar and geothermal power, as well as energy storage, required for achieving a below 2 degree Celsius future. The World Bank has modelled and forecast the increase in mineral and metal production required to produce the volume of clean technology needed to achieve stated Paris Agreement objectives.

As a leading producer of responsibly sourced mineral and metal products globally, Canada has an opportunity to become the world's leading supplier of inputs integral to a lower carbon economy. MAC's *Towards Sustainable Mining*® can help demonstrate responsible sourcing as it produces site-level performance data in key environmental and social areas. It is essential that Canada's role in the responsible sourcing of the mined materials necessary for green technology be prioritized.

MINING'S CONTRIBUTION TO THE CANADIAN ECONOMY

Mining is a significant contributor to the Canadian economy. The direct and indirect wages and employment of approximately 692,000 people across the country (of which 377,000 are direct jobs), taxes and royalties collected by governments, and the capital expenditures required for project development and operation are only some examples of the essential role it plays. Beyond its direct economic impact, the industry also supports many firms and sectors that supply miners with the goods and services they need to operate.

What follows throughout this publication is the presentation of the mining industry's economic and social contributions to Canada, as well as its environmental and operational performance across Canada and internationally, using the latest data available. MAC is reliant on the Government of Canada for much of the data published in these pages, and the latest year available for much of this data is 2020. For reasons above explained, 2020 is an outlier year in economic terms, and as such, 2020 data is unlikely in many cases to be representative of 2021 realities. Where possible, MAC will provide context to reconcile this data lag, but in many instances this may not be possible.

Contribution to Canada's GDP

Real GDP is used by policy makers, financial institutions and other businesses to help determine the economic health of a nation. Since real GDP measures the volume of goods and services produced, an increase in its value is a sign of a healthy economy while a decline indicates that the economy is not functioning to its full capacity.

Historically, the value of minerals and metals to Canada's economy has ranged between 2.7% and 4.5% of the country's real GDP. In 2020, the industry's contribution remained within this range at 3.4%.

2020 Contribution

The extractive industry, which combines mineral extraction with oil and gas extraction, contributed $148.4 billion, or 7.9%, to Canada's real GDP in 2020 (see Figure 1). By this measure – virtually unchanged as a percentage of the economy year-over-year – the extractive industry is the fourth largest of Canada's 18 industries, surpassed only by the services, real estate, and manufacturing sectors.

FIGURE 1: CANADA'S REAL GROSS DOMESTIC PRODUCT, BY INDUSTRY, 2009 - 2020

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
($ millions)												
All industries	1,572,167	1,626,420	1,679,460	1,710,429	1,754,173	1,803,636	1,820,026	1,839,614	1,901,971	1,955,465	1,990,316	1,888,604
Agriculture	24,841	24,314	25,051	25,568	31,191	27,843	29,472	31,698	32,505	33,423	36,175	39,021
Forestry and logging	3,158	3,650	4,015	3,937	4,049	4,210	4,259	4,030	3,975	4,034	3,691	3,629
Fishing, hunting and trapping	1,198	1,273	1,250	1,269	1,292	1,343	1,261	1,149	1,135	1,078	1,110	1,087
Support activities for agriculture and forestry	2,278	2,319	2,386	2,322	2,470	2,475	2,496	2,510	2,643	2,607	2,671	2,649
Mining (including milling) and quarrying, and oil and gas extraction	**107,584**	**118,732**	**127,019**	**124,527**	**131,044**	**141,409**	**138,548**	**137,737**	**151,162**	**161,367**	**160,537**	**148,473**
Support activities for mining and oil and gas extraction	12,754	15,787	18,710	19,078	19,330	20,178	14,202	12,316	15,175	16,436	14,767	9,955
Electric Power, gas and water utilities	37,605	38,120	39,343	38,954	38,986	40,238	40,378	41,355	41,811	42,599	43,080	41,960
Construction	112,031	120,684	125,224	134,959	140,705	144,292	141,540	135,332	139,994	142,999	142,734	138,471
Manufacturing	167,055	174,675	180,726	183,087	182,337	187,893	189,177	188,847	192,917	199,070	198,962	180,467
Trade, wholesale	76,472	82,196	88,268	91,307	95,136	97,589	94,554	94,375	97,721	100,979	102,745	100,446
Trade, retail	81,987	84,398	85,170	85,541	90,292	91,297	91,252	94,713	97,131	98,905	99,683	97,005
Transportation and warehousing	65,292	67,804	70,498	71,427	72,694	77,026	79,273	81,232	86,419	89,492	90,617	72,273
Information and cultural industries	52,387	53,477	54,233	54,677	54,374	56,093	57,459	59,632	61,829	63,120	65,496	64,277
Finance and insurance	97,543	99,608	103,037	104,910	108,794	111,860	117,338	121,395	130,338	133,055	136,914	143,302
Real estate and rental and leasing	191,372	197,550	203,706	210,099	215,896	221,964	228,557	234,096	240,893	245,937	252,547	255,753
Community, business and personal services**	201,982	202,358	208,929	215,169	220,313	230,830	232,623	235,341	240,291	246,215	253,512	223,353
Public administration	117,970	121,260	123,425	122,427	121,972	121,392	122,186	124,344	126,663	130,104	133,345	131,404
Health care and social assistance	116,496	118,268	120,311	122,167	122,326	124,252	126,065	129,007	130,551	134,582	138,941	130,698
Educational services	89,410	91,187	91,947	93,706	95,123	96,498	97,701	98,274	99,789	102,537	104,742	99,201

Source: Statistics Canada, Table 36-10-0434-01

Note: Values at Basic Prices in 2012 Constant Dollars

**Combination of Professional, scientific and technical services, Administrative and support, waste management and remediation services, Accommodation and food services, other services

The mining industry as a whole goes beyond extraction to include mineral manufacturing and needs to be carved out from the broader mining and oil and gas category. The mining industry's 2020 contribution to real GDP is detailed in Figure 2, which divides industry activity into four stages:

- **Stage 1**, extraction of minerals (metals, non-metals and coal): $34.6 billion
- **Stage 2**, primary metal manufacturing (smelting, refining, rolling, extruding, alloying and casting of primary metals): $9.4 billion
- **Stage 3**, non-metallic mineral product manufacturing (abrasives, lime, cement, glass and ceramics): $6.7 billion
- **Stage 4**, fabricated metal product manufacturing (forging, stamping and heat-treating to produce reinforcing bars, fabricated wire, cutlery, tools and hardware): $13.9 billion

FIGURE 2: CANADA'S REAL GROSS DOMESTIC PRODUCT, MINING, MINERAL MANUFACTURING, AND OIL AND GAS, 2009 - 2020

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
($ millions)												
Metal mines	12,734	13,186	14,461	14,669	16,296	17,605	18,883	19,497	19,668	19,455	19,859	19,982
Nonmetal mines	6,137	9,859	10,648	9,151	9,672	10,512	10,572	10,395	13,001	13,874	12,318	12,167
Coal mines	3,300	3,744	3,657	3,717	4,040	3,935	3,359	3,460	3,163	3,066	3,032	2,436
Total Mining	**22,171**	**26,789**	**28,766**	**27,537**	**30,008**	**32,052**	**32,814**	**33,352**	**35,832**	**36,395**	**35,209**	**34,585**
Primary metal manufacturing	9,313	10,624	11,271	11,151	10,785	11,637	11,495	11,243	11,653	12,090	10,992	9,351
Fabricated metal product manufacturing	12,429	12,962	14,019	15,052	15,434	15,368	14,819	14,039	14,118	15,172	15,866	13,876
Non-metallic mineral product manufacturing	5,815	5,958	6,076	6,215	6,098	6,219	6,140	6,196	6,495	6,753	7,020	6,713
Total Mineral Manufacturing	**27,557**	**29,544**	**31,366**	**32,418**	**32,317**	**33,224**	**32,454**	**31,478**	**32,266**	**34,015**	**33,878**	**29,940**
Oil and gas extraction	72,890	75,975	79,580	77,912	81,706	89,179	91,532	92,069	100,155	108,536	110,561	103,933
Petroleum and coal products manufacturing	12,525	11,821	11,315	11,396	11,331	11,637	11,645	11,160	11,303	10,935	10,565	9,127
Support activities for mining and oil & gas	12,754	15,787	18,710	19,078	19,330	20,178	14,202	12,316	15,175	16,436	14,767	9,955
Total Oil and Gas and Associated Manufacturing	**98,169**	**103,583**	**109,605**	**108,386**	**112,367**	**120,994**	**117,379**	**115,545**	**126,633**	**135,907**	**135,893**	**123,015**

Source: Statistics Canada, Table: 36-10-0434-01
Note: Values at Basic Prices in 2012 Constant Dollars

"Accelerate project permit timelines while still ensuring Canada is meeting the highest environmental, social, and governance standards, including Indigenous consultation and partnership."

- CLEAN ENERGY CANADA, *TURNING TALK INTO ACTION: BUILDING CANADA'S BATTERY SUPPLY CHAIN*

The difference between real and nominal GDP is that real GDP is only calculated in terms of expenditure, whereas nominal GDP is calculated by using current dollars, and is produced in terms of income and expenditure. Real GDP is better at illustrating the performance of a sector over time, whereas nominal GDP is useful to illustrate an industry's contribution to the economy in a given year. Accordingly, mining's nominal GDP for 2020 decreased year-over-year by 4% from $73.4 to $70.7 billion (see Figure 3). These numbers increase further when indirect contributions that the industry generates are factored in. These would include service consumption from third parties, such as railways and other service providers discussed further below.

FIGURE 3: CANADIAN MINERALS AND METALS SECTOR GDP (2007-2020)

NOMINAL GROSS VALUE ADDED (CURRENT DOLLARS)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2019-20 % diff.
($ millions)															
COMMODITIES															
Extraction	**23,347**	**25,877**	**17,533**	**25,336**	**32,892**	**26,444**	**24,862**	**23,888**	**22,821**	**22,159**	**25,324**	**28,833**	**28,568**	**28,751**	**1%**
Metallic minerals	16,198	13,218	8,210	13,056	16,766	14,132	14,105	13,568	12,565	13,063	14,294	15,374	16,196	17,765	10%
Non-metallic minerals	5,480	8,778	6,081	8,291	10,551	8,608	8,031	8,322	8,750	6,556	7,089	8,905	8,210	8,049	-2%
Coal	1,669	3,881	3,242	3,989	5,575	3,704	2,726	1,998	1,506	2,540	3,941	4,554	4,162	2,937	-29%
Services	**3,861**	**4,684**	**3,472**	**4,550**	**6,127**	**6,269**	**5,873**	**5,368**	**5,171**	**5,028**	**5,541**	**5,487**	**5,247**	**4,655**	**-11%**
Primary manufacturing	**19,294**	**18,018**	**12,417**	**13,443**	**15,076**	**14,221**	**12,976**	**14,052**	**13,869**	**13,832**	**14,575**	**16,392**	**16,401**	**15,518**	**-5%**
Primary metallic minerals products	12,435	11,733	7,191	8,157	9,605	8,538	7,432	8,312	8,281	8,289	8,744	10,129	9,862	9,305	-6%
Primary non-metallic minerals products	6,859	6,285	5,226	5,286	5,471	5,683	5,544	5,740	5,588	5,543	5,831	6,263	6,539	6,213	-5%
Downstream manufacturing	**18,380**	**17,534**	**15,537**	**16,527**	**18,664**	**20,226**	**20,731**	**21,455**	**21,898**	**21,284**	**22,440**	**22,863**	**23,608**	**21,168**	**-10%**
Secondary metal products	3,083	3,303	2,093	2,559	2,788	2,941	2,948	3,307	3,268	2,978	3,351	3,507	3,312	3,037	-8%
Tertiary metal products	11,014	10,491	9,191	9,294	10,463	11,604	12,358	12,452	12,558	12,299	13,310	3,274	3,223	3,066	-5%
Miscellaneous metal products	2,155	1,714	2,320	2,694	3,298	3,516	3,452	3,624	3,943	3,923	3,542	2,214	2,295	2,069	-10%
Services and custom work	2,128	2,026	1,933	1,980	2,115	2,165	1,973	2,072	2,129	2,084	2,237	13,868	14,778	12,996	-12%
Total minerals and metals	**64,882**	**66,113**	**48,959**	**59,856**	**72,759**	**67,160**	**64,442**	**64,763**	**63,759**	**62,303**	**67,880**	**73,575**	**73,824**	**70,092**	**-5%**

FIGURE 3: CANADIAN MINERALS AND METALS SECTOR GDP (2007-2020), CONTINUED

REAL GROSS VALUE ADDED (2012 CONSTANT PRICES)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2019-20 % diff.
($ millions)															
COMMODITIES															
Extraction	**28,684**	**29,156**	**21,903**	**24,822**	**27,440**	**26,446**	**27,087**	**28,120**	**28,768**	**29,177**	**31,431**	**31,960**	**30,860**	**30,305**	**-2%**
Metallic minerals	14,251	14,919	11,582	12,007	14,054	14,133	14,395	15,103	16,199	16,709	16,855	16,674	17,018	17,121	1%
Non-metallic minerals	10,700	10,305	7,032	9,085	9,740	8,608	8,708	9,582	9,638	9,446	11,814	12,609	11,194	11,058	-1%
Coal	3,733	3,932	3,289	3,730	3,646	3,705	3,984	3,435	2,931	3,022	2,762	2,677	2,648	2,126	-20%
Services	**5,248**	**5,779**	**4,188**	**5,184**	**6,148**	**6,269**	**5,899**	**5,462**	**5,074**	**4,490**	**5,036**	**5,524**	**4,969**	**4,579**	**-8%**
Primary manufacturing	**16,238**	**15,942**	**12,601**	**13,590**	**14,181**	**14,222**	**13,329**	**14,104**	**13,929**	**13,757**	**14,319**	**14,869**	**14,268**	**12,769**	**-11%**
Primary metallic minerals products	9,694	9,669	7,282	8,140	8,623	8,539	8,124	8,792	8,684	8,483	8,792	9,122	8,294	7,054	-15%
Primary non-metallic minerals products	6,544	6,273	5,319	5,450	5,558	5,683	5,205	5,312	5,245	5,274	5,527	5,747	5,974	5,715	-4%
Downstream manufacturing	**19,850**	**17,984**	**15,793**	**17,100**	**18,971**	**20,225**	**20,986**	**21,753**	**21,355**	**20,415**	**20,992**	**21,634**	**21,608**	**19,452**	**-10%**
Secondary metal products	3,072	3,254	2,184	2,721	2,862	2,940	3,170	3,506	3,571	3,444	3,778	3,782	3,495	3,132	-10%
Tertiary metal products	12,326	11,021	9,707	9,988	10,811	11,603	12,100	12,407	11,964	11,256	11,321	12,165	12,722	11,141	-12%
Miscellaneous metal products	2,354	1,867	2,199	2,591	3,280	3,517	3,485	3,497	3,519	3,524	3,684	3,364	3,070	3,057	-0%
Services and custom work	2,098	1,842	1,703	1,800	2,018	2,165	2,231	2,343	2,301	2,191	2,209	2,323	2,321	2,122	-9%
Total minerals and metals	**70,020**	**68,861**	**54,485**	**60,696**	**66,740**	**67,162**	**67,301**	**69,439**	**69,126**	**67,839**	**71,778**	**73,987**	**71,705**	**67,105**	**-6%**

Source: Statistics Canada. Table 38-10-0285-01 - Natural resources satellite account, indicators, annual (dollars unless otherwise noted) (accessed: August 20, 2020)

Table 38-10-0285-01 Natural resources satellite account, indicators, annual (dollars x 1,000,000)

Survey or program details: National Gross Domestic Product by Income and by Expenditure Accounts - 1901

MINING IN THE PROVINCES AND TERRITORIES

Year-over-year, mineral production values were projected to decrease for 2020 in eight of Canada's 13 provinces and territories. This is unsurprising given the heightened period of volatility and resulting period of market and operational disruption caused by COVID-19. The production values for three out of four of Canada's leading mining jurisdictions were projected to increase with Quebec forecast to post the largest gain in absolute value by more than $874 million and Nunavut, Canada's fastest growing mining region, forecast to post the second largest absolute gain of $754 million – a number that would likely have been substantially larger given the extent of COVID-related disruptions in the territory. Overall, total production value is down 8%, or more than $4.2 billion (see Figure 4 for more information). When reflecting on the scale of national and international economic and supply chain disruption caused by COVID-19, it is remarkable how resilient the industry's performance was.

Mining's direct contribution to 2020 real GDP totaled $67.5 billion while the sector's direct contribution to nominal GDP totaled $70 billion.

Regional Distribution of Mining

Figure 5 illustrates the geographical location of Canada's mining clusters and active mineral development regions (details in Annex 1). The Northwest Territories are 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 (for detailed mineral production by province and territory, see Annex 2 and Annex 3).

Canada's mining business has significant ties to its major cities. Some of the largest Canadian and international mining companies are headquartered or have a significant presence in urban centres, including: Vancouver (Newmont, Teck Resources Limited), Saskatoon (Cameco Corporation, BHP), Calgary (Canadian Natural Resources Limited, Suncor Energy Inc.), Toronto (IAMGOLD, Vale, Glencore) and Montreal (ArcelorMittal, Iron Ore Company of Canada, Rio Tinto Alcan).

Vancouver is the global centre of expertise for mineral exploration. Some 800 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 (TSX) and TSX Venture Exchange are the world's number one mining and exploration listing venues, where much of the world's total mining equity capital is raised annually. The city itself hosts mining company head offices, as well as several hundred mining suppliers, consulting firms and service providers.

As home to Rio Tinto, 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, Fort McMurray 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

A correlation exists between production values and expenditures on resource development. The top four provinces by production value in 2020 – Ontario, Quebec, British Columbia and Saskatchewan – also led in expenditures on mineral resource development (see Figure 6). Of the $13.5 billion invested in mine complex development in Canada, combined spending across these four provinces exceeded $10.9 billion (80% of the total).

CANADIAN MINES IN 2020	PROVINCES WITH THE MOST METAL MINES	MAIN TYPES OF NON-METAL MINES	VALUE OF MINING IN 2020
1,001 Total mining establishments	24 Quebec	571 Sand and gravel	$43.8 billion Canada-wide
70 Metals	18 Ontario	265 Stone	TOP 4 PROVINCES: $11.6 billion Quebec
931 Non-metals	9 British Columbia	50 Peat	$10.7 billion Ontario
			$7.2 billion British Columbia
			$4.7 billion Saskatchewan

FIGURE 4: CANADA, VALUE OF MINERAL PRODUCTION BY PROVINCE AND TERRITORY, 2010 AND 2020 [P]

Province/Territory	2010 ($ current millions)	2010 (%)	2010 RANK	2020 [p] ($ current millions)	2020 [p] (%)	2020 [p] RANK
Quebec	6,794.7	16.9	3	11,649.4	26.5	1
Ontario	7,573.7	18.9	1	10,722.3	24.4	2
British Columbia	6,943.0	17.9	2	7,295.2	16.6	3
Saskatchewan	6,488.0	16.2	4	4,711.8	10.7	4
Newfoundland and Labrador	4,583.1	11.4	5	2,964.6	6.8	5
Nunavut	317.1	0.8	10	2,070.3	4.7	6
Alberta	1,957.8	5.7	6	1,408.8	3.2	7
Northwest Territories	2,044.8	5.1	7	1,151.6	2.6	8
Manitoba	1,694.8	4.2	8	862.2	2.0	9
Yukon	298.8	0.7	11	337.1	0.8	11
Nova Scotia	197.8	0.6	12	506.6	1.2	10
New Brunswick	1,210.5	3.0	9	197.7	0.5	12
Prince Edward Island	2.9	...	13	2.7	...	13
Canada	**40,107.4**	**100.0**		**43,880.3**	**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. As of reference year 2017, Statistics Canada has ceased the collection of the cement data. Values for cement production have been removed from 2010 values.

FIGURE 5: MINING IN CANADA

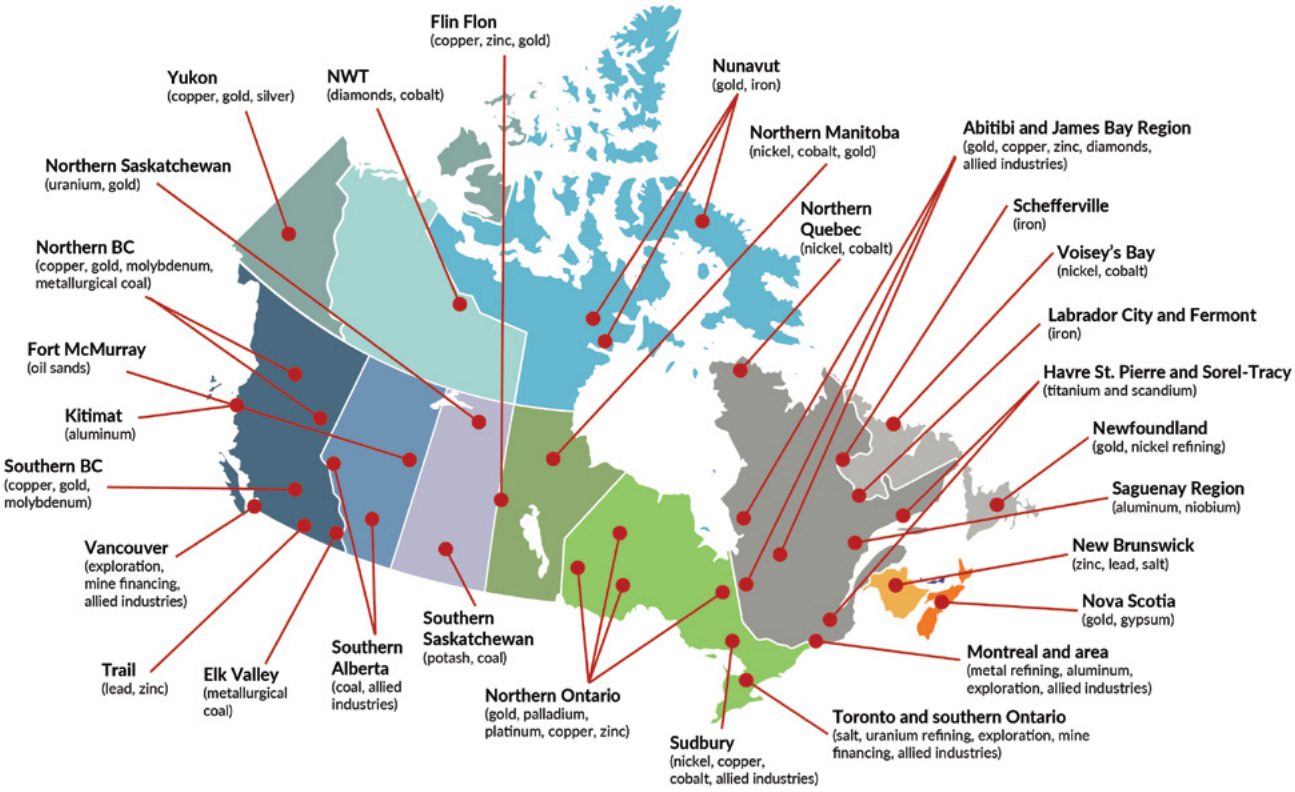


FIGURE 6: TOTAL MINERAL DEVELOPMENT EXPENDITURES, BY STAGE AND PROVINCE AND TERRITORY, 2020 [P]

Province/Territory	Exploration	Deposit Appraisal	Mine Complex Development	Total Expenditures
($ millions)				
Newfoundland and Labrador	53.0	14.5	835.6	903.1
Nova Scotia	11.5	16.0	75.8	103.3
New Brunswick	11.8	0.7	10.0	22.5
Quebec	336.1	192.2	2128.7	2,657.0
Ontario	428.5	187.3	2691.1	3,307.0
Manitoba	50.7	5.9	268.9	325.5
Saskatchewan	110.1	52.5	2438.6	2,601.2
Alberta	25.1	25.6	91.1	141.8
British Columbia	310.5	224.0	1847.5	2,382.0
Yukon	64.2	12.0	61.7	137.9
Northwest Territories	28.2	10.4	105.7	144.4
Nunavut	35.2	72.2	726.0	833.5
CANADA	**1,465.0**	**813.4**	**11,280.8**	**13,559.2**

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.

Of note, also, is that year-over-year mineral development expenditures in 2020 are projected to grow from $9.7 billion to $13.6 billion – an increase exceeding 40%. A likely major driver of this investment increase is the buoyant mineral and metal prices on the backdrop of substantial projections for future mineral and metal demand, discussed above. For example, BHP – the world's largest mining company – announced it had approved spending $7.5 billion to begin building the Jansen mine, located in Saskatchewan. This decision qualifies as the second largest single mining investment in Canadian history, and projects first production of potash in 2027.

TAXES AND OTHER PAYMENTS TO GOVERNMENTS

Canadian governments receive substantial taxes and royalties as a result of mining activity, with these payments coming from the first three stages of activity – extraction, smelting and processing (see Figure 2). These tax revenues, in turn, are reinvested to provide education, healthcare and other social and economic development programs that support the quality of life that Canadians enjoy. The industry proactively discloses the taxes, royalties and other payments companies make to Canadian governments.

Payments to Governments

Canada's payment disclosure legislation, the *Extractive Sector Transparency Measures Act*, which came into force in 2015, requires companies to disclose the payments they make to governments that exceed a $100,000 threshold. This creates greater transparency of the taxes, royalties and other forms of disbursement that companies pay to governments, both at home and abroad. The Mining Association of Canada and the Prospectors and Developers Association of Canada played a seminal role in developing this legislation, in partnership with Publish What you Pay and the Natural Resource Governance Institute (NRGI).

According to the NRGI, in 2020, extractive sector companies reported payments of more than $46 billion to Canadian governments of which $4.7 billion derived from mining projects outside the oil and gas sector. These payments, to Indigenous, municipal, provincial and federal governments, are generally royalty or tax payments.

Extractive sector payments to Canadian governments totalled $38.4 billion in 2019, of which $4.7 billion derived from the mining sector.

While payments to governments are a significant benefit generator from natural resource extraction and processing, they do not characterize the full extent of the benefit. For example, the mining industry pays the highest industrial wage in Canada, on which the federal government levies taxes from both companies and employees, both of which pay tax on virtually all goods and services they consume, augmenting these benefits even further.

INDIRECT CONTRIBUTIONS TO MINING INDUSTRY SUPPLIERS

The mining industry's economic impact far surpasses its direct contribution to the GDP. For example, mining accounts for approximately half of Canada's rail-freight revenues and tonnage annually, typically exceeding $6 billion in expenditures. Organizations such as CN Rail, CP Rail, and the Ports of Montreal, Quebec and Vancouver rely on a vibrant mining industry. Many other related specialist firms, including those in the legal, environmental, taxation, engineering and other fields, support the industry's many requirements to locate, develop, construct, operate and reclaim a mine. These supply relationships are mutually beneficial. As just one example, supplier companies play a crucial role in introducing and spreading innovative technologies and ideas within the mining industry.

InfoMine, a mining database, reported in 2019 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, and generate significant local benefits for Canada. For example, according to the Mining Suppliers of British Columbia, that province's supply sector generated $2.9 billion worth of economic activity in 2018.

Recently, InfoMine reported that Australia's mining supply sector surpassed that of Canada's, bumping Canada to third place. In 2019, neither Canada nor Australia's sectors grew much year-over-year, but the gap between them persists at roughly 700 firms. This is one of many indicators suggesting that Canada's dominance and attractiveness as a destination for mineral investment has declined in recent years.

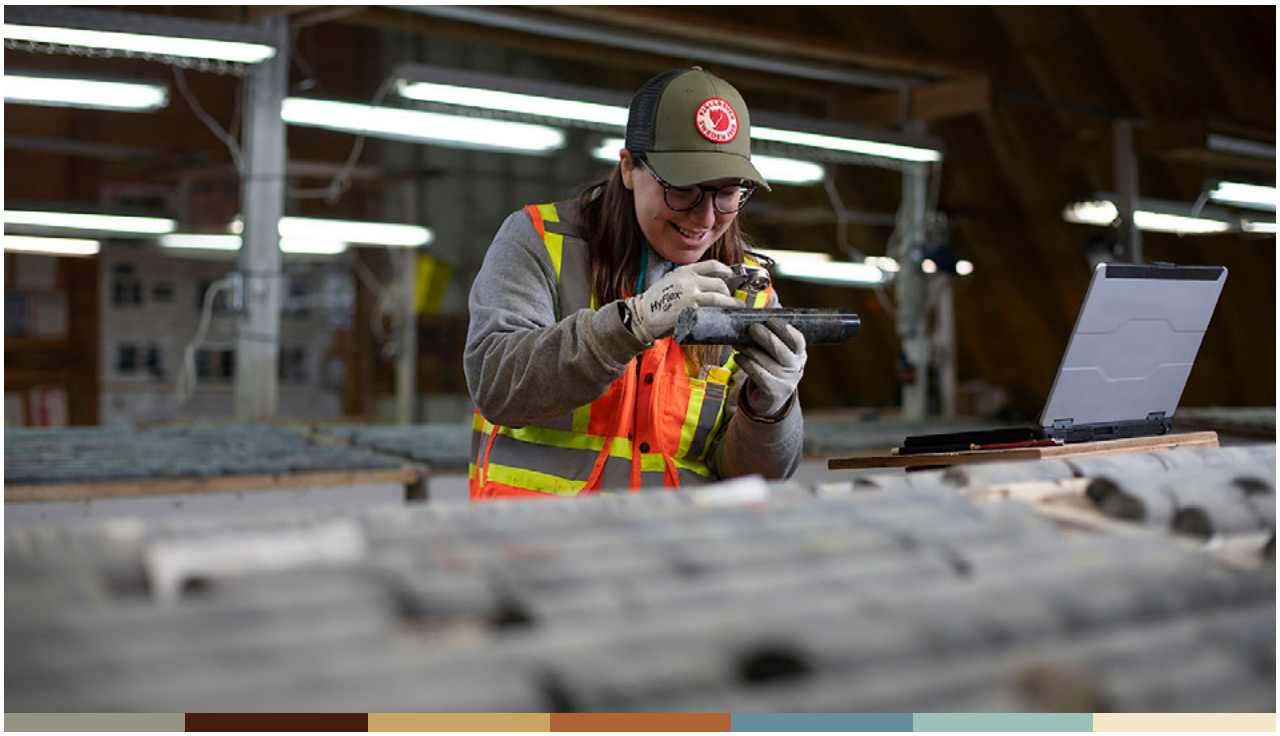
NUMBER OF MINING SUPPLIERS IN LEADING COUNTRIES

United States	5,986
Australia	4,543
Canada	3,762
Brazil	3,651
Chile	1,823

Source: InfoMine

SECTION 2

The Activities: Production, Processing and Transportation



Canada's strength in mining rests on its ability to produce and process minerals competitively and to transport products efficiently to and from 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 14 minerals and metals (details in Annex 4):

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

While Canada produces some 60 different minerals and metals, its status as a top-five producer has slipped over the past 15 years. Today, Canada no longer holds the position as a top producer of copper, zinc, molybdenum, lead and cadmium, having been surpassed by other countries. For example, Canada has lost ranking for critical battery metals like nickel and cobalt – second in the world for the production of both in 2008 accounting for 15.9% and 13.3% of global production respectively – having fallen in 2019 to sixth for both nickel (at 6% of global production) and cobalt (at 2.3% of global production). In both cases, the absolute volumes produced have shrunk while those of other jurisdictions have increased, suggesting the need to increase the attractiveness of Canada for the development of these materials critical to the climate transition. Fortunately, recent policy and programmatic decisions have become more responsive to these trends with the aim of reversing them.

Also noteworthy is that Canada has become a top-five producer over the same period of time of niobium, a commodity for which it previously was not on the charts. Niobium is used in alloys, including stainless steel, to improve strength, particularly at low temperatures and also has superconducting properties. Alloys containing niobium are used in jet engines and rockets, beams and girders for buildings and oil rigs, and oil and gas pipelines.

Production Values

In 2020, the value of Canadian mineral production is projected to decrease marginally, falling 8% (or by $3.8 billion) to $43.9 billion (see Figure 7). Metal production values dropped marginally – by $400 million – whereas non-metals and coal accounted for the majority of the decrease, of $1.8 billion and $1.6 billion respectively. Increases and decreases in production values correlate to the increases and decreases in metal, non-metal and coal prices over the course of the year. Noting how volatile prices were in 2020, and how continued upward pressure on commodity prices has persisted into 2021, it is reasonable to expect that production values for the current year will recover and potentially exceed the above noted loss.

Canada's top 10 minerals and metals (see Figure 8) each had projected production values of more than $1.5 billion in 2020, with five (gold, potash, copper, iron ore, and coal) at more than $3 billion each. Together, the top 10 minerals and metals represented $39 billion (91% of Canada's total mineral production value in 2020).

On the petroleum front, synthetic crude oil accounted for 29.4% of Canada's crude oil production volume in 2019, a 1% increase from 2018 (see Figure 9). Indicative of an increase in oil prices beyond this production increase, the absolute value of synthetic crude oil production increased from $28.5 billion to $30.5 billion year-over-year.

FIGURE 7: VALUE OF CANADIAN MINERAL PRODUCTION, 2000-2020 (P)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020(p)
($ billions)																					
Metals	11.0	10.4	10.4	9.7	12.4	14.6	21.1	26.2	22.6	15.5	21.4	25.6	23.6	23.5	24.2	23.1	23.3	25.7	27.1	28.9	28.5
Nonmetals	6.2	6.3	6.5	7.4	8.7	8.8	8.6	9.8	17.7	10.2	13.2	16.2	14.9	13.9	14.1	14.8	12.1	13.3	15.5	13.2	11.4
Coal	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	4.0	6.3	6.5	5.6	4.0
Total Mineral Production	**18.6**	**18.2**	**18.5**	**18.6**	**22.7**	**26.3**	**32.6**	**38.7**	**45.3**	**30.1**	**40.1**	**49.3**	**44.4**	**42.3**	**42.2**	**41.0**	**39.4**	**45.3**	**49.0**	**47.7**	**43.9**

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. As of 2017, Statistics Canada is no longer conducting the monthly survey of cement, and values are no longer included in Canada's mineral production. Cement production has also been excluded from 1999 to 2016 values for comparability.

FIGURE 8: CANADA'S TOP TEN METALLIC AND NON-METALLIC MINERAL PRODUCTS, BY VALUE OF PRODUCTION, 2010 AND 2020 (P)

		2010		2020 (p)	
	Unit of Measure	Quantity	$ Value (millions)	Quantity	$ Value (millions)
Gold	t	102	4,143	182	12,321
Iron ore	kt	36,178	5,314	60,060	5,610
Coal	kt	68,152	5,541	40,792	3,958
Copper	kt	508	3,942	476	3,860
Potash (K_2O) (1)	kt	9,700	5,062	13,410	3,736
Nickel	kt	157	3,530	167	2,834
Platinum group	t	10	260	31	1,818
Sand and gravel	kt	211,448	1,576	181,471	1,729
Stone	kt	170,695	1,638	141,201	1,633
Diamonds	000 ct	11,804	2,377	15,036	1,542

Sources: Natural Resources Canada; Statistics Canada.
(p) Preliminary, (..) Not available for specific reference period
Notes: (1) Shipments of potash to Canadian potassium sulphate plants are not included in this table.

With prices for a host of minerals, metals and energy products plummeting in March 2020 due to COVID-19 economic contraction, supply-chain disruptions and, in the case of energy, demand destruction, one might have expected the 2020 production values for the commodities noted in Figures 8 and 9 to be measurably lower. Retrospectively, due to the industry's safe resumption of operational activities upon implementing public health guidance, accompanied by significantly elevated commodity prices in the latter half of 2020, much of the lost ground was regained, limiting what could have been much greater losses.

The price of oil has followed a different trajectory. The decision of OPEC to flood the oil market immediately prior to pandemic related mobility restrictions saw the consumption of transportation fuels (both surface and aviation) remain depressed without a substantial recovery until September 2021, where prices per barrel broke the $80 mark. While COVID-19 related demand destruction is gradually tapering off – with economic re-opening policies gaining momentum – constrained investment in the oil sector has analysts speculating that a supply gap relative to projected demand is also contributing to upward movement in the oil price, and will continue to do so until addressed.

CANADA'S MINERAL-PROCESSING FACILITIES

QUEBEC:
9 smelters, 4 refineries, 2 secondary smelters

ONTARIO:
2 smelters, 2 secondary smelters, 4 refineries, 1 conversion facility, 2 processing plants

MANITOBA:
1 refinery

ALBERTA:
1 refinery

BRITISH COLUMBIA:
2 smelters, 1 secondary smelter, 1 refinery, 1 processing plant

NEWFOUNDLAND AND LABRADOR:
1 refinery

FIGURE 9: PRODUCTION OF SYNTHETIC CRUDE OIL BY OIL SANDS MINING PLANTS, ALBERTA AND CANADA, BY QUANTITY AND VALUE, 1998-2019

	Synthetic Crude Oil (000's of m^3)	Total Crude Oil and Equivalents	Synthetic Crude as % of Total	Synthetic Crude Oil ($000)	Total Crude Oil and Equivalents ($000)	Synthetic Crude as % of Total
ALBERTA						
1998	17,870.8	94,676.2	18.9	2,313,518	9,734,475	23.8
1999	18,766.9	89,065.5	21.1	3,252,547	13,727,829	23.7
2000	18,608.0	89,136.1	20.9	5,188,916	21,687,681	23.9
2001	20,260.6	89,364.5	22.7	4,995,003	17,734,825	28.2
2002	25,494.6	89,885.1	28.4	6,455,743	19,778,759	32.6
2003	25,028.8	95,311.4	26.3	6,777,342	22,187,602	30.5
2004	26,661.9	101,007.0	26.4	8,570,468	27,767,704	30.9
2005	21,932.5	98,878.7	22.2	9,213,624	33,282,754	27.7
2006	28,764.2	106,017.8	27.1	14,831,145	38,498,843	38.5
2007	39,900.2	108,853.3	36.7	18,012,945	42,130,415	42.8
2008	38,020.7	108,322.4	35.1	25,214,415	62,941,690	40.1
2009	44,330.8	112,937.7	39.3	19,043,537	43,934,049	43.3
2010	46,110.5	119,559.3	38.6	23,473,269	54,005,153	43.5
2011	49,375.1	129,183.4	38.2	30,518,182	69,033,911	44.2
2012	52,455.2	143,873.9	36.5	28,588,084	69,346,737	41.2
2013	54,328.1	154,324.2	35.2	34,382,129	79,535,264	43.2
2014	55,345.9	168,971.7	32.8	35,467,401	94,140,139	37.7
2015	56,646.4	179,262.9	31.6	21,512,827	57,544,954	37.4
2016	54,072.0	179,202.5	30.2	19,276,126	51,957,648	37.1
2017	59,565.2	196,674.2	30.3	25,370,287	71,020,665	35.7
2018	61,299.4	215,910.0	28.4	28,598,985	82,132,901	34.8
2019[p]	64,459.9	218,910.5	29.4	30,523,961	89,161,933	34.2
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	224,157.5	25.3	21,512,827	72,081,704	29.8
2016	54,072.0	225,089.3	24.0	19,276,126	65,410,168	29.5
2017	59,565.2	244,670.2	24.3	25,370,287	88,548,410	28.7
2018	61,299.4	266,733.2	23.0	28,598,985	103,800,123	27.6
2019[p]	64,459.9	272,185.4	23.7	30,523,961	112,154,044	27.2

Source: Statistics Canada

[p]: preliminary

PROCESSING OF MINERALS

Canada has a significant mineral-processing industry, with 35-facilities – comprised of non-ferrous metal smelters, refineries and conversion facilities – in six provinces (see Figure 10).

Canada's integrated smelters and refineries were built in proximity to world-class mines, most located inland, without access to affordable marine transport. As local ore reserves become depleted over time and the production of base metal concentrate declines, smelters and refineries are transitioning from integrated production to the more expensive custom treatment of concentrates from multiple mines imported from other countries. Additionally, they are also using more secondary raw materials and scrap feed. While this form of recycling is good, it is also expensive.

The quantity and value of refined metal production in Canada has 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. Since 2008, production of refined copper and zinc has dropped, while aluminum has fluctuated. The production of cadmium, cobalt and lead has increased. In absolute terms, total refined Canadian metal production has decreased by 10%, or 518,000 tonnes, from 2008-2018 – the latest year for which a complete production data set is available.

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 declined. Importing feedstock from abroad greatly influences the cost and profitability of domestic refining and smelting operations. If the industry is to remain competitive, enhancing domestic levels of mineral production through requisite investment in exploration and mine development is essential.

Other factors also influence the competitiveness of Canada's mineral-processing industry. Canada's processing facilities operate in a global arena, where China and other countries are expanding their capacity with newer facilities and competing fiercely for raw materials. The cost of electricity is also a factor in some Canadian jurisdictions, such as Ontario, where rates have steadily increased in recent years. 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.

FIGURE 10: NON-FERROUS SMELTERS AND REFINERIES IN CANADA, 2020

Owner/Operator	Operation	Type of facility	Location	Outputs
Newfoundland and Labrador				
Vale Newfoundland and Labrador Limited	Long Harbour	(Ref.)	Long Harbour	Ni, Cu, Co
Quebec				
Rio Tinto Aluminum Inc./Aluminium Austria Metall Québec Inc./ Hydro Aluminium a.s./Société générale de financement du Québec/Marubeni Québec Inc.	Alouette	(Sm.)	Sept-Îles	Al (pure)
Alcoa Corporation	Baie-Comeau	(Sm.)	Baie-Comeau	Al (pure or alloyed)
Rio Tinto Aluminum Inc.	Grande-Baie	(Sm.)	Grande-Baie	Al (pure or alloyed)
Rio Tinto Aluminum Inc.	Laterrière	(Sm.)	Laterrière	Al (pure or alloyed)
Rio Tinto Aluminum Inc.	Vaudreuil Works	(Ref.)	Saguenay	Alumina
Rio Tinto Aluminum Inc. Al chemicals, composites	Arvida	(Sm.)	Saguenay	Al (pure or alloyed), alumina,
Rio Tinto Aluminum Inc.	Alma	(Sm.)	Alma	Al (pure or alloyed)
Alcoa Corporation	Deschambault	(Sm.)	Deschambault	Al (pure)
Alcoa Corporation/Rio Tinto Aluminum Inc.	Bécancour	(Sm.)	Bécancour	Al (pure or alloyed)
Glencore Canada Corporation	CCR	(Ref.)	Montréal-Est	Cu (cathodes, billets, cakes, ingots, bars), Au, Ag, Te, Se, Ni sulphate, Cu sulphate, 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 anodes, PM
Ontario				
Royal Canadian Mint	Ottawa	(Ref.)	Ottawa	Au, Ag
Cameco Corporation metals, alloys)	Port Hope	(Con. Fac.)	Port Hope	U (hexafluoride, dioxide,
Vale Canada Limited residues), Co oxide	Port Colborne	(Ref.)	Port Colborne	Electrolytic Co, PGM (in
Tonolli Canada Ltd.	Mississauga	(Sec. Sm.)	Mississauga	Recycled Pb
Real Alloy Canada Ltd.	Mississauga	(Sec. Sm.)	Mississauga	Recycled Zn
Asahi Refining Canada Ltd.	Brampton	(Ref.)	Brampton	Au, Ag
Glencore Canada Corporation Au, Ag, PGM	Sudbury	(Sm.), (Pl.)	Sudbury	Ni-Cu matte containing Co,
Vale Canada Limited	Copper Cliff Complex	(Sm.), (Ref.), (Pl.)	Sudbury	Ni (oxide sinter, pellets, powder, sulphate), Cu cathodes, Au, Ag, Se cake, Te dioxide cake, PGM (in residues), S*
Cameco Corporation	Blind River	(Ref.)	Blind River	U (trioxide)
Manitoba				
HudBay Minerals Inc.	Flin Flon	(Ref.)	Flin Flon	Zn
Alberta				
Sherritt International Corporation and General Nickel Company S.A.	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, PM, S*
Metalex Products Ltd.	Richmond	(Sec. Sm.)	Richmond	Recycled Pb
Rio Tinto Aluminum Inc.	Kitimat	(Sm.)	Kitimat	Al (pure or alloyed)

Source: Natural Resources Canada.
Note: Included are operations that produced in 2020.
(Sm.) Smelter (Ref.) Refinery (Sec. Sm.) Secondary smelter (Pl.) Plant (Con. Fac) Conversion facility S* Sulphuric aci

FIGURE 11: CANADIAN PRODUCTION OF SELECTED REFINED METALS, 2005-2020

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
(Tonnes)												
Aluminum	2,894,204	3,051,128	3,082,625	3,120,148	3,030,269	2,963,210	2,987,964	2,780,556	2,967,364	2,858,238	2,880,035	3,208,707
Cadmium	1,727	2,090	1,388	1,409	1,299	1,357	1,240	1,286	1,313	1,187	1,159	2,305
Cobalt	4,618	4,555	4,883	4,899	4,358	4,145	5,317	5,322	4,012	4,527	5,359	5,584
Copper	515,223	500,463	453,453	442,050	335,896	319,618	273,761	275,990	321,511	325,352	330,902	314,074
Lead	230,237	250,464	236,688	259,094	258,854	273,017	282,589	279,150	281,781	281,456	268,863	273,299
Nickel	139,683	146,899	153,647	167,732	116,909	105,413	142,445	146,850	152,728	149,486	149,717	158,381
Zinc	724,035	824,464	802,103	764,310	685,504	693,014	662,151	648,619	651,638	649,217	683,118	685,409

	2017	2018	2019	2020
(Tonnes)				
Aluminum	3,211,882	2,923,204	2,905,489	3,154,493
Cadmium	1,802	1,857	1,803	..
Cobalt	5,152	6,349	6,075	5,965
Copper	330,386	291,250	x	x
Lead	274,061	260,956	147,358	x
Nickel	154,759	137,411	124,838	124,043
Zinc	598,438	620,202	654,971	623,558

Sources: Natural Resources Canada; Statistics Canada (Table 16-10-0019-01).
(..) Not available for a specific reference period, (x) Confidential
Starting in 2020, the data can be downloaded from the StatCan website at the following link (Table: 16-10-0019-01)
https://www150.statcan.gc.ca/n1/daily-quotidien/200720/dq200720c-cansim-eng.htm

Finally, the age of some Canadian operations, and their ability to meet potential regulatory requirements, also affects their viability.

In the face of these combined factors, the downstream Canadian mining industry risks being left behind over time. Recent smelting facility closures in Manitoba and New Brunswick represent lost metal manufacturing capacity that will prove challenging to reclaim. This is particularly relevant given the federal government's recognition of how critical the stability and security of the mining and primary metal manufacturing ecosystem is to attracting advanced manufacturing investment. Noteworthy in the critical minerals space is the projected need for huge volumes of minerals and metals. With among the lowest carbon intensity nickel production in the world, Canada must signal that it no longer takes its smelting and refining industry for granted, nor the extractive supply chain that supports these critical mineral assets. Action to protect its competitiveness is essential to the low-carbon economy both in Canada and abroad, and these activities should therefore be understood as climate actions.

At stake are real benefits, such as stable, long-term, and high-paying employment, including union jobs. For example, primary metal manufacturing and non-metallic mineral product manufacturing employment exceeded 84,000 jobs in 2020. Both sectors combined account for almost 21% of the industry's overall direct employment for the year. While significant, these numbers have been in decline. Since 2008, employment in primary metal manufacturing and non-metallic mineral product manufacturing has dropped by 37,000 jobs, or nearly 10% of the industry's current total direct workforce. A concrete example of this is the recent closure of the Brunswick Smelter in northern New Brunswick in November 2019.

Transportation

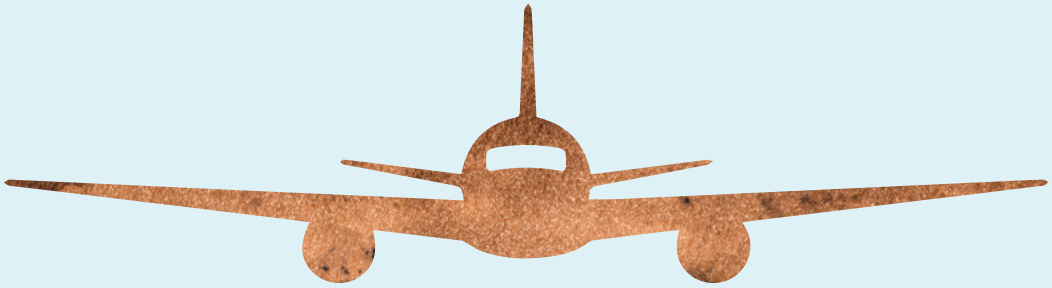
Global supply chain fluidity has been heavily strained in recent months due to sharp swings in consumer demand during the pandemic, disruptions to global shipping and a battered airline industry. Beyond the volatility in consumer demand and associated shifting patterns of expenditure on goods and services, the shipping industry has had to wrestle with COVID-related absences among port workers and shortages in the UK, Europe and the US of truck drivers, who help transport goods to their final inland destinations and return the empty containers. The constraints in shipping productivity and serviceability have resulted in a surge in shipping related costs as demand mounts. For example, as of the end of August 2021, prices of shipping containers have more than doubled in the past year, and container freight rates are up 351% year-on-year, according to Drewry maritime consultancy.

This current environment is juxtaposed against additional challenges in Canada's supply chain. Over the last few years, Canada has witnessed an unprecedented level of disruption in its supply chain through labour actions by railway and port workers, civil disruption in the form of random and sporadic rail blockades and, of course, the widespread and ongoing disruptions associated with COVID-19. Canada's logistics supply chain is critical to the flow of mined and refined products to both domestic and international markets, and the mining industry is the largest industrial customer group of Canada's transportation sector, providing it with considerable tonnage. Canada can and must do better at creating a stable and predictable logistics supply chain that restores greater confidence in Canada's reliability as a trading partner.

Strained Confidence in Canada's Supply Chain

MAC has been underscoring for years that the reliability of the supply chain is a significant determinant for mining industry investment given the volume of mineral and metal products transported in Canada. The reliability of Canada's supply chain has deteriorated significantly over the last 36 months, due largely to the number and extent of both regional and national disruptions, including:

- Winter 2018, plagued by rail service disruptions
- Vancouver port and rail congestion in winter 2019
- Extensive Canadian National Rail strike in November 2019
- Crippling rail barricades in February and March 2020
- Port of Montreal strike in July 2020
- The tragic Lytton fires in July 2021



PRODUCTS THAT RELY ON MINING

AVIATION TECHNOLOGY

Efficient, lightweight vehicles and aircraft need aluminum as well as lighter composites and alloys involving nickel and other metals to reduce weight and improve efficiency.

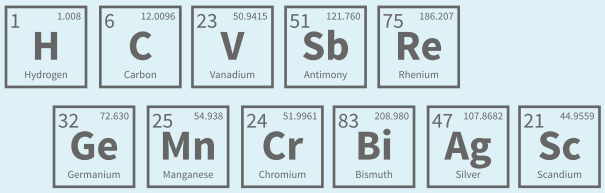


FIGURE 12: CRUDE MINERALS AND PROCESSED MINERAL PRODUCTS TRANSPORTED BY CANADIAN RAILWAYS, 2006-2020

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
(million tonnes)															
Total Freight Volume [1]	258.7	255.7	244.4	212.9	235.4	250.8	253.5	268.0	277.9	287.6	281.7	295.1	307.5	307.5	295.6
Total Crude Minerals	108.0	112.0	111.9	85.0	107.6	109.8	103.4	112.0	112.0	123.2	120.5	128.2	131.2	134.2	127.0
Total Processed Mineral Products	27.9	27.7	27.6	21.7	24.6	26.5	27.3	28.3	28.1	28.7	28.3	29.0	29.9	28.7	28.4
Total Crude and Processed Minerals	**135.9**	**139.8**	**139.4**	**106.7**	**132.3**	**136.4**	**130.7**	**140.3**	**140.1**	**151.9**	**148.8**	**157.2**	**161.1**	**162.9**	**155.3**
Crude Minerals and Processed Mineral Products as a Percentage of Total Freight Volume	52.5	54.7	57.1	50.1	56.2	54.4	51.5	52.4	50.4	52.8	52.8	53.3	52.4	53.0	52.5

Source: Statistics Canada.

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.

Noteworthy is that the above disruptions are separate and distinct from the additional supply chain impacts stemming from COVID-19, specifically the associated shortage of goods due to the pandemic and the general delays associated with the delivery of products. Unfortunately, rail service disruptions have become a perennial feature of Canada's supply chain since the mid-2000s and have escalated in both scale and frequency in more recent years, underscoring the need for further reforms to the system. The costs to Canada are immense: reputational damage as a reliable trade partner; additional operational costs to businesses; and reduced confidence in Canada as a destination for business investment for supply-chain reliant businesses, such as mining.

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 2019, shipments of coal, iron ore, potash and other minerals and metals represented 52.5% of total Canadian rail freight volume (see Figure 12). What's more is that the industry has accounted for roughly half of total rail freight volume for the last 15 years, as long as data has been available.

A key challenge is that Canada's rail freight system operates primarily as a dual monopoly, shared by CN and CP – Canada's largest Class I railways. Mining operations, in addition to communities and businesses, are frequently captive to only one railway given the remoteness of their locations.

The number of rail service-related consultations and legislative measures in recent years reflect the persisting challenges that rail customers face. The *Fair Rail Freight Service Act*, the *Fair Rail for Grain Farmers Act* and the *Transportation Modernization Act* – three pieces of legislation in a six year window, have consistently failed to address systemic challenges, hampering opportunities for Canadian mining companies to grow their businesses, take advantage of newly created market share from trade agreements, and contribute more substantively to the Canadian economy. These ongoing challenges also impact Canada's reputation as a stable and reliable destination for foreign direct investment.

Transportation Modernization Act

In spring 2017, building on *Transportation 2030: A Strategic Plan for the Future of Transportation in Canada*, the then Minister of Transport, the Honourable Marc Garneau, tabled Bill C-49, the *Transportation Modernization Act*.

While the package of reforms went further than those of Minister Garneau's predecessors, they still fell short of rebalancing the position of railways and customers in the rail freight market. MAC, in partnership with seven other resource shipping associations, advanced two recommendations to improve the bill. The first was to give shippers a right to a costing assessment in the context of a Final Offer Arbitration (FOA), one of the remedies under the *Canadian Transportation Act*. The second was to give the Canada Transportation Agency unilateral "own-motion" powers to investigate service disruptions in the rail freight market – with the aim of expeditiously advancing solutions to reduce economic harm.

For decades, the one useful remedy for captive shippers was FOA, and in order for it to work properly, there has to be reasonable access to information on both sides of an arbitration, including with respect to costing. Without such information, shippers are negotiating in the dark, and arbitrators are unable to assess the reasonableness of bids. For many years, shippers requested such information during a FOA and the railways complied, leading to fair processes and reasonable outcomes. But that changed about a decade ago when railways started objecting to this information being shared, leaving shippers at a major disadvantage and effectively nullifying the FOA remedy.

MAC's proposed amendment would have made the provision of costing information a mandatory input into a FOA process, restoring the remedies to function as originally designed. The amendment was rejected on the basis of a false premise, and the own-motion powers proposal was reduced in scope, requiring the Agency to seek permission from the Minister instead of being able to act independently as a third-party regulator should be.

More recently, as a component of the *Transportation Modernization Act*, Transport Canada launched a regulatory consultation to establish a permanent transportation data regime, to which MAC has made a submission. To support greater balance in the rail freight market, MAC recommends the establishment of a robust transportation data regime that maximizes data disclosure and public access, including railway capacity data. These points were unrepresented in the December 2020 Transport Canada white paper proposal on this topic, and MAC reiterated in a subsequent submission the need for robust, granular and real time performance and capacity data. Google knows where you are on earth – at any moment down to a GPS coordinate – yet rail customers, responsible for hundreds of billions of dollars of Canadian economic activity do not know where their goods are in the rail freight network, nor would Transport Canada's proposal go far enough to meaningfully close the gap.

A meaningful and robust data regime will not only enhance transparency in the transportation system, but also improve relations between shippers and transportation service providers, minimize unnecessary and costly disputes, provide government with the tools necessary to identify, assess and resolve existing policy challenges, and be a beacon to inform confidence in future large-scale investments reliant on rail for market access. MAC believes that robust data transparency is the least onerous way to reform Canada's rail network without resorting to re-regulation. Allowing data to inform the interactions between railways and their customers is the nearest term, most justifiable, and least intrusive choice available to federal decision makers to effect desired and positive change.

Trucking

Trucking also plays an 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 2020 report, *Transportation in Canada*, trucks were projected to carry more than $213 billion in Canadian exports in 2020, 12% of which ($25 billion) were mining-related products. Trucks also carried $316 billion in imports to Canada, 9% of which ($29 billion) were mining-related products.

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 essential materials.

Marine

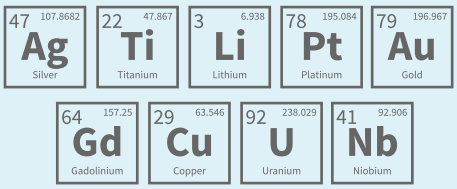
Mining is also a leading customer of Canadian ports. The Port of Montreal handles large volumes of iron ore and salt, as well as other mineral products such as fertilizer, ores, gypsum and scrap metal. Total dry bulk mined products accounted for approximately 4 million tonnes in 2019, or ~43%, of the 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. On the container side, the port moves metallurgical steel and mineral products, which together accounted for ~2.2 million tonnes of goods moved, or roughly 15% of total container volumes moved.

Beyond Montreal, the mining industry is a major contributor to Canada's St. Lawrence Seaway. Shipments of iron ore, coke and coal represent ~20% of total seaway traffic, with iron ore accounting for the second-largest share of any commodity shipped.

PRODUCTS THAT RELY ON MINING

HEALTHCARE

Metal-based compounds are crucial to the diagnosis and treatment of disease. The nanotechnology boom has opened up a new frontier of early detection, diagnosis and treatment of diseases. Gold nanoparticle technology is being used to target and deliver antibodies directly into cancerous tumors. They are also being engineered to attach to cancer-related proteins to aid earlier detection.



Steelmaking coal accounts for ~19% of the total overall volume of goods handled at the Port of Vancouver annually, which moves shipments to China, Japan and other Asian markets. Fertilizer/ potash represents another 8% of the port's volume, and minerals and ores another 9%. All told, mining products account for more than 50 million tonnes, or roughly 40%, of the port's volume.

Pipelines

The North American energy landscape is undergoing significant changes in the aftermath of the pandemic. In recent years the US has met a significant portion of its internal demand for oil through hydraulic fracturing to produce oil and gas from shale. However, pandemic-induced low oil prices reduced US oil production by 2 million barrels per day (from 13 million barrels per day pre-pandemic), which has meant Canadian oil and gas products are all the more critical in allowing the US to meet its current and future energy demands.

Oil demand in Asia has grown significantly in recent decades and is expected to continue to grow in the long term; China has surpassed the US as the world's largest oil importer. Although not expected to grow materially, US demand will likely be resilient over the next five years and will remain one of the top two oil consumers in the world, along with China. Historically the price differential between Western Canadian Select and Western Texas Intermediate has created a significant disadvantage to Canada's energy sector. More recently, greater rail capacity and improved supply links have helped this differential narrow significantly. Despite this, timely completion of the Trans Mountain Pipeline, in addition to improved pipeline capacity throughout North America, is still very much a priority as without this capacity, differentials are at risk of widening in the long term.

As the industry continues to recover from the pandemic, and services debt incurred during the period of significant demand destruction, it will be important to the sector that Canada develop a strategy to ensure that Canadian producers can meet global demand, and respond to the long-term shift towards Asian markets. While infrastructure is an important part of this strategy, positioning Canada to be a producer of choice will be important to the sector. This will require leveraging the strong ESG profile of our sector, and continuing to work with government to find pathways to deep, sustainable decarbonization.

SECTION 3

The Money: Reserves, Prices, Financing, Exploration, Investment and Fiscal Policy

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 affected by mineral and metal prices. Canada's ability to capture mineral investment is contingent on mineral prospects and the policy environment, of which tax policy is a key determinant.

CANADIAN RESERVES

The past 30 years have seen marked declines in Canadian mineral reserves in all major base metals (see Figure 13 and Annex 6). Since 1980, the most dramatic declines have been in lead (98%) and zinc (94%). Copper (56%) and nickel (72%) reserves have also fallen significantly.

Recent years have shown fluctuating growth for certain commodities. Since 2009, gold, silver and copper reserves have fluctuated, with gold at near historic highs and copper at heights not seen since the mid 2000s. For example, gold reserves have increased by 152% since 2009. Zinc, on the other

hand, has ebbed downward, with current levels suggesting continued decline.

Consistent investment over time and access to large tracts of land to explore are needed to reverse the long-term decline in proven and probable reserves. To ensure the Canadian mining industry maintains its competitive advantage in this crucial area, the federal and provincial governments should continue to invest in geoscience and strengthen policies that stimulate 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, for example, 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, oil and other commodities when prices are low, making it difficult for analysts to accurately forecast how supply and demand dynamics are likely to affect 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 early to mid-2010s. Despite

FIGURE 13: CANADIAN RESERVES OF SELECTED METALS, 1980 - 2019 (P)

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

Year	Copper (000 t)	Nickel (000 t)	Lead (000 t)	Zinc (000 t)	Molybdenum (000 t)	Silver (t)	Gold (t)
1980	16,714	8,348	9,637	27,742	551	33,804	826
1985	14,201	7,041	8,503	24,553	331	29,442	1,373
1990	11,261	5,776	5,643	17,847	198	20,102	1,542
1995	9,250	5,832	3,660	14,712	129	19,073	1,540
2000	7,419	4,782	1,315	8,876	97	13,919	1,142
2003	6,037	4,303	749	6,251	78	9,245	1,009
2004	5,546	3,846	667	5,299	80	6,568	787
2005	6,589	3,960	552	5,063	95	6,684	958
2006	6,923	3,940	737	6,055	101	6,873	1,032
2007	7,565	3,778	682	5,984	213	6,588	987
2008	7,456	3,605	534	5,005	222	5,665	947
2009	7,290	3,301	451	4,250	215	6,254	918
2010	10,747	3,074	400	4,133	254	6,916	1,473
2011	10,570	2,936	247	4,812	256	6,954	2,225
2012	10,364	2,617	126	4,163	256	5,598	2,148
2013	10,777	2,682	116	3,532	145	5,013	2,140
2014	10,214	2,287	88	2,972	121	5,498	2,070
2015	9,937	2,725	83	3,009	101	5,345	1,984
2016	9,101	2,604	40	2,231	98	3,626	1,910
2017	8,984	2,790	165	2,286	96	5,074	2,578
2018	8,115	2,296	118	1,913	77	4,865	2,597
2019P	7,235	2,235	192	1,751	72	4,280	2,311

Source: Natural Resources Canada, based on company reports.

(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.

(p) Preliminary.

Note: One tonne (t) = 1.1023113 short tons = 32 150.746 troy oz.

FIGURE 14: METAL PRICES 2001-2020

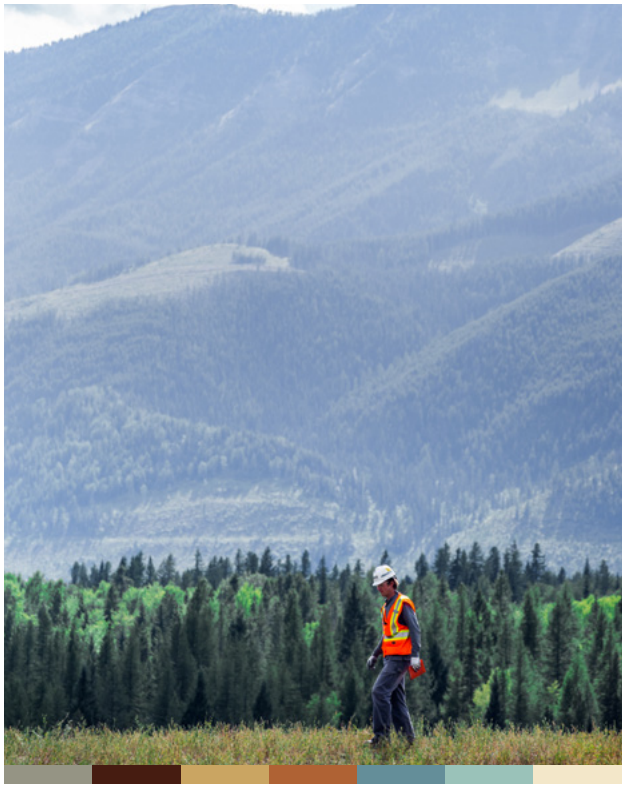
Prices	Aluminum US ¢/lb	Copper US ¢/lb	Gold US $/tr. oz	Iron Ore[1] US $/DMT	Nickel US $/lb	Silver US $/tr. oz	Uranium US $/lb	Zinc US ¢/lb
2001	66.46	72.74	269.98	12.99	2.67	4.38	8.82	51.47
2002	61.23	70.72	309.97	12.68	3.08	4.60	9.88	45.36
2003	64.92	80.68	363.51	13.82	4.53	4.95	11.55	87.31
2004	77.82	129.96	409.21	16.39	6.40	6.68	18.60	121.58
2005	86.10	166.84	444.88	28.11	6.68	7.39	28.67	159.18
2006	116.55	304.85	604.34	33.45	11.39	11.83	49.61	371.43
2007	119.65	322.83	696.66	36.63	16.70	13.51	99.33	370.13
2008	116.68	315.47	871.67	61.57	9.37	14.98	61.71	218.04
2009	75.50	233.67	972.98	79.99	6.78	14.77	46.06	193.37
2010	98.55	341.74	1,224.66	146.72	10.11	20.51	46.84	250.65
2011	108.77	400.10	1,568.58	167.79	10.46	35.56	56.37	251.55
2012	91.59	360.58	1,668.81	128.53	7.91	31.63	48.40	224.40
2013	83.70	332.29	1,411.06	135.36	6.74	23.53	38.17	222.54
2014	84.62	311.13	1,266.12	96.84	7.61	18.76	33.21	248.67
2015	75.41	224.22	1,160.11	55.21	5.26	15.51	36.46	222.48
2016	72.12	284.93	1,326.03	56.67	4.35	17.11	23.00	241.13
2017	89.25	293.46	1,257.56	71.76	4.79	17.17	21.66	330.55
2018	95.88	296.22	1,268.09	71.20	5.95	15.61	24.59	332.02
2019	82.24	272.35	1,391.53	93.32	6.31	16.18	25.64	287.34
2020	78.59	280.05	1,778.67	125.52	6.26	20.59	29.96	262.49

Source uranium prices: Cameco

[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.

the tremendous price volatility witnessed in 2020, seeing dramatic price swings upwards of 20% for some commodities, the year-over-year variance is modest. This underscores the post-peak-volatility price recovery experienced by a host of mineral commodities, in many cases gaining lost ground, and in some cases, exceeding pre-pandemic price highs prior to the end of 2020.

2021 saw a buoyant prices continue for many commodities. At the time of writing, monthly prices year-to-date in September 2021 for copper, nickel, zinc and uranium were up 26%, 15%, and 9% respectively. Gold – already at an elevated price – was down approximately $60/oz to $1,800/oz, while iron ore, having undergone the most dramatic volatility, settled at $124/tonne in September, after hitting an all-time monthly high in June of $214.14/tonne. Notable, as well, is the steadily surging price of uranium, reaching $45/pound in September, a month-over-month increase of 40%, and a high not seen in nearly a decade.



The general consensus is that demand for mineral and metal products will increase over the medium to long-term at an accelerating rate. The transition to a lower carbon future will result in significant demand for battery minerals and metals, including copper, nickel, lithium and cobalt, among others. The broader advanced manufacturing push, and the reliance on critical minerals, suggests an increased demand for these products as well. Further, increasing geopolitical tensions, and their implications on pre-existing supply-chains, have unleashed motivations to re-shore the production and manufacturing of key inputs, including rare earth elements and magnets, super conductors and other computer chips, and battery grade materials back into the Western sphere of influence. Indeed, there is a greater sense of urgency to secure geographically proximate supply of these products, and the materials and capacities required to produce them, than ever before. What follows is a discussion of the financial segment of Canada's mining industry – a key ingredient for success in attracting mining investments to Canada.

FINANCING

Canada is the leading global centre for mining finance. The Toronto Stock Exchange (TSX) and TSX Venture Exchange (TSX-V) list 43% of the world's publicly traded mining companies, which combined accounted for more mining equity capital raised (37% of the global total) than any other exchange in the last five years. In 2020, 1,146 of the firms listed on the TSX and TSX-V were mining companies. Together, they had a combined market value of $413 billion and raised $7.5 billion in equity. TSX-listed mining companies mainly deal in gold, copper, uranium, silver, diamonds, zinc, nickel, lithium, 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 December 31st, 2020, the 944 mining companies listed on the TSX-V had a combined quoted market value of $41 billion and raised $4.1 billion in equity capital for the year – a nearly 50% increase in capital raised year-over-year. Junior mining companies have faced challenges in raising capital in recent years, but the federal government's decision to renew the Mineral Exploration Tax Credit (METC) for a five-year period in 2018 – the first time such an expansive renewal has ever occurred – has helped bolster these numbers by providing certainty for multi-year business plans. The recent 2021 federal election campaign promise to double the METC for critical minerals will drive further investment into the exploration sector in Canada.

Global Financing

According to the TSX, global funding for the mineral sector contracted modestly in 2020, falling by $300 million year-over-year to $17.9 billion. Noting the level of uncertainty experienced in the industry due to COVID-19, and the volatility of commodity prices, the relative continuity of equity activities suggests investors place more weight on the long-term fundamentals of the sector relative to near-term disruptions (see Figure 15).

Despite this, there are signs that Canada is holding its ground in the face of weakening investment. According to the Prospectors and Developers Association of Canada, 2020 represented the 3rd consecutive year where Canadian exchanges recorded an increase in the proportion of total equity raised for the industry, bringing it to the highest level reached in at least a decade. While

FIGURE 15: MINING EQUITY RAISED—ROLE OF TORONTO STOCK EXCHANGE, 2000–2020

Equity Raised (US$ billions)	2000	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Worldwide	3.1	50.3	46.6	65.9	29.6	31.7	14.8	15	14.40	19.8	22.7	24.2	16.1	18.2	17.9
TSX exchanges	1.1	17.6	8.3	22.2	17.8	12.5	10.3	6.9	8.9	6.8	9.4	8.5	6.4	12.5	7.5
Percent of worldwide total reported by TSX and TSXV	36	35	18	34	60	39	70	46	62	34	41	35	34	68	42

Source: Gamah International, compiled by Toronto Stock Exchange.

Canadian exchanges are recording an increased share of a much smaller pie when compared to financing levels pre-2018, this resiliency is welcome, suggesting Canada has a safe-haven status for fiercely contested international mineral equity. Further, it suggests a loyalty to Canada increases alongside investment scarcity, underscoring a competitive advantage.

In 2020, 54% of all global mining equity financing was done on the TSX and TSX-V, representing 42% of the equity capital raised globally for the same year.

The large proportion of public financing 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 financing 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 2020, TSX and TSX-V companies were involved in more than 5,200 mineral projects worldwide (see Figure 16), with more than half in Canada. Most of the projects involve exploration, and very few will turn into operating mines. However, the locations do illustrate the prime areas of mining interest, and the broad international reach of the exchange.

FIGURE 16: GEOGRAPHIC REACH OF TSX-LISTED COMPANIES, JANUARY 2020

Location of Mineral Projects	Percent
Canada	53%
Mexico	7%
Central America & Caribbean	1.5%
South America	12%
United States	13%
Africa	6%
United Kingdom and Europe	4%
Asia	1.6%
Russia & CIS	0.4%
Middle East	0.1%
Australia/PNG/NZ	3%
	5,200+ Projects

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

Note: Total projects is an approximation on the basis of available information

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 in order to achieve success.

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

Exploration and Deposit Appraisal in Canada

The financial health of the mineral exploration sector can be measured by spending on exploration and deposit appraisal. Gauging spending levels also assists in predicting the future of Canada's mineral production. Natural Resources Canada, 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."

2020 saw a year-over-year decrease in exploration spending of 8%, with total expenditure falling from $2.28 billion in 2019 to $2.09 billion in 2020 (see Figure 17). Looking ahead, investment intentions suggest that this decline will be reversed with projected spending in 2021 poised to surge by 37% to $2.9 billion – the highest level seen in eight years.

Financing for the Junior Mining Sector

A major issue for junior mining companies is the persistent challenge of raising capital. Indicative of this dampened financial investment climate is the reversal in exploration and deposit appraisal expenditures. For example, in 2007, junior companies accounted for the majority (67%) of expenditure on these activities, with majors accounting for the balance (see Figure 18). From 2007 until 2015, juniors accounted for less each year, and the majors' share grew to 69%. The three years from 2016 to 2018 showed a return toward normalcy as junior companies' absolute share of exploration and deposit appraisal strengthened. Looking forward, each party is projected to account for roughly 50% of expenditure.

FIGURE 17: MINERAL EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, BY PROVINCE AND TERRITORY, 2007 - 2021 [(i)]

Province/ Territory	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020[(p)]	2021[(i)]	% Change from 2019 to 2020
($ millions)																
Newfoundland and Labrador	148.0	146.7	54.9	105.2	156.8	199.9	117.2	80.7	47.4	25.4	41.5	47.1	50.3	66.8	82.6	32.8%
Nova Scotia	23.5	21.4	9.0	16.7	13.7	14.6	12.3	7.0	10.1	5.3	18.2	40.4	37.9	26.8	38.6	-29.3%
New Brunswick	35.8	32.7	8.1	17.1	27.1	28.0	27.6	29.0	8.6	14.2	15.8	25.6	12.7	12.3	17.9	-3.1%
Quebec	476.4	526.1	379.3	511.6	833.9	620.7	381.8	317.4	259.5	297.4	573.9	564.8	503.2	511.2	988.2	1.6%
Ontario	571.7	799.3	536.2	853.4	1,067.7	961.5	562.0	468.1	440.2	394.3	539.7	591.4	523.2	569.6	650.1	8.9%
Manitoba	102.6	152.1	97.8	83.5	140.0	105.6	61.4	28.0	46.9	47.3	41.1	49.7	77.5	56.6	74.0	-27.0%
Saskatchewan	314.0	430.7	311.0	299.4	334.6	411.1	221.7	245.2	257.0	228.7	191.2	261.9	277.5	158.9	168.1	-42.7%
Alberta	11.8	20.8	8.3	15.2	47.3	35.2	38.9	26.1	18.5	16.7	24.6	26.6	53.2	49.4	50.8	-7.1%
British Columbia	470.6	435.4	217.1	374.4	645.1	734.1	493.0	448.9	346.3	231.5	302.6	427.9	388.7	457.4	574.8	17.7%
Yukon	144.7	134.0	90.9	156.9	331.7	233.2	100.6	107.1	92.2	90.4	168.7	182.3	166.2	75.9	98.5	-54.3%
Northwest Territories	193.7	147.7	44.1	81.7	93.8	108.7	77.9	101.7	100.9	73.0	91.2	112.0	79.8	35.4	47.7	-55.6%
Nunavut	338.0	432.6	187.6	256.7	535.7	422.5	257.6	158.0	215.0	204.5	177.0	155.6	116.4	71.0	85.4	-39.0%
Total	**2,830.8**	**3,279.5**	**1,944.4**	**2,771.9**	**4,227.4**	**3,875.1**	**2,352.0**	**2,017.4**	**1,842.4**	**1,628.8**	**2,185.5**	**2,485.2**	**2,286.5**	**2,091.3**	**2,876.7**	**-8.5%**

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

[(p)] Preliminary; (i) Intentions.

Notes: Includes on-mine-site and off-mine-site activities. Includes field work, overhead costs, engineering, economic and pre- or production feasibility studies, environment, and land access costs. Numbers may not add to totals due to rounding.

FIGURE 18: MINERAL EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, BY COMPANY TYPE, 2007 - 2021[(i)]

Type of Company ($ millions)	2007	%	2008	%	2009	%	2010	%	2011	%	2012	%	2013	%
Junior	1,904.4	67.3	2,117.8	64.6	1,110.7	57.1	1,547.0	55.8	2,049.1	48.5	1,847.0	47.7	963.6	41.0
Senior	926.5	32.7	1,161.7	35.4	833.7	42.9	1,224.9	44.2	2,178.3	51.5	2,028.1	52.3	1,388.4	59.0
Total	**2,830.8**		**3,279.5**		**1,944.4**		**2,771.9**		**4,227.4**		**3,875.1**		**2,352.0**	

Type of Company ($ millions)	2014	%	2015	%	2016	%	2017	%	2018	%	2019	%	2020 (p)	%	2021 (i)	%
Junior	814.3	40.4	577.7	31.4	633.9	38.9	1,076.3	49.2	1,121.3	45.1	957.0	41.9	1,029.3	49.2	1,381.4	48.0
Senior	1,203.2	59.6	1,264.7	68.6	994.9	61.1	1,109.3	50.8	1,363.9	54.9	1,329.4	58.1	1,062.1	50.8	1,495.3	52.0
Total	**2,017.4**		**1,842.4**		**1,628.8**		**2,185.6**		**2,485.2**		**2,286.4**		**2,091.4**		**2,876.7**	

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

[(p)] Preliminary; [(i)] Intentions.

Notes: Includes on-mine-site and off-mine-site activities. Includes field work, overhead costs, engineering, economic and pre- or production feasibility studies, environment, and land access costs.

Totals may not add due to rounding.

FIGURE 19: MINERAL EXPLORATION AND DEPOSIT APPRAISAL EXPENDITURES, BY TARGET, 2010 AND 2020 [(P)]

	2010		2020 [(p)]	
	$ millions	% of Total	$ millions	% of Total
Precious metals	952.8	53.3	1,367.0	65.4
Base metals	368.8	20.6	400.0	19.1
Uranium	175.3	9.8	88.4	4.2
Coal	71.0	4.0	97.1	4.6
Nonmetals (excluding diamonds)	52.7	2.9	33.1	1.6
Other metals	35.2	2.0	35.4	1.7
Diamonds	121.0	6.8	38.7	1.9
Iron ore	10.3	0.6	31.6	1.5
Total	**1,787.2**	**100.0**	**2,091.3**	**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.

Allocation of Investment by Minerals and Metals

Precious metals attracted the lion's share of Canadian exploration spending again in 2020, accounting for 65% overall (see Figure 19) – an 8% increase over 2019. Buoyant gold prices have driven the attractiveness of this target in exploration investment in recent years. Looking forward, with projected inflationary pressures on the horizon, the safe-haven status of gold as an inflation hedge may propel the trend even further.

From 2017 to 2019, base metal exploration's share of total investment edged upwards, to 19%, and the absolute value of dollars invested in base metal exploration has nearly doubled, from $209 million in 2017 to $400 million in 2019. 2020 sees a plateauing of this trend, with base metal exploration allocation persisting year-over-year at 19% overall, coming in at $400 million. This persistence is welcome as these investments are essential to address the ongoing depletion of Canadian base metal reserves, as well as meet projected global demand for critical

minerals for clean technologies, including batteries. Without sustained and effective exploration, Canadian base metal production will outstrip reserve additions, reducing the competitiveness of our smelters and refineries, and weakening our overall competitiveness as a destination for electric vehicle investment.

International Exploration

Globally, Canada has been a top destination for mineral exploration investment for the past 37 years. Canada dropped to second place in 1992 for non-ferrous exploration budgets, surpassed by Australia. In 2004, Canada regained the top position and remained there until 2020, when it was again surpassed by Australia.

S&P Global Market Intelligence, in its 2020 edition of the State of Mineral Finance, assessed that global exploration expenditures from 2012-2017 declined over 65% from a peak of US$20.5 billion in 2012 to US$7 billion in 2016. The report confirmed a trend reversal in 2017 as expenditures increased approximately 15% compared to 2016 (to US$8.1 billion) and this trend continued in 2018, with global expenditures rising a further 18% to US$9.6 billion. Canada and Australia continued to lead global activity in 2018, accounting for 15% and 13.8% of expenditures, respectively. In 2020, while Canada and Australia are statistically tied at 16% each, Australia's absolute share of expenditure comes in slightly higher than that of Canada, at US$1.37 billion.

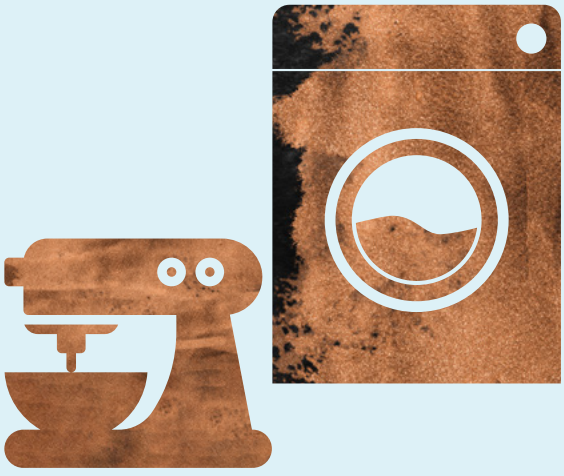
When exploration budgets factor in iron ore, S&P data indicate that Australia's share over Canada increases even further. Australia's attractiveness as a destination for investment has increased recently with its introduction of a flow-through share mechanism to bolster investment in early stage exploration, as well as the predictability and reliability of its regulatory regime, and the dedicated focus on mining as a priority in the country's broader innovation agenda.

Part of the challenge in Canada is regulatory uncertainty, as companies will not invest where they do not believe they can permit a mine, and cost, where they will not invest where they can't afford to build and profitably operate a mine. At the time of writing the *Impact Assessment Act* had only recently come into force, and it is too soon to assess the success of this legislation in bringing greater certainty to companies seeking to permit natural resources projects in Canada.

INVESTMENT

Capital Spending

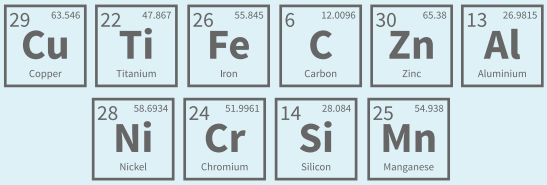
Capital spending is a barometer of how confident managers and investors are about current



PRODUCTS THAT RELY ON MINING

APPLIANCES

Mining keeps your electronics working. The appliances we use everyday, everything from the refrigerator to the washer and dryer, require metals to function. Copper, as just one example, is used in plumbing, industrial machinery and construction materials for its durability, corrosion resistance and ability to be cast with high precision.



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 extension of the Highway 37 transmission line in northeastern British Columbia is a good example of a long-term strategic infrastructure investment. Notably, this capital cost of $400 million will enhance the economics of an estimated $15 billion in mining projects, with one already built – the $450 million, 300-person Red Chris Mine owned by Newcrest Mining – and others in development. Similarly, the extension of the Monts Otish Highway in northern Quebec will improve prospects for the development of gold, diamond, copper and other critical minerals projects in the surrounding region.

The federal government recently announced several new projects that will provide much needed enhancements to mine related infrastructure, including $155 million for the T'licho Road and $90 million to extend a section of the McKenzie Valley Highway in the Northwest Territories (NWT), and $360 million for the Yukon Resource Gateway to expand several road networks in the Yukon. Funding was announced to advance a road that would connect Gray's Bay Nunavut to Yellowknife via the Slave Geological Province in the NWT, as well as support the advancement and planning of the Kivalliq Hydro-Fibre link. These projects will enhance the economics of several mining projects, such as Fortune Minerals' Nico project in the NWT, Newmont's Coffee Gold project and Western Copper and Gold's Casino project in the Yukon.

Mining Industry Capital Investment

In 2021, capital spending intentions in the Canadian mining industry account for 4.6% of Canada's total at $12.3 billion, up 5.1% year-over-year. The industry's capital investment has persisted at these comparably low levels since 2016 – the bottom of the previous commodity price cycle. While 2019 represented an uptick – reaching nearly $15 billion – it is reasonable to presume that pandemic related disruptions in 2020 and 2021 truncated an upward trend. Looking forward, as COVID-19 uncertainty continues to abate, and in light of buoyant mineral and metal prices, capital investment into the sector should increase (see Figure 20).

FIGURE 20: CAPITAL EXPENDITURES IN THE CANADIAN MINING INDUSTRY, 2010 - 2021 [I]

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020[P]	2021[I]
($ millions)												
Stage 1 - Total Mineral Extraction	9,054	12,163	16,916	15,086	11,115	10,188	9,636	8,986	10,037	10,871	8,634	9,508
Metal ore mineral extraction	5,504	8,108	11,020	9,174	5,298	4,881	5,137	5,413	6,715	6,778	5,434	6,188
Non-metallic mineral extraction	2,853	3,083	4,812	5,243	5,433	5,078	4,294	3,201	2,335	3,050	2,516	2,860
Coal mining	697	972	1,085	668	384	230	206	373	987	1,042	683	460
Stage 2 - Primary Metal Manufacturing	1,823	2,936	3,864	3,458	3,332	3,219	2,329	1,520	1,792	2,350	1,604	1,542
Stage 3 - Non-Metallic Mineral Product Manufacturing	765	672	572	459	976	1,136	1,196	899	611	682	567	602
Stage 4 - Fabricated Metal Product Manufacturing	608	729	536	574	640	735	746	925	856	1,075	932	679
Total Mining and Mineral Processing	**12,250**	**16,500**	**21,888**	**19,577**	**16,062**	**15,279**	**13,907**	**12,330**	**13,296**	**14,977**	**11,737**	**12,331**
Non-conventional oil extraction (oil sands)	17,113	22,163	26,246	29,029	35,711	23,420	x	14,278	12,090	10,434	7,440	x

Source: Statistics Canada, Table 34-10-0036-01 (formerly: CANSIM 029-0046)

[P] Preliminary; [I] Intentions

Symbol legend:(X) Suppressed to meet the confidentiality requirements of the Statistics Act

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.

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 20 as this data lags behind capital expenditure data by one year. Adding 2018 repair costs (about $4.3 billion) to 2021 projected capital ($12.3 billion) and exploration ($2.1 billion) spending is projected to produce roughly $16.7 billion in Canadian mineral development investment in 2020.

Current and Future Investments – Critical Minerals on the Cusp

Despite volatility – including that caused by COVID-related disruptions – higher commodity prices have seen a return to normalcy in the global mining industry and may lead mining companies to make new and significant investments to meet growing projected demand. The extent to which Canada's mining industry will rebound after recent years of lower growth remains uncertain. Recent indicators provide some line of sight into Canada's competitiveness as a destination for mineral investment:

- The most recent edition of NRCan's annual report, Natural Resources: Major Projects Planned and Under Construction – 2020 to 2030, while showing modest upward growth of 2.5% (or $2 billion)

year-over-year, indicates the total value of projects planned and under construction from 2020 to 2030 has reduced by nearly 50% since 2014, from $160 billion to $82 billion.

- Australia's mining supply sector surpassed Canada's in 2015, leading now by more than 700 firms.
- Over the last 15 years, several Canadian senior mining companies have been acquired by multi-nationals, resulting in an erosion of Canada's role as the host to global head-offices for the mining industry.
- Canada's share of global production for critical minerals and metals has been eroding, with other jurisdictions capturing greater market share of growing global demand.

Beyond the above quantitative metrics, a number of qualitative indicators from MAC member companies suggest that Canada's competitiveness has declined compared to other jurisdictions, though efforts by governments in recent years are attempting to reverse this. Indeed, there is greater recognition of the strategic importance of Canada's mining industry relative to national climate and foreign policy priorities than at any other time in living memory.

Federal, provincial and allied international governments have recognized Canada has the raw materials and value-added mineral and metal manufacturing expertise to help meet their growing demand while diversifying supply sources. A further competitive advantage is Canada's low-carbon intensity mineral production, broader ESG bonafides, and geographical proximity to US and EU markets, amongst those of other trading partners. In short, countries diversify their supply chains with improved security and sustainability when they source critical minerals from Canada.

> Canadian resources are a best-in-class solution for international partners seeking to reconcile their security of supply, climate change and other ESG priorities.

To bolster this opportunity, Canadian governments have taken action to enhance the industry's competitiveness, in a manner consistent with broader federal climate priorities. For example, MAC has welcomed the following measures taken in recent years:

- The Accelerated Investment Incentive, which will enable miners to write off three times the eligible cost of newly acquired assets in the year the investment is made.
- Extending the Mineral Exploration Tax Credit for a five-year term, bringing greater investment certainty for early stage mineral exploration, with the subsequent commitment to double this credit for critical minerals exploration.
- Commitments to support and accelerate the development and deployment of clean technologies, including renewables, hydrogen and small modular nuclear reactors.
- Allowing businesses to immediately write-off the full cost of clean energy equipment, including the immediate write-off of heavy electric equipment, including haul trucks, in the mining space.
- The launch of the Mines to Mobility strategy and its subsequent inclusion as 1 of 3 pillars in the expanded Strategic Innovation Fund's Net Zero Accelerator to establish and expand a battery electric vehicle supply chain in Canada.

Evidence that these measures are beginning to take effect include positive investment decisions made in recent years. For example, BHP decided to proceed with the development of the Jansen Mine in Saskatchewan – a $7.5 billion project, the largest in the province's history. While Canada has lost mining corporate headquarters over the last two decades – which is a concern and a trend that policy makers should manage against – a number of companies are making notable new investments in Canada, including in the Red Chris, Noront, and Casino projects, a host of metallurgical coal projects in Alberta, and St Barbara in Nova Scotia.

With the advent of mine electrification and zero-emissions mining, these measures recognize the Canadian mining industry is at a tipping point in the transition to a lower carbon economy. Encouraging these investments to help green the mining process, which will enable the responsible extraction of the raw materials needed to support the low-carbon economy, must remain a priority going forward.

Mining is a significant engine of the Canadian economy and supports many other important sectors, including construction, manufacturing and transportation. While Canada remains one of the top mining countries, its leadership in this area is being challenged, and is not guaranteed going forward. While the above measures are both positive and welcome, policy incoherence persists between Canada's clean technology manufacturing, carbon abatement and broader regulatory approaches. Key inflection points include the increasing vulnerability of off-grid mines and the efficacy of Canada's project permitting system. If Canada loses its competitiveness, this will translate into an increasing amount of exploration and mining investments flowing offshore, job losses, deteriorating trade balances and a weakening of our overall economic strength, including on key policy objectives such as establishing a battery and EV supply chain. Further, it will decrease the economic prospects for the many Indigenous peoples and rural communities who rely on the mining sector for reliable and well-paying jobs in remote areas where there are often very few alternative employment opportunities.

SECTION 4

The People: Safety, Employment, Costs and Innovation

The Canadian mining industry accounts for one in every 26 jobs across Canada and, proportionally, is the largest industrial employer of Indigenous peoples in Canada. The safety of workers is the industry's number one priority.

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.

Safety First: COVID-19 Health and Safety Measures in Canada's Mining Sector

Protecting the health and safety of employees, contractors and communities is deeply ingrained in the Canadian mining industry's culture and is a point of focus now more than ever in the face of the ongoing COVID-19 pandemic. From building mobile testing units at remote mine locations, to chartering planes for fly-in fly-out operations to ensure social distancing, the mining sector has prioritized the health and safety of their employees, their contractors and the communities in and around which they operate, and will continue to do so.

Due to the mining industry's essential nature across Canada and its critical role as a contributor to global long-term economic recovery and low-carbon transition efforts, it has been of utmost importance that those who work at the mine site are protected and engaging in safe work practices. In addition to following public health guidance and regulations on COVID-19, including on vaccinations, MAC and its members remain dedicated to ensuring screening and testing measures of the highest calibre are in place to maximize safety at the mine site and surrounding communities.

The mining industry supplies the materials required for the manufacture of products essential for Canadians, including medical technologies and medications, and it has been critical that supply chains stay open so that mined products are readily available for the people and businesses who rely on them. Mined materials, like gold, carbon, zinc, uranium and nickel, are required in the instruments and medicines used in hospitals around the globe. For example, gold is an integral ingredient in the hundreds of millions of Rapid Diagnostic Tests that are being used around the world to aid in COVID detection, while carbon is needed in everything from hospital furniture to ventilators. Uranium is needed to develop isotopes for nuclear medicine – a critical tool in the detection and treatment of cancer. Nickel alloys and nickel-containing stainless steel, essential materials in surgical steel, medical devices and diagnostic tools, able to provide medical solutions and prolong lives.

Mined metals like copper plays an important role in killing bacteria and preventing patients from acquiring infections, and there is promising research being done on the public health value of introducing copper coatings on high-touch surfaces to reduce or eliminate the potential for germs to spread. For example, in September 2021, Teck Resources announced its plans to install antimicrobial copper coatings that can kill 99.9 per cent of bacteria on high-touch surfaces on the Toronto Transit Commission's buses, subway cars, and streetcars. The pilot project comes after a successful five-week trial period on transit vehicles in Vancouver that demonstrated copper's ability to kill germs on transit surfaces.

Other research is being done by companies like Rio Tinto on technology that incorporates and seals antimicrobial agents in aluminum surfaces that could be used on everything from door handles to medical equipment to hand rails on public transport. This technology, which has been tested by Canada's National Research Council and several research entities and certified in independent laboratories, eliminates up to 99.99% of bacteria, viruses and other germs and could be a game changer in preventing the spread of diseases like COVID-19.

Beyond safety, MAC member companies went further during periods of peak uncertainty, making contributions to foodbanks, women's shelters, Indigenous organizations and health authorities across Canada exceeding $40 million. These are in addition to the donation of tens of thousands of N95 masks, test kits and ventilators amongst other equipment and goods to address shortages of these critical supplies.

The John T. Ryan Trophies

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

Mining safety statistics can be invaluable tools 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 existing figures and analyses be easily accessible and that the people and organizations compiling statistics understand the information needs of safety professionals.

In 2021, the following MAC members were recipients of John T. Ryan Trophies:

- **Glencore's Raglan Mine and Matagami Mine**
  Canada Trophy for Metal Mines
- **Vale's Voisey's Bay Mine**
  Canada Trophy for Select Mines
- **New Gold's New Afton Mine**
  Regional Metal BC / Yukon
- **Cameco's Cigar Lake Mine**
  Regional Metal Prairies and Territories
- **Vale's Totten Mine**
  Regional Metal Trophy Ontario

MINING INDUSTRY EMPLOYMENT

According to Statistics Canada data, the mining industry directly employed 377,000 people in 2020, accounting for roughly one in every 49 Canadian jobs (see Figure 21). When indirect jobs are included, the industry's employment reach increases significantly. According to Natural Resources Canada estimates, the mining industry indirectly employed an additional 315,000 individuals in 2020. Together, the industry's direct and indirect employment exceeds 692,000 jobs, accounting for one in every 26 jobs in Canada.

Overall Employment Numbers

In 2019, 181,000 (48%) of those directly employed in mining worked in the extraction and primary metal and non-metallic manufacturing sector (see Figure 21). This figure includes approximately 41,000 workers in metal mining, 23,000 workers in non-metal mining and 8,000 workers in coal mining. 84,000 employees are split evenly between primary metal and non-metallic manufacturing, with mining services accounting for the balance of 20,000 jobs.

FIGURE 21: MINERALS AND METALS SECTOR EMPLOYMENT, BY SUBSECTOR AND PRODUCT GROUP, 2020[(P)]

Subsector/Commodity group	2020[(p)]
(000 jobs)	
Direct	**377**
Primary	**181**
Extraction	**72**
Coal	8
Metallic minerals	41
Non-metallic minerals	23
Services	**24**
Primary manufacturing	**84**
Primary metallic mineral products	42
Primary non-metallic mineral products	42
Downstream	**195**
Secondary metal products	21
Tertiary metal products	123
Miscellaneous metal products	31
Services and custom work	20
Indirect	**315**
Total minerals and metals sector	**692**

p - preliminary

Source: Statistics Canada. Table 38-10-0285-01 Natural resources satellite account, indicators.

According to Natural Resources Canada, the mining industry indirectly employed an additional 315,000 individuals in 2020, bringing total employment to 692,000 jobs.

In the oil sands extraction sector, recent data show that Suncor, Syncrude, and Canadian Natural directly employ approximately 12,600, 4,800, and 9,700 people respectively, in mining and oil and gas activities. These figures do not include indirect employees, which number in the thousands.

Employment statistics for the mining and oil sands sectors are dynamic 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. 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. Canada's Mining Industry Human Resources Council (MiHR) is focused on researching these changing trends and forecasts labour market demand to help the industry meet its human resources needs and objectives.

Need for Workers and Skills

The mining industry, both in Canada and abroad, faces a number of human resources challenges. MiHR's 2020 edition of the *Canadian Mining Labour Market Outlook* estimates that the Canadian mining industry will need to hire close to 80,000 new workers over the next decade to 2030. These new hires are required to replace retirees and fill new positions to meet baseline production targets (see Figure 22). In its report, MiHR also forecasts contractionary and expansionary hiring scenarios. Notably, even in a contractionary scenario, the hiring forecast predicts that nearly 50,000 new hires will be necessary to meet labour demand.

This workforce shortage is compounded by the wave of the industry's skilled core of workers who are retiring. By 2030, MiHR forecasts that more than 57,000 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. Also

FIGURE 22: CUMULATIVE HIRING REQUIREMENTS* BY FORECAST SCENARIO (2020–2030)

	Net Change in Employment	Replacement Requirements		Cumulative Hiring Requirements
		Retirement	Non-Retirement	
Contractionary	-25,940	56,020	21,800	49,880
Baseline	-1,140	57,830	23,260	79,680
Expansionary	26,330	61,960	24,840	113,130

Sources: Mining Industry Human Resources Council, Statistics Canada (System of National Accounts, 2016 Census), 2019

concerning is MiHR's forecast of further contraction in employment in the primary metal manufacturing sector, projecting 4,400 job losses over the next decade. Underscoring the essential role that Canada's smelters and refineries play in the critical minerals supply chain, and how essential their products are to attracting advanced manufacturing investment into Canada, policy makers should heed this warning and take measures to strengthen Canada's competitiveness in this space.

MiHR's 2020 report included a 10-year hiring forecast based on a model developed in a much different economic environment, before the COVID-19 pandemic. The events of 2020 introduced unprecedented uncertainty—the trajectory of the industry could change dramatically depending on several factors such as the introduction of remote work, the acceleration of technological innovation across the value chain, shifting macroeconomic conditions (including commodity prices and monetary policy), as well as the length of time that the pandemic will continue to impact the global economy. Because of this uncertainty, in a more recent projection, MiHR limited its model to the next five years (to 2025), providing a conservative assessment about how hiring requirements might change under current economic conditions. In this model, the optimistic scenario assumes the labour market recovers quickly adding 14,380 more cumulative jobs than the pre-COVID scenario over five years, while the pessimistic scenario assumes the pandemic has a lasting negative effect on mining employment, resulting in a net loss of 3,510 jobs over five years than the pre-COVID-19 baseline. Given how unpredictable and dynamic economic activity has been since COVID took hold, MiHR will continue to update their models with the aim of managing employment expectations as honestly as possible until we return to a less volatile period.

These shifts lead to an entirely new set of challenges, with relatively inexperienced workers replacing those far more seasoned, particularly in the high turnover trades and production occupations. Further, with smelters and refineries often located in rural communities, the loss of these employment opportunities is likely to present local economic challenges. This places an additional onus on industry to work collaboratively with government and educational institutions to ensure that new entrants to the industry have the skills required for high-demand jobs within mining. Companies need to ensure that new employees have opportunities to learn from those with significant experience both during training programs and on the job. Beyond skilled talent, a broader set of policy considerations should be undertaken with the aim of ensuring Canada's downstream metal manufacturing sector remains competitive over the next decade. Although the newest labour market data is still unclear, it is very possible that the COVID-19 pandemic could have accelerated many of these trends due to retirements as well as a change in the types of jobs in demand.

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, and heavy equipment operation in addition to other areas. Because today's mining industry relies on advanced technologies, much of the demand is for highly skilled workers. It is possible that the pandemic could simultaneously make highly-skilled workers more valuable for mining (due to the faster adoption of new technologies) and make them more difficult to acquire (since the skills shortages also affect many other competing industries that can make themselves even more attractive by offering full-time remote work).

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

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

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

The federal government has taken some steps to help the industry address these problems, including through the expansion of the Youth Employment Strategy, the proposed Post-Secondary Industry Partnership and Co-operative Placement Initiative, and continued funding for the Indigenous Skills and Employment Training Strategy. MAC supports an expansion of this program, which has proven to be a valuable source of funding for Indigenous skills training initiatives.

MiHR has also benefited from programmatic support, specifically in developing critical research to inform industry actions to address its human resources challenges and meet its employment needs. Ensuring MiHR can continue to produce crucial research and deliver strategic programs is essential to supporting the industry's workforce needs and meeting its commitments to diversity.

Women in Mining

While Canada's mining industry has long been a male dominated sector, strides are being made to promote greater inclusion of women. Mining companies across the country are increasingly seeing women in senior leadership roles and working at the site level, but there is still work to be done to ensure that their meaningful participation in the sector is prioritized.

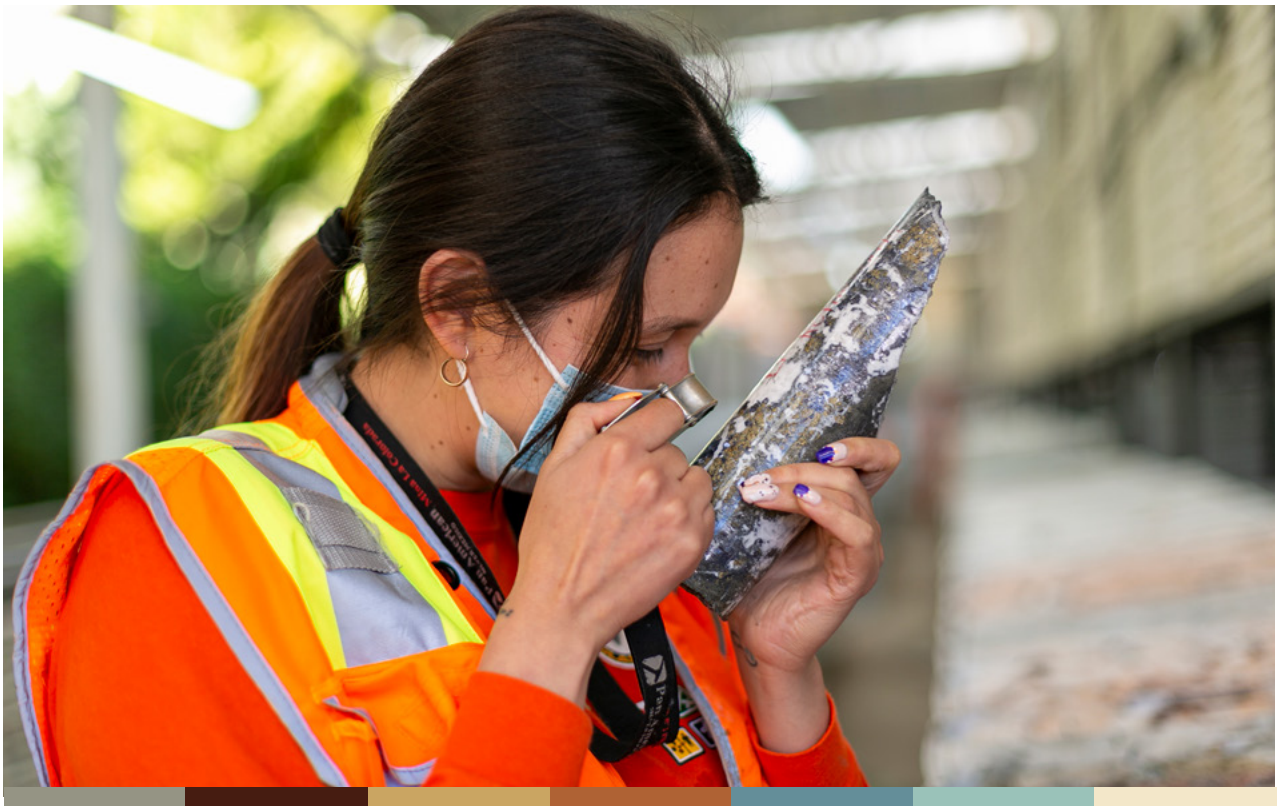
According to Canada's most recent census data for selected occupations – itself now dated, as we await the release of data from Census 2021 – women's representation has increased across all industries in recent years, from 27% in 2011 to 31% in 2016 (see Figure 23). While Census 2016 suggests that the mining industry has yet to realize these gains – with women making up 12% of the work force – more recent data from MiHR indicates improvement. As of December 2020, employment for women totaled 8,900 workers, representing 15% of the workforce in mining and quarrying. Further, since the emergence of the pandemic, women in the sector have shown more employment resiliency than their peers in other industries. The average unemployment rate for women in mining was 3.8% from April to December 2020, compared to 10.5% (on average) for women in all industries across Canada.

Of note is that MiHR sources both data from the census and from the Labour Force Survey (LFS) to complete its analyses, with the former being collected every five years, and the latter being procured, but from a smaller sample, on an annual basis. In this sense, while the census is more authoritative, LFS data provides a more current set of information, helping to bridge the long gaps in available information between respective editions of the national census. Ultimately, both tools are important to monitor trends and help the industry inform, refine and adapt human resources programming.

FIGURE 23: REPRESENTATION OF WOMEN IN MINING INDUSTRY AND ALL INDUSTRIES, SELECTED OCCUPATIONS AND ALL OCCUPATIONS (2011 AND 2016)

	2016	2011
Mining Industry / Selected Occupations	12%	12%
Mining Industry / All Occupations	16%	17%
All Industries / Selected Occupations	31%	27%
All Industries / All Occupations	48%	48%

Source: Mining Industry Human Resources Council, Statistics Canada (2011 NHS, 2016 Census), 2019



Recognizing the need to do more to attract female workers, concerted efforts by both industry and government are underway to attract and retain women in the mining industry. Developed on the foundation of a previous research initiative – Strengthening Mining's Talent Alloy: Exploring Gender Inclusion – MiHR's Gender Equity in Mining Works (GEM Works) program offers comprehensive training to help establish Change Agents within an organization and ultimately eliminate unintentional barriers to gender inclusion found in dated policies, procedures and practices. Validated through industry leading labour market research and funded through Employment and Social Development Canada's Sectoral Initiatives Program and the Department of Status of Women, the driving intent of GEM Works is to provide mining companies with tangible tools and training to increase the participation of women in the sector. Following a successful launch of the pilot program, the number of active sites that have adopted and/or continue to use GEM Works training has increased. To learn more about this important work, visit MiHR's website.

Written resources highlighting what mining companies can do to enhance the inclusion of women in the sector have also been an industry focus. The Prospectors and Developers Association of Canada (PDAC), an organization representing Canada's junior mining sector, published *Gender Diversity and Inclusion: A Guide for Explorers*, in 2019. This document is designed as a guide for mining companies that are new to understanding issues and implementing efforts related to gender, diversity and inclusion. The guide provides information and tools needed for exploration and mining companies to both implement gender diversity and inclusion strategies and programs and cultivate more gender inclusive and diverse environments both internally and externally within the communities in which they engage. MAC and its members were pleased to play a role in the creation of this important resource.

Several organizations in Canada, including Women in Mining Canada and Women Who Rock, focus on encouraging mentorship and supporting initiatives that promote professional development for women in the mining sector. These initiatives, and others

like them at the company level, are dedicated to empowering women and improving gender diversity in the mining industry.

Employment of Indigenous People

Indigenous people in Canada comprise three main groups: First Nations, Métis and Inuit. In 2016, they accounted for 5% of the total population, up from about 4% in 2006, and 3% in 1996. Since 2006, the Indigenous population in Canada has grown by 43% – more than four times the rate of the non-Indigenous population – and is expected to reach more than 2.5 million over the next two decades.

Proportionally, the mining industry is the largest private sector employer of Indigenous peoples in Canada. According to MiHR research, Indigenous people represented more than 7% of the mining workforce in Canada in 2016, up from roughly 5% in 2011. Most of the Indigenous people in the mining industry are either Métis or First Nations, though Inuk employment in the sector has been growing as mining opportunities in Inuit regions have increased in recent years. Indigenous people are better represented in the mining industry (7.4%) than in all other industries (3.9%). Interestingly, the share of the mining workforce that is Métis nearly doubles the share found in all other industries combined (see Figure 24).

The proportion of Indigenous workers in the mining industry is well above that of the rest of the Canadian workforce.

A critical challenge is to ensure that Canada's new cohort of Indigenous peoples has the opportunity to participate meaningfully in the Canadian workforce and is provided with training and educational opportunities to advance and thrive. Approximately one in four Indigenous people in their prime working age (between 25-54 years old) are not participating in the labour force. Since attaining an appropriate level of education is an important factor to entering the labour force, training to develop the requisite skills for meaningful participation is critical for accessing well-paying mining jobs.

Fortunately, the mining industry has proven an effective vehicle not just for Indigenous employment, but also for skills training and upward mobility. For example, Indigenous people in the mining workforce are increasingly pursuing formal education credentials. According to 2019 MiHR research in 2006, 30% had no certificate, diploma or degree; by 2016, that rate fell to 22%. From 2006 to 2016, the share of Indigenous people in the mining workforce with a college, CEGEP or other

FIGURE 24: REPRESENTATION OF INDIGENOUS PEOPLES IN THE WORKFORCE, MINING INDUSTRY AND ALL INDUSTRIES, 2016

Aboriginal Status	All Industries	Mining Industry
Indigenous	3.9%	7.4%
Métis	1.7%	3.2%
First Nations	2.0%	3.4%
Inuk (Inuit)	0.1%	0.6%
Indigenous responses not included elsewhere	0.1%	0.1%
Multiple Indigenous responses	0.0%	0.1%

Sources: Mining Industry Human Resources Council, Statistics Canada (2016 Census), 2018

FIGURE 25: REPRESENTATION OF NEW CANADIANS AND VISIBLE MINORITIES IN THE MINING WORKFORCE (2006, 2011, 2016)

Diversity Status	2006	2011	2016
Immigrant	12%	14%	13%
Visible Minority	7%	9%	9%

Sources: Mining Industry Human Resources Council, Statistics Canada (2006 Census, 2011 NHS, 2016 Census), 2018

non-university certificate or diploma rose by three percentage points, as did the rate for those with a university certificate, diploma or degree at bachelor level or above.

Potential for increased Indigenous employment remains strong. Some 209 producing mines and more than 2,500 exploration properties are located within 200 km of Indigenous communities. Also, many mines and projects are located on traditional lands. Indigenous people across the country are, therefore, ideally situated to access employment opportunities, and other benefits, in the mining industry.

New Canadians and Visible Minorities in the Mining Workforce

Census data from 2016 demonstrate that immigrants and visible minorities in Canada each make up one-fifth of the country's total population. Of the visible minority population, 30% were born in Canada. Statistics Canada projects that the immigrant share of Canada's population could reach between 25% and 30% by 2036; Canada's visible minority population is expected to be even higher, between 31% and 38%.

According to MiHR research, in 2016, the representation of immigrants (13%) and visible minorities (9%) in the mining workforce were both lower relative to all industries (23% and 21% respectively). Concurrently, the share of the mining workforce that are immigrants has been modestly increasing, from 12% in 2006 to 13% in 2016 (see Figure 25). Similarly, the share of visible minorities in mining is smaller relative to immigrants, but this gap is closing; the share of visible minorities in the mining workforce grew from 7% in 2006 to 9% in 2016.

Given Canada's aging population, the labour market demand for new immigrants is increasing. Thus, appealing to this demographic is important to the medium and longer-term sustainability of the mining sector workforce.

KEY COSTS

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

Wages

The Canadian mining industry boasts the highest wages and salaries of all industrial sectors in Canada

(see Annexes 7 and 8 for details). The average annual pay for a mining worker in 2020 exceeded $123,000, which surpassed the average annual earnings of workers in forestry, manufacturing, finance and construction by a range of $22,000 to $37,000.

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

Overall Production Costs

Mining operations incur significant production costs. The industry's three main production costs – wages, materials and supplies – totalled $5.1 billion, $2.8 billion and $8.5 billion, respectively, in 2018, the most recent year for which data are available (see Figure 26). Cost data for energy – historically the third highest operational cost in the mining industry – has been available but has been suppressed due to confidentiality considerations in the *Statistics Act* for this year. This is likely due to mergers and acquisitions in the industry that have resulted in an increased risk of data breach should certain figures be released. Recently, MAC led an effort, in partnership with NRCan, to get member companies to sign waivers that would permit the release of this important data. While there was strong participation from the membership, unfortunately, MAC does not represent thermal coal operators where these numbers have been suppressed. MAC supports public and transparent reporting of data as a critical step in the broader public policy development process and encourages companies to sign waivers in support of fact-based discourse.

Remote and Northern Regions

While the mining industry is truly pan-Canadian, with operations from coast-to-coast-to-coast, it is particularly significant to remote and northern Canada. Mining is the largest private sector driver in Canada's Arctic employing approximately 8,500 people, roughly one in every six jobs. These numbers expand when the northern regions of Manitoba, Quebec and Newfoundland and Labrador are incorporated. According to the Conference Board of Canada, mining industry GDP contributions for 2021 for the Northwest Territories, Nunavut and the Yukon are forecast at 27% and 42% and 12.8% respectively, totalling nearly $3 billion.

Proportionally, the industry is the largest private sector employer of Indigenous peoples in the country and the territories host the highest per-capita demographic of Indigenous peoples of any sub-national jurisdiction in Canada. Mining is also the largest private sector business partner of Indigenous-owned enterprises in the North, responsible for helping to develop and grow many successful Indigenous businesses, some that have grown and now serve customers beyond the mining sector. As such, more so than any other region in the country, strengthening northern peoples and communities means advancing Indigenous economic reconciliation.

FIGURE 26: SELECTED COSTS OF PRODUCTION IN THE MINERAL INDUSTRY [1], 2018

By Industry	Establishments Surveyed (number)	Wages for Production & Related Workers ($000)	Fuel & Electricity ($000)	Materials & Supplies ($000)	Value of Production ($000)
Metal Ore Mining	68	3,134,056	1,924,006	5,833,610	26,871,087
Nonmetallic Mining and Quarrying	931	1,493,978	921,823	1,694,807	13,447,430
Coal	21	494,400	X	988,766	X
Total Mineral Industry	**1,020**	**5,122,434**	**X**	**8,517,183**	**X**

Source: Statistics Canada.

X - Suppressed to meet the confidentiality requirements of the Statistics Act

[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.

The future of Canada's mining industry lies increasingly in remote and northern regions, but the infrastructure deficit in this part of the country challenges project economics. MAC and mineral industry partners undertook extensive research on how remote and northern mining costs compare to those in the south. Our research indicates it costs 2-2.5 times more to build the same precious or base metal mine in the North (off-grid) – and 60% more expensive to operate – than the same mine in a centrally located region. Most importantly, 70% of this cost differential derives from the infrastructure deficit. These heightened costs also curtail attractiveness for exploration investment – critical to discovering the future fleet of Canadian mining operations, on which continued economic, social and sovereignty benefits are contingent.

The remote and northern segment of the Canadian mining industry was the hardest hit by COVID-19 and has taken the longest to recover. Companies, in close consultation with and out of respect for the concerns of their local communities, made difficult decisions to temporarily cease operations, or curtail production, often while continuing to pay their local workforce salaries. Throughout the past year and a half, companies have adapted their operations to ensure they provide a safe workplace for employees and protect the communities where they operate. Managing COVID-19 continues to be a challenge for remote fly-in, fly-out northern mines. With the arrival of new and highly contagious variants, and with the fluctuation of COVID-19 cases in Canada, companies have planned additional precautionary measures to protect the health of employees and communities. Companies are acutely aware of the limited intensive care capacity in Canada's North, and the fact that Indigenous populations are at higher risk.

These realities, combined with the extensive infrastructure deficit, the limited optionality to displace mounting carbon costs, and the corresponding heightened remote operational costs, have presented challenges for our sector in this region.

Without strategic and wealth-generating infrastructure development to enhance investment competitiveness, these regions and their inhabitants will remain disproportionately reliant on transfer funding for core services and program delivery (frequently at lower standards than southern Canadian jurisdictions enjoy). Strategic investments in energy infrastructure are also essential to reduce northern reliance on costly and higher-emitting fossil fuels.

Infrastructure is Essential to Achieve Critical Mineral Potential

MAC welcomed the government's renewal of the Trade and Transportation Corridors Initiative's (TTCI) northern allocation of $400 million in Budget 2019, the commitment to invest $1.7 billion over 13 years to enhance digital connectivity and internet speeds, and the allocation of an additional $700 million over the next 10 years in new and focused funding to ensure Arctic communities have the opportunity to grow. Allocating $35 billion in the creation of the Canada Infrastructure Bank adds an additional incentive for remote and northern project development and funding amplification for strategic projects. Beyond these programmatic developments, positive project-specific funding decisions have been made in support of:

- The Yukon Resource Gateway ($360 million).
- The T'licho Road in the NWT ($155 million).
- A section of the McKenzie Valley Highway in the NWT ($90 million).
- Funding to advance planning for the road that will connect the Slave Geological Province in the NWT to the Kitikmeot Inuit region of Nunavut ($27 million).
- Support planning by the Government of the NWT for its proposed Taltson hydroelectricity expansion project ($18 million).

While some of the above listed projects will require further funding considerations as they progress over time, MAC interprets these allocations as recognition by decision-makers that they are in the national interest, have a strategic value to Canada, and that all Canadians stand to benefit from their completion.

Northern Policy Coherence is Needed

MAC supports climate action that is consistent with the ambition of the Paris Agreement to limit global warming to well below 2 degrees Celsius and is openly supportive of a revenue-neutral price on carbon. From the outset of our engagement on this important issue, MAC has underscored the

need for any climate change policy to ensure the competitiveness of emissions-intensive and trade exposed sectors (such as mining), as well as the necessity of being sensitive to the realities of remote and northern regions. Off-grid mining companies are overwhelmingly reliant on liquid fuels for power generation and will remain so until a paradigm shift ushers in the next generation of technologies. Until then, it remains in Canada's best interest, and consistent with stated Indigenous reconciliation and clean technology development policy priorities, to ensure these vulnerable assets are not artificially rendered redundant.

Nickel and cobalt are a good proxy for the opportunity and challenges that Canada faces in the global battery race. These two metals commonly make up 60%-80% of the material input into current EV batteries. In 2018, 52% and 62% respectively of Canadian nickel and cobalt were mined at diesel-reliant off-grid mines – at higher operational and carbon cost exposure – but processed at clean grid-connected Canadian smelters and refineries. Even though extracted at off-grid mines, nickel processed in Canada has the second lowest carbon-intensity in the world on a supply-chain basis. Just as Canada's ambition to pursue the production of battery grade nickel manufacturing is contingent on its pre-existing nickel smelting and refining capacity, that smelting and refining capacity is contingent on sourcing feedstock from those off-grid mines. Jeopardizing the root of this supply chain imperils Canada's world leading low-carbon smelting and refining capacity, while simultaneously weakening Canada's prospects for attracting new investments in the battery manufacturing race.

Gold, diamond and iron ore mining are excellent examples of the driving force the mining industry plays in supporting Indigenous reconciliation in remote regions. In Nunavut and the NWT, companies that mine these materials, combined, are the largest Indigenous employers and business partners in these territories. It took decades to cultivate relationships with local communities, establish meaningful partnerships, construct mines, train local workforces, and ultimately generate the wealth and prosperity this effort has made possible. With exceptionally limited meaningful alternative economic development opportunities, climate policy

PRODUCTS THAT RELY ON MINING

CURRENCY

The Winnipeg location of the Mint is a high-tech, high-volume manufacturing facility. Every single Canadian circulation coin is produced here—literally billions each year.

considerations must carefully weigh the holistic and long-term costs of an increasingly uncompetitive mining industry in these regions. These include off-grid mines in Canada becoming a constituency of concern in the context of a Just Transition dialogue, with materially negative trade-offs for local Indigenous communities, regional economies, and sovereignty considerations – all of which have competing federal policy rationales.

The Kivalliq Hydro-Fibre Link is an Inuit-led project that will deliver renewable energy and broadband service to underserved remote communities while enabling the region's mining sector to flourish. The Hydro-Fibre Link project is a once-in-a-generation opportunity to decarbonize communities and industry in Nunavut, improve quality of life and connectivity, and create new economic opportunities long into the future. The benefits from this project will be enormous for the environment and for the economies of Nunavut and Canada and would work to solve two persistent problems at once.

The government has deployed various programs to support businesses and communities in reducing their carbon-cost exposure. While these programs initially were not designed with remote industry in mind, MAC appreciates recent recognition of the need for programmatic supports (including the Strategic Innovation Fund and NRCan's Smart Renewables and Electrification Pathways Program) to account for remote industrial realities and is aware of several members who have made applications, and others who are considering or planning to. Ensuring these programs remain open to off-grid industrial projects – and that terms and conditions do not prohibit or discriminate against these operations – is critical.

INNOVATION AND RESEARCH AND DEVELOPMENT

Canadian mining companies are leaders in innovative practices, particularly through the role they play in moving towards a lower-carbon future. The increased adoption of EVs for underground mines is one demonstration of this. Use of EVs not only helps to reduce energy use (e.g., eliminates vehicle emissions and reduces energy used for ventilation), but the reduction or elimination of underground diesel emissions also improves worker health and safety. This is just one example of where the sector is providing leadership in showing how innovation in mining is contributing to the transition to a low-carbon economy.

Innovative Initiatives in Canadian Mining

Canada hosts a number of innovation forums for the mining industry. Some of these are commodity specific, while others focus on challenges unique to the regions in which their members operate. Others are broad in their appeal and seek to advance solutions and resolve challenges common to mining operations regardless of their particular circumstances.

Specific areas of focus include small modular nuclear reactors to provide an alternative to producing electricity using diesel generators for mine sites in remote areas, the application of hydrogen in the mining sector for power generation and mobile propulsion, the potential for expanded use of carbon capture utilization and storage technologies, and efforts to create next generation mineral processing efficiencies, amongst others. To support progress in these areas, MAC liaises with the Clean Resources Innovation Network (CRIN), the Canadian Oil Sands Innovation Alliance (COSIA), the Centre for Excellence in Mining Innovation (CEMI), COREM and the Canadian Mining Innovation Council (CMIC).

Recent and ongoing supports to these organizations are both appreciated and critical to supporting decarbonization, performance and broader environmental objectives, including:

- $40 million to CEMI in July 2021 for the Mining Innovation commercialization Accelerator
- $6.97 million to COREM in August 2021
- $100 million to CRIN in October 2020
- $2 million to CMIC in September 2019

Innovation Essential to Critical Minerals Success

Without a sustainable and competitive critical mineral and metal manufacturing supply chain, Canada's competitiveness as a destination for advanced technology manufacturing is significantly diminished.

While a number of policy measures are required for success, deploying an effective critical minerals innovation strategy is key among them, and support from the federal government is critical. Innovation is needed to support the identification, extraction and refining processes for rare earth elements (REEs), including from existing mine waste streams where they are commonly found.

Budget 2021 announced specific supports targeting REEs, including the establishment of a Critical Minerals Centre of Excellence that will focus on coordinating federal policy and programs on critical minerals and $36.8 million over three years for federal research and development to advance critical battery mineral processing and refining expertise.

REEs, a subset of critical minerals, are used in a wide range of essential technologies including in healthcare, defence, clean energy and telecommunications. To date, China has dominated the market for these key materials, developing market control over their production and distribution, thus rendering the rest of the world reliant on China for procurement. To help address this vulnerability, Canada and the United States signed a Joint Action Plan to partner in creating greater North American resilience and independence in the extraction, processing and manufacturing of REEs and magnets. While the above policies and funding are positive first steps, they are modest, and should be expanded if Canada is to fulfill its objective in creating greater autonomy of supply for these materials.

SECTION 5

The Environment: Sustainable Development, Climate Change and the Clean Energy Economy

The Canadian mining industry is providing global leadership through its *Towards Sustainable Mining*® program, focused on enabling mining companies to meet society's needs for minerals, metals and energy products in the most socially and environmentally responsible way.

Environmental, social and governance (ESG) practice is increasingly well integrated into mine planning and management. Resource development and environmental conservation are not mutually exclusive but can be achieved by effective regulation and responsible sustainability practices. In Canada, mining companies are required to plan for closure well before entering into production. Not only are closure plans required by law in Canada, but companies must also provide financial assurance to ensure that appropriate funding is available for effective mine closure and reclamation. Reclamation, one of the most important aspects in the mine closure process, specifically focuses on restoring mined lands to their original state.

MAC's *Towards Sustainable Mining*® (TSM) initiative is committed to responsible mining and serves as an example of how resource development can co-exist with environmental conservation, and how partnerships can be fostered between mining companies and communities. TSM, first established in 2004 and mandatory for all MAC members, is focused on enabling mining companies to meet society's needs for mined products in the most socially, economically and environmentally responsible way.

THE CLEAN ENERGY ECONOMY

The World Bank forecasts up to 500% increases in the production of multiple mineral and metal inputs required to produce the clean technology essential to limiting global temperature rise to 2 degrees Celsius. Similarly, the International Energy Agency projects that EVs and battery storage will account for roughly half of the mineral demand growth from clean energy technologies over the next two decades (to 2040), spurred by surging demand for battery materials. At the same time, the energy mix is set to change, with renewable and non-emitting power sources, including nuclear power, set for market share expansion. On this backdrop, fossil fuel products are forecast to continue playing an important role in energy and transportation markets, albeit on a declining scale. On the backdrop of this projected energy transformation are deepening global fault-lines with implications for pre-existing raw material supply chains, and the respective national economies that rely on these materials to operate. The term critical minerals has been adopted to demark the particular products on which national economies are reliant.

Critical Minerals

Increasing geopolitical uncertainty has magnified the precariousness of existing sources of critical minerals, vital in aerospace, defence, healthcare, telecommunications, computing, and an array of clean technologies such as solar panels, nuclear energy and EV batteries and motors. Governments globally have started assessing the vulnerability of their respective economies to supply shocks for critical minerals: minerals and metals that they cannot source in sufficient volume, or at all, from within their own borders but on which the proper functioning of their economies, and sovereign responsibilities, depend.

According to the recently released G7 Panel on Economic Resilience report, China alone accounts for 80% of the US's Rare Earth Elements (REE) imports and 98% of the EU's, without which wind energy, EV motors, enhanced defense systems, and a host of other technologies would not be possible to manufacture. Similarly, China hosts approximately 70% of global battery grade material manufacturing, without which batteries for EVs and other applications cannot be built. Reinforcing this acute vulnerability is the ongoing global chip and semi-conductor shortage, and the demand implications for autos and other advanced manufacturing technologies this presents.

In response, governments are creating lists of minerals and metals on which their economies and national interests rely but to which they have insufficient or precarious access. While the materials on national critical minerals lists vary across jurisdictions, economic security, national defense and sustainability are common themes through which critical material identification has been justified. While each list is different, two general categories of critical minerals are at the heart of the supply chain security-sustainability nexus: battery minerals and REEs. Materials from both categories are listed on Canada's critical minerals list – published in March 2021.

To create greater security of supply, policies and cooperative partnerships are being developed across like-minded countries to secure new access to the critical minerals required to bolster economic

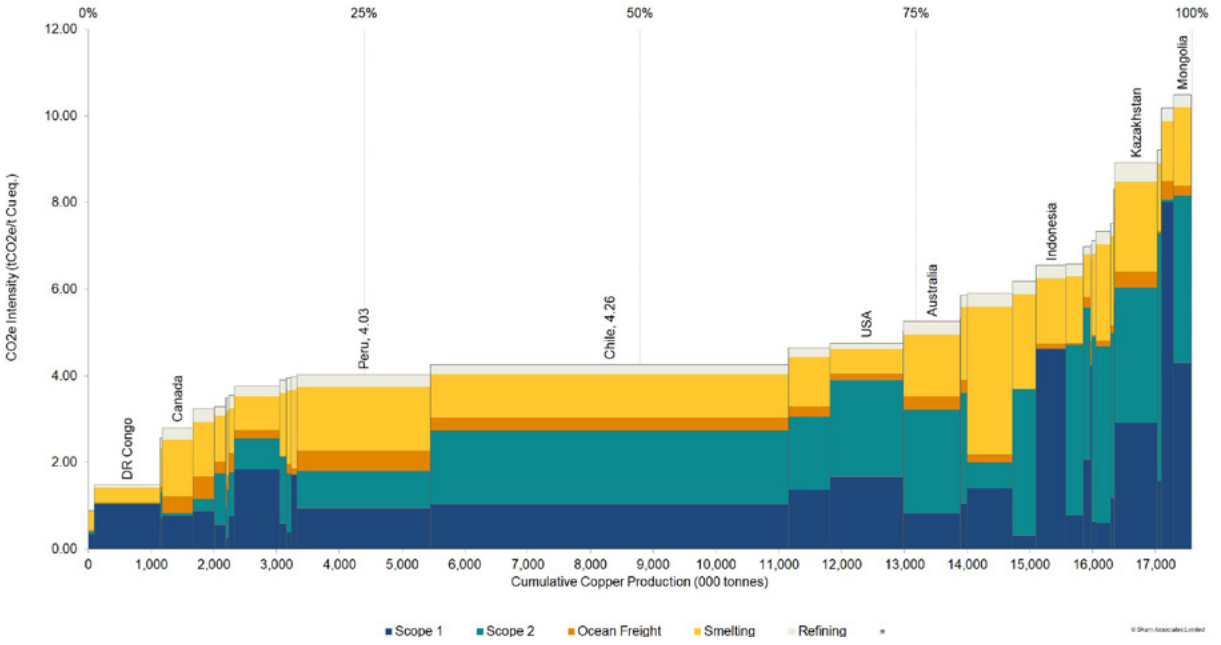
security, national defense and low carbon energy transition. Canada has entered critical minerals dialogues with the US and the EU, amongst other partners, to assess how deepened partnerships can increase supply chain resiliency for critical minerals. In each case, governments are looking to Canada as a preferential and responsible source for increased volumes of critical minerals and as a destination of choice to reliably diversify existing supply-chain reliance.

Battery Materials and Clean Technology

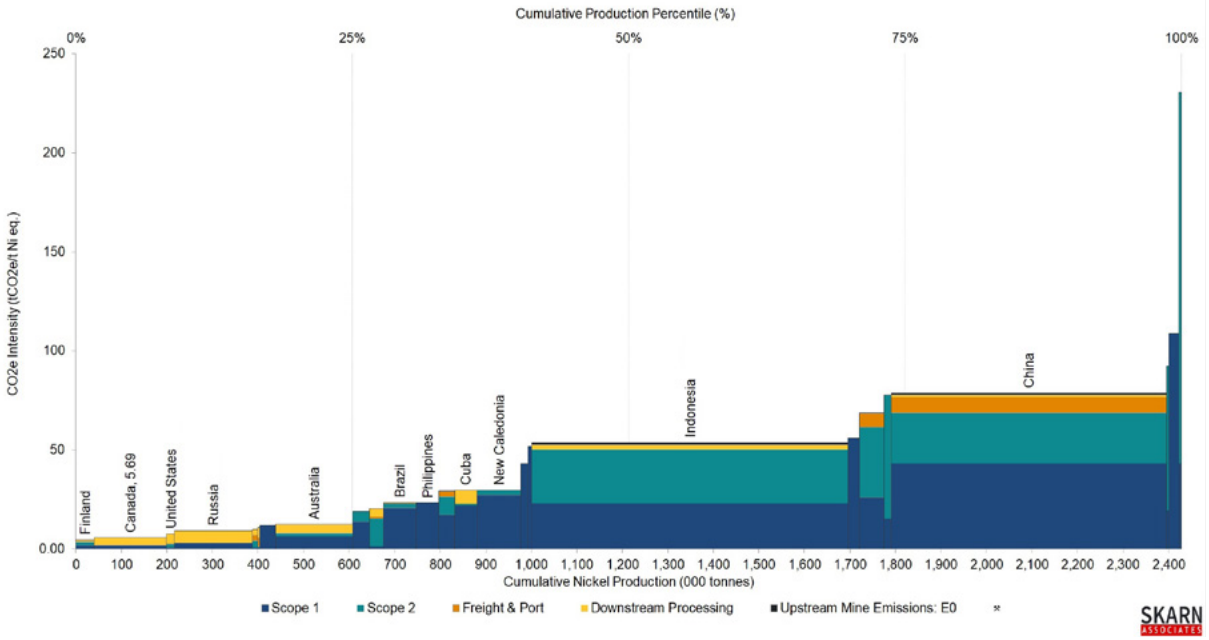
Nickel, cobalt, manganese, lithium, and graphite are the predominant EV battery minerals at present.

FIGURE 27: SKARN ANALYSIS ON GLOBAL CARBON INTENSITY OF SELECT MINERALS AND METALS

GLOBAL CARBON INTENSITY CURVE FOR COPPER



GLOBAL CARBON INTENSITY CURVE FOR NICKEL



Evolution of battery chemistries may displace reliance on some of these materials for others, in whole or in part, but current EV production overwhelmingly uses batteries formulated on a mix of these materials, and this reliance is likely to continue for the foreseeable future.

Fortunately, Canada is in possession of all of these materials – some at world-leading production scales and others being developed. Canada hosts an established world-leading up- and down-stream nickel extraction, smelting and refining supply chain with the second lowest carbon intensity production in the world. Relatively significant volumes of low carbon cobalt are also produced in Canada, largely as a by-product from the nickel mining and manufacturing process. Graphite and manganese are produced at a smaller volume, while graphite, manganese and lithium advanced projects are at various stages of development.

While Canada has a strong foundation of battery minerals and metals, and downstream smelting and refining capacity in the nickel and cobalt space, currently Canada does not produce battery grade nickel, cobalt, manganese, graphite or lithium. Further value-added processing plants are required to manufacture these key inputs.

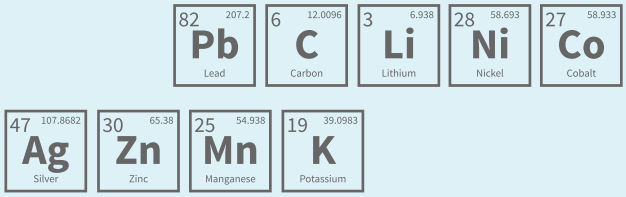
Beyond batteries, raw material inputs are essential for a host of clean energy technologies. The average EV requires three times the volume of copper than a conventional internal combustion engine. Wind turbines, solar panels, nuclear power and other alternative power generation technologies require a host of raw material inputs.

Sourcing these materials from Canada provides a net climate benefit globally. Canada hosts the world's 4th cleanest electricity grid with 82% of power coming from renewable or non-emitting sources. As a result, Canadian mineral products are among the lowest carbon intensity in the world, as demonstrated by the ongoing work of SKARN Associates, an organization focused on connecting ESG analytics and mineral economics (see Figure 27). Critical minerals production in Canada yields a lower supply-chain carbon-intensity finished product than most alternative raw material sources globally.

PRODUCTS THAT RELY ON MINING

BATTERIES

Canada's mining industry is providing the responsibly-sourced minerals and metals that power electric vehicles, including metallurgical coal, nickel, copper, iron ore, zinc, cobalt and many more.



Rare Earth Elements

No set of materials characterizes the security of supply dilemma more than REEs, used in a wide range of essential battery, medical, energy, computing, defense and advanced manufacturing applications, including the magnet-driven motors in EVs. Unlike battery minerals, Canada does not have a pre-existing supply chain for REEs, from extraction, through separation and refining. Canada has deposits of REEs – with companies involved in a number of advanced stage exploration projects – as well as nascent processing and separation capacity.

While more work needs to be done to establish a REE supply chain than a battery supply chain, Canada should not be deterred from leveraging its competitive advantages to create greater supply of REEs for domestic use and export, including identified opportunities to extract REEs through recycling and mining value from waste streams.

Decarbonized Oil

Looking forward, global oil demand is anticipated to persist, albeit at diminishing volumes, for decades to come. Underscoring this demand shift is a tremendous opportunity. As lower and carbon-free power generation and propulsion sources come online, demand for lower carbon intensity oil production will increase. The opportunity to decarbonize Canadian oil production presents a meaningful opportunity to combat climate change while simultaneously improving the industry's attractiveness in an increasingly carbon constrained world.

Acknowledging this, the Canadian oil sands industry has created the Pathways alliance. Pathways alliance members, who operate facilities accounting for 90% of Canadian oil sands output, are working collectively with the federal and Alberta governments, with a goal to achieve net zero (neutral) emissions from oil sands operations by 2050 to help Canada meet its climate goals, including its Paris Agreement commitments and 2050 net zero aspirations. To do this, the alliance has established a 68 megatonne emissions displacement objective, in three phases, between now and 2050.

The initiative will employ several parallel pathways and technologies. These include established and proven technologies such as carbon capture, utilization and storage (CCUS) as well as other existing and emerging GHG reduction technologies. This includes switching to lower carbon fuels such as clean hydrogen and electricity to power oil sands operations, implementing advanced production processes and improving energy efficiency at oil sands facilities.

The Pathways initiative will also work to accelerate the development of potential emerging emissions-reducing technologies such as direct air capture of carbon dioxide (CO_2), more efficient next-generation oil sands production technologies and small modular nuclear reactors. The initiative will help preserve jobs in the oil sands sector, which is one of Canada's largest employers, while also creating thousands of new construction and permanent jobs in the oil and gas and cleantech industries.

POLICY COHERENCE: CLIMATE CHANGE, PROJECT PERMITTING AND INDIGENOUS RECONCILIATION

MAC and its members support climate action that is consistent with the ambition of the Paris Agreement to limit global warming to well below 2 degrees Celsius (above pre-industrial levels). MAC has consistently and outspokenly supported the need for a robust but efficient mine permitting regime, and meaningful and ongoing consultation, engagement and collaboration with Indigenous communities. To assist government in these areas, MAC has actively engaged in the following consultation processes in recent years, and remains engaged in the ongoing development and deployment of many of them:

- Implementation of federal carbon pricing
- Ongoing development of the proposed Clean Fuel Regulation (CFR)
- National offsets market development
- Carbon net-neutrality legislation
- Technological innovation, such as small modular nuclear reactors (SMRs), hydrogen, and carbon capture, utilization and storage, the deployment of which are critical for Canada to achieve its climate goals
- Just Transition legislation
- Border Carbon Adjustments
- The *Impact Assessment Act*

- The *Fisheries Act*
- The *Canadian Navigable Waters Act*
- the *United Nations Declaration on the Rights of Indigenous Peoples Act*

Collectively, these policies have been designed in response to the rising expectations of Canadians on how project risks need to be managed relative to the benefits that development provides. Juxtaposed against this backdrop of policies and regulations are a series of investments the federal government has made in support of Indigenous reconciliation, industrial decarbonization and clean technology manufacturing. Among these, and particularly relevant for the mining industry, are:

- The ongoing implementation of the Canadian Minerals and Metals Plan
- Establishing the "Mines to Mobility" battery electric vehicle supply chain policy objective (as a pillar in the Strategic Innovation Fund Net Zero Accelerator)
- Establishing a Critical Minerals Centre of Excellence
- R&D funding for critical minerals manufacturing
- Renewing the Mineral Exploration Tax Credit for five years (and, most recently, committing to doubling its value for critical minerals)
- Measures to accelerate the deployment of state-of-the-art environmental clean technologies, such as SMRs, hydrogen and carbon capture, utilization and storage

While each of the above policies and programs is designed to fit a specific purpose, MAC is concerned that aspects of existing or developing federal policies and regulatory initiatives will work at cross purposes with clearly stated clean technology manufacturing policy objectives. The result will be sub-optimal investment, climate and economic reconciliation outcomes. Noting this, several refinements are required to ensure that policy objectives that are designed to be complementary are not in competition with each other.

The Clean Fuel Regulation (CFR)

Consistent with MAC's original input to ECCC in 2018, the association welcomed the December 2020 decision to remove gaseous and solid fuel streams, focusing instead on transportation fuels, from the proposed CFR. Since then, further refinements have been made to exempt liquid fuels used in space heating applications in certain contexts from coverage in the proposed CFR. Just as the exclusion of heat-generating applications represents a departure from the now established transportation focus of the regulation, MAC is urging ECCC to consider exempting liquid fuels utilized for power generation in off-grid mining contexts.

Off-grid mining companies are overwhelmingly reliant on liquid fuels for power generation and will remain so until major infrastructure investments connect them to the grid or a paradigm shift ushers in the next generation of technologies. Until then, it remains in Canada's best interest, and consistent with stated Indigenous reconciliation and clean technology development policy priorities, to ensure these vulnerable assets are not artificially rendered redundant.

That off-grid mines are consistently the largest direct and indirect economic drivers in the regions where they operate, and the single largest drivers of Indigenous economic reconciliation through employment, training, business development opportunities, royalties and equity shares, the intersectional nature of this exposure merits unique attention and consideration from officials and decision-makers in reconciling competing federal government policy objectives, lest these mines become a constituency of concern in the ongoing Just Transition consultation.

Just Transition

Contemporary thinking around a just transition holds – at a macro level – that, in the pursuit of decarbonization objectives, some economic sectors will expand while others contract, and that there is a role for government to help bridge between the adverse effects of contraction and the growth opportunities that result. In MAC's view, worker and community well-being – the central focus of NRCan's August 2021 white paper on the topic – is contingent on the protection and improvement of employment. MAC reads this in two ways:

1. Amidst the transition to a low carbon economy, **protecting well-being** is akin to preserving employment and economic continuity to the maximum extent possible, thus minimizing potential disruption.

2. Where disruption is unavoidable, **improving well-being** consists of deploying active supports to renew and restore, to the maximum extent possible, the security, autonomy and independence that meaningful and stable employment provides both to workers and the communities in which they reside.

To enmesh the above logic in the development of a federal Just Transition policy, MAC recommended to NRCan that the government strengthen the initial set of principles by expanding the list to include the following:

- *On the pathway to a low GHG economy, and in a manner consistent with Canada's overarching climate goals and objectives, the government of Canada commits to a "least-disruption possible" approach for workers and communities recognizing that doing so maximizes worker and community well-being.*

Doing so will make explicit the economic dimension underlying any employment transition that results from the pursuit of carbon net-neutrality. Further, it will establish a government commitment to preserve economic stability to the maximum extent possible by viewing broader policy and regulatory decisions on a "least harm, least disruption possible" basis. Finally, as technologies advance and are deployed, and the skill set of the mining worker of the future takes greater shape, long-term investments in skills training will be critical. To support identifying how best to invest those limited resources, the Mining Industry Human Resources Council (MiHR) will be proposing a substantial piece of research on this topic. MAC supports this effort and initiative and recommends that the government partner with MiHR on the delivery of this important work.

Border Carbon Adjustments

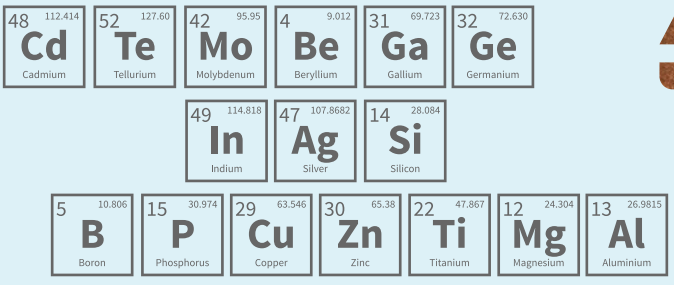
As Canada and other countries move to meet their international climate commitments, it is inevitable that there will be variations across countries, both in terms of approach and speed of implementation. A key emerging challenge is how to address these disparities in a coordinated way, to achieve results in lowering GHG emissions while mitigating pressures on international trade without inadvertently undermining Canada's global competitiveness. The efficacy of border carbon adjustments is being considered as a potential solution to this challenge.

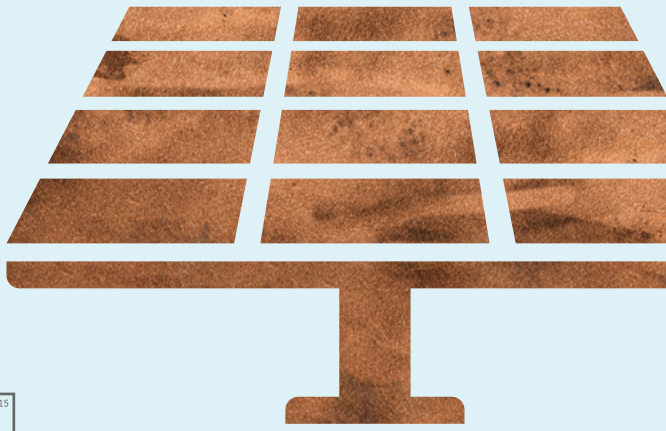
Key concerns for MAC focus on the sheer complexity involved in developing such a policy for imports,

PRODUCTS THAT RELY ON MINING

SOLAR PANELS

Mining is essential to a low-carbon future with clean energy and "green" products requiring metals and minerals as building blocks. In fact, 14 of the 19 metals and minerals used in solar PV panels come from Canadian mines.





the potential risks for unintended consequences, and the risk that Canadian mineral exports may be discriminated against unfairly in export market jurisdictions. While MAC is developing a formal policy position on this issue with the intent to engage constructively on this topic with decision-makers, the following issues have been identified as key considerations: 1) Traceability and Life-Cycle Carbon Intensity; 2) The scope of emissions included in the policy (noting the EU regime proposes inclusion of scope 1 emissions exclusively, a measure that, if adopted in Canada, would eliminate the value of our overwhelmingly clean energy grid); 3) Enforcement: how enforcement will function so as to avoid a protracted descent into protectionist trade disputes; and 4) the primacy of EITE protections, notably that MAC supports EITE protections for exposed sectors, including mining and oil and gas, and does not support the displacement of these protections in lieu of a border carbon adjustment regime as has been negotiated in the EU context.

Offsets

MAC supports the government's commitment to establish a national offsets market to support least cost emissions reductions. While consultations are underway, MAC underscores the necessity of the interchangeability of offsets between and across different systems, and a clear and expedient process for generating new and updating existing protocols. Critical to this progress are Article 6 negotiations at COP26 toward the establishment of a recognized international trading system.

United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)

In 2019, British Columbia (BC) became the first jurisdiction in Canada to pass legislation intended to implement the United Nations Declaration on the Rights of Indigenous Peoples. The *Declaration on the Rights of Indigenous Peoples Act* (DRIPA), which received Royal Assent on November 28, 2019, had unanimous support in the BC legislature. In 2021, the province released its first draft UNDRIP Action Plan which identifies a number of priorities under four categories: Self-determination; Title and Rights of Indigenous Peoples; Ending Indigenous-specific Racism and Discrimination; and Social, Cultural and Economic Well-being.

On June 21, 2021, the new federal *United Nations Declaration on the Rights of Indigenous Peoples Act* (UNDRIP Act) received Royal Assent. The new Act is a framework for UNDRIP implementation, which requires the federal government, in cooperation and consultation with Indigenous peoples, to:

- Take all measures necessary to ensure the laws of Canada are consistent with UNDRIP
- Prepare and implement an action plan to achieve UNDRIP's objectives
- Table an annual report on progress to align the laws of Canada and on the action plan

The Act acknowledges that UNDRIP is already a source for the interpretation of Canadian law. However, the Minister of Justice and Attorney General of Canada clarified that the new UNDRIP Act was not intended to give UNDRIP direct legal effect in Canada, as it is a framework for implementation.

The details of implementation will come through the development of the national UNDRIP action plan as well as efforts to ensure that federal laws are consistent with UNDRIP. As per the Act, the action plan must be completed by June 21, 2023, two years after coming into force. These processes may lead to a variety of potential outcomes, some of which will have implications for the mining sector and its relationships with Indigenous communities. The resulting legislative agenda, for example, may affect laws and regulations that intersect with natural resource development as well as Indigenous consultation processes.

UNDRIP references Free, Prior and Informed Consent (FPIC) and emphasizes that in the context of natural resource development governments should consult with Indigenous groups with the goal of obtaining consent. Much of the discussion related to the new Act and the implementation of UNDRIP in Canada has been focused on the interpretations of FPIC. During the legislative process for the new UNDRIP Act, the federal government provided some guidance on its approach to FPIC and notably explained that FPIC does not equate to a veto over government decision-making. While these statements clarified the federal government's approach, additional clarity on process including how the federal government intends to navigate through situations when efforts

to obtain consent have been unsuccessful, or when consent is provided by some affected communities but not all, is needed to ensure there is a common understanding of what FPIC means in practice.

As these important conversations take place, meaningful mining-Indigenous collaboration will continue. In general, this new legislation will not represent a major change in practice in terms of engagement and collaboration with Indigenous communities. The mining sector understands the value of early and meaningful engagement and relationship building, which is a core component of MAC's TSM initiative. Furthermore, the mining sector has decades of experience with establishing relationship agreements and fulfilling the terms of those agreements. Mining companies are leading the way in terms of forming partnerships with Indigenous businesses, with many mining companies spending millions annually on contracts with Indigenous service providers.

The degree to which the federal UNDRIP Act affects Indigenous relations with the mining industry will depend on the implementation approach taken by the federal government, inclusion of diverse voices in the development of the action plan and how the next two years leading up to a final action plan are managed.

The mining sector has an important role to play in reconciliation and is positioned to meaningfully contribute to the development of the national UNDRIP action plan and to discussions related to economic development and regulatory consultation processes.

Mine Permitting

Developing a new mine or undertaking a major expansion in Canada requires undergoing an environmental or impact assessment as well as obtaining permits from the province or territory where the deposit is located. Some Indigenous nations have their own review process for projects on their territory. In addition, most new mines and major expansions must undergo federal impact assessment and, depending on the details of the

project and the mine site, may require approvals under other federal legislation, such as the *Fisheries Act*.

For the mining industry to thrive in Canada, assessment and permitting must be timely, and the process must be predictable, coordinated and grounded in meaningful consultation. Unfortunately, seamless coordination promised as "one project one assessment" continues to be elusive. Timelines are long and predictability is diminished by frequently moving goalposts.

Three federal acts relevant to mining projects were amended in 2019: the *Impact Assessment Act*, the *Fisheries Act*, and the *Canadian Navigable Waters Act*. Two years after these amendments came into force, implementation is falling short of expectations.

The most effective implementation has been achieved by Transport Canada in its administration of the *Canadian Navigable Waters Act*. The department has put in place clear guidance and an efficient submission and application process and has amended the Minor Works Order to reduce unnecessary burden for activities with little impact on navigability. In contrast, Fisheries and Oceans Canada has yet to deploy promised compliance instruments, continuing to rely on cumbersome site-specific reviews of numerous routine projects with little or no impact and well-known mitigation measures.

Initial experience with implementation of the *Impact Assessment Act* indicates that the new planning phase of the process is not yet achieving the hoped-for results. The first few projects entering the process have seen enhanced coordination within the federal government, but coordination with provincial assessment processes needs further improvement. Most disappointing is that the planning of the first assessments has resulted in limited focusing of information requirements on issues important to each project, or "project tailoring". As well, broad scoping of Indigenous engagement has not been accompanied by clear communication or recognition of Indigenous groups directly affected by the project.

It is critical that implementation of the *Impact Assessment Act* be adjusted to avoid diminishing Canada's mining investment climate and hampering the development of Canada as a reliable source of critical minerals needed for low carbon technologies.

STRATEGIC ASSESSMENT OF CLIMATE CHANGE (SACC)

As a component of the impact assessment process, proposed projects will undergo a strategic assessment of climate change to help inform the implications the project may have relative to Canada's climate objectives. While the consultation remains ongoing, and MAC is still formulating a complete set of comments, the following three points were identified as opportunities to support greater policy cohesion, as well as manage the expectations of officials on how realistic aspects of the proposed guidance are from a proponent's standpoint.

1. **Information on speculative technologies:** We recognize and appreciate the Government of Canada's desire to see proponents evaluate a pathway to achieving net-zero GHG emissions. This is consistent with MAC's recently released *TSM Climate Change Protocol*'s incorporation of net-zero commitments. However, when comparing multiple decarbonization options, on an ongoing basis, many of these options are not yet available. We are concerned about the implications of including speculative technologies in the Impact Statement phase and, noting the pace of change and the potential length of impact assessments, MAC believes ECCC should reconsider requiring this level of granularity.
2. **Lack of clarity on Best Available Technologies (BAT) / Best Environmental Practices (BEP):** MAC supports the intention of the BAT/BEP requirements, but believes further clarification is required. In particular, there remains a significant amount of ambiguity and uncertainty around key definitions related to BAT/BEP requirements, such as the term "economically feasible". Clearer definitions are critical to avoid circumstances where parties interpret terms differently.
3. **Offset restrictions:** Offsets provide a valuable means to reduce GHG emissions and compliance costs for industrial facilities. It is our view that having a greater supply volume helps drive down the price of offsets for regulated entities. We are concerned that the restrictions currently in place under the SACC are limiting the supply of offsets.

ENVIRONMENTAL STEWARDSHIP

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

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

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

FIGURE 28: INTERNATIONAL INITIATIVES

INTERNATIONAL INITIATIVES																						
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	
	ICMM PERFORMANCE EXPECTATIONS	WGC RESPONSIBLE GOLD MINING PRINCIPLES	ISO 14001 - EMS STANDARD	INTERNATIONAL CYANIDE CODE	KIMBERLEY PROCESS	ICA COPPER MARK	RMI RISK READINESS ASSESSMENT	ISO 45001	UN GLOBAL COMPACT	EXTRACTIVE INDUSTRIES TRANSPARENCY INITIATIVE	VOLUNTARY PRINCIPLES ON SECURITY AND HUMAN RIGHTS	OECD GUIDELINES FOR MULTINATIONAL ENTERPRISES	AA 1000	GLOBAL REPORTING INITIATIVE	CARBON DISCLOSURE PROJECT	WATER DISCLOSURE PROJECT	CARBON PRICING LEADERSHIP COALITION	IFC SOCIAL AND ENVIRONMENTAL PERFORMANCE STANDARDS	RECOMMENDATIONS OF THE TCFD	DOW JONES SUSTAINABILITY INDEX	JANTZI SOCIAL INDEX	RESPONSIBLE JEWELLERY
COMPANIES HEADQUARTERED IN CANADA:																						
Agnico Eagle Mines		✔		✔							✔			✔	✔	✔				✔		✔
Barrick Gold Corporation	✔	✔	✔	✔					✔	✔	✔	✔	✔	✔		✔	✔			✔		
Eldorado Gold		✔	✔	✔				✔	✔					✔	✔	✔						
First Quantum Minerals Ltd.									✔	✔	✔				✔			✔				
HudBay Minerals Inc.			✔					✔		✔	✔	✔		✔	✔	✔		✔				
IAMGOLD Corporation		✔	✔					✔		✔				✔							✔	
Kinross Gold Corporation		✔	✔	✔				✔	✔	✔	✔			✔	✔	✔		✔			✔	
Lundin			✔					✔	✔		✔	✔	✔	✔	✔	✔						
New Gold Inc.		✔	✔	✔				✔	✔		✔			✔	✔	✔						
Pan American Silver									✔													
Sherritt International									✔	✔	✔	✔		✔				✔				
Tata Steel Canada	✔																					
Teck Resources Limited	✔		✔						✔	✔		✔		✔	✔	✔	✔	✔		✔	✔	
COMPANIES HEADQUARTERED OUTSIDE OF CANADA WITH CANADIAN OPERATIONS:																						
ArcelorMittal Mines Canada			✔					✔		✔				✔								
De Beers Canada Inc.	✔		✔		✔			✔	✔	✔	✔	✔	✔	✔	✔			✔			✔	✔
Glencore Copper						✔																
Glencore Nickel	✔		✔					✔	✔	✔	✔			✔	✔	✔		✔		✔		
Hecla									✔													
Newmont Corporation	✔	✔	✔	✔					✔	✔	✔			✔	✔					✔		
Niobec			✔																			
Rio Tinto	✔	✔	✔	✔	✔			✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔
Vale			✔					✔	✔	✔	✔			✔	✔	✔	✔	✔				

Note:

- HudBay Minerals Inc. and Sherritt International apply the IFC Social and Environmental Performance Standards only to select international facilities.

Towards Sustainable Mining® (TSM)

The Mining Association of Canada's TSM standard is a globally recognized sustainability program that supports mining companies in managing key environmental and social risks. TSM was the first mining sustainability standard in the world to require site-level assessments and is mandatory for all companies that are members of implementing associations. Through TSM, eight critical aspects of social and environmental performance are evaluated, independently validated, and publicly reported against 30 distinct performance indicators.

Increasingly, other mining associations, governments, investors, and manufacturers are looking to TSM as global best practice in sustainable and responsible mining. In recent years, mining associations in Spain, Finland, Norway, Botswana, Argentina, Brazil, Australia, Colombia, and the Philippines have adopted the program.

How TSM Works

Participation in TSM is mandatory for MAC's member companies with Canadian operations. At its core, TSM is:

- **Accountable:** Assessments are conducted at the facility level where the mining activity takes place – the first program in the world to do this in the mining sector. The results provide local communities with a meaningful view of how a nearby mine is faring.
- **Transparent:** On the MAC website, mining companies publicly report their facilities' performance against a suite of indicators. Results are externally verified every three years.
- **Credible:** TSM is overseen by an independent Community of Interest Advisory Panel. This multi-interest group helps mining companies and communities of interest foster dialogue, improve the industry's performance and support continual improvement of the TSM program.

Currently, TSM sets out thirty performance indicators in eight areas:

- Tailings management
- Climate change
- Indigenous and community relationships
- Crisis management and communications planning
- Biodiversity conservation management
- Safety and health
- Preventing child and forced labour
- Water stewardship

Below is a summary of performance data (the most recent available) for three TSM areas that pertain to environmental stewardship: tailings management, biodiversity conservation management, and energy use and greenhouse gas emissions management (a protocol that was replaced by the more updated climate change protocol in the spring of 2021). For a more complete overview of industry performance, please refer to the *TSM Progress Report* on the MAC website.

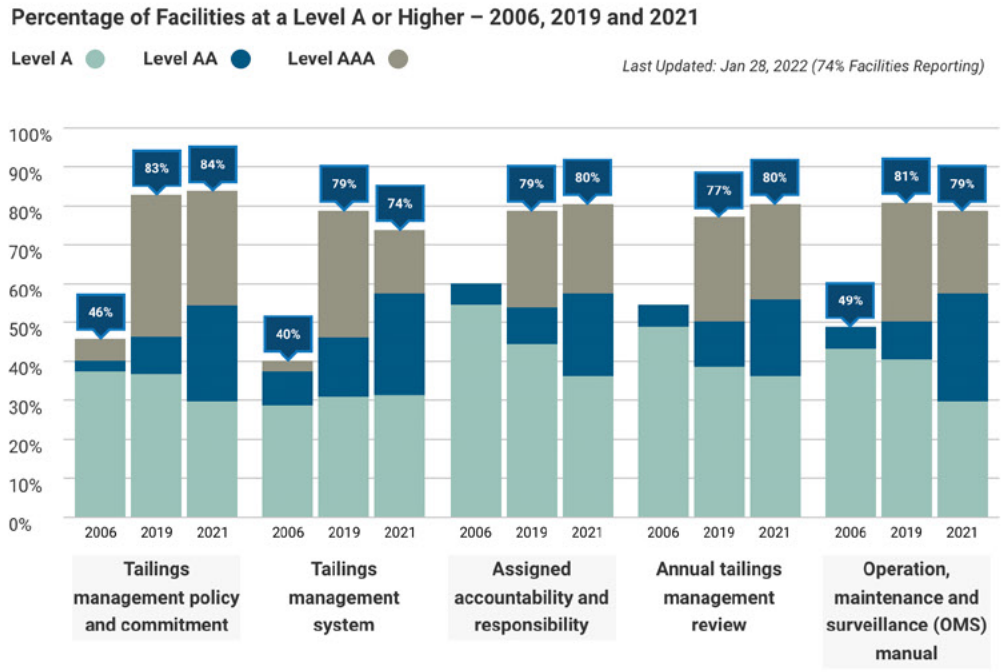
Tailings Management

Tailings facilities are necessary components of mining activity. It is crucial that these facilities be managed responsibly to protect human safety and the environment. As part of TSM, MAC has developed tailings management guides that outline best practices for responsible tailings management: *A Guide to the Management of Tailings Facilities* (the Tailings Guide) and *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities* (the OMS Guide). These guides, available on the MAC website, are recognized as describing leading practice, and are applied globally. The *TSM Tailings Management Protocol* measures adherence to the practices described in the guides. The requirements of TSM have a high degree of alignment with the *Global Industry Standard on Tailings Management* that was released in 2020, and many aspects of TSM provide a more stringent standard with more rigorous performance measurement.

In 2018, MAC members demonstrated strong performance across the five indicators in this protocol (see the industry-level results on this protocol in Figure 29).

Beyond TSM, oil sands operators are making measured progress in tailings management. Through the Oil Sands Tailings Consortium, now a part of Canada's Oil Sands Innovation Alliance, Canada's largest oil sands mining companies share tailings research and technology in a unified effort to advance tailings management.

FIGURE 29: TAILINGS MANAGEMENT



Biodiversity Conservation Management

Adopting best practices in biodiversity conservation management through all stages of a mine's life cycle is an industry priority. The *TSM Biodiversity Conservation Management Protocol* evaluates and confirms a facility's performance and commitment to biodiversity conservation. Facilities that achieve Level A performance in this protocol engage with key communities of interest – governments, Indigenous communities, and conservation organizations – to develop biodiversity objectives and strategies. These facilities also put in place mechanisms to assess, mitigate, and compensate for impacts on biodiversity.

Facilities continue to demonstrate good performance on the *TSM Biodiversity Conservation Management Protocol*. However, performance on two indicators remains relatively stagnant. MAC will be working with members over the course of 2022 to consider how to drive performance more effectively in these areas. Also in 2021, facilities will begin reporting on a slightly revised version of this protocol, which includes new requirements related to the mitigation hierarchy and no net loss. MAC members have continued to make significant improvements in biodiversity conservation management since the protocol was first introduced in 2012. See the industry-level results on this protocol in Figure 30.

Energy Use and Greenhouse Gas (GHG) Emissions Management

Improving energy efficiency and reducing GHG emissions are priorities for the mining industry. TSM measures a facility's ability to track and report energy data, as well as to establish and meet targets. Through comprehensive management systems, the *TSM Energy Use and Greenhouse Gas Emissions Management Protocol* helps mining operations reduce emissions that contribute to climate change, while also supporting them in reducing operational costs.

To achieve a Level A, TSM requires facilities to establish comprehensive systems for energy use and GHG emissions. This includes providing energy awareness training and establishing systems to track and report data for internal and external reporting. Facilities must also set and meet targets for their energy use and GHG emissions performance. See the industry-level results on this protocol in Figure 31.

FIGURE 30: BIODIVERSITY CONSERVATION MANAGEMENT

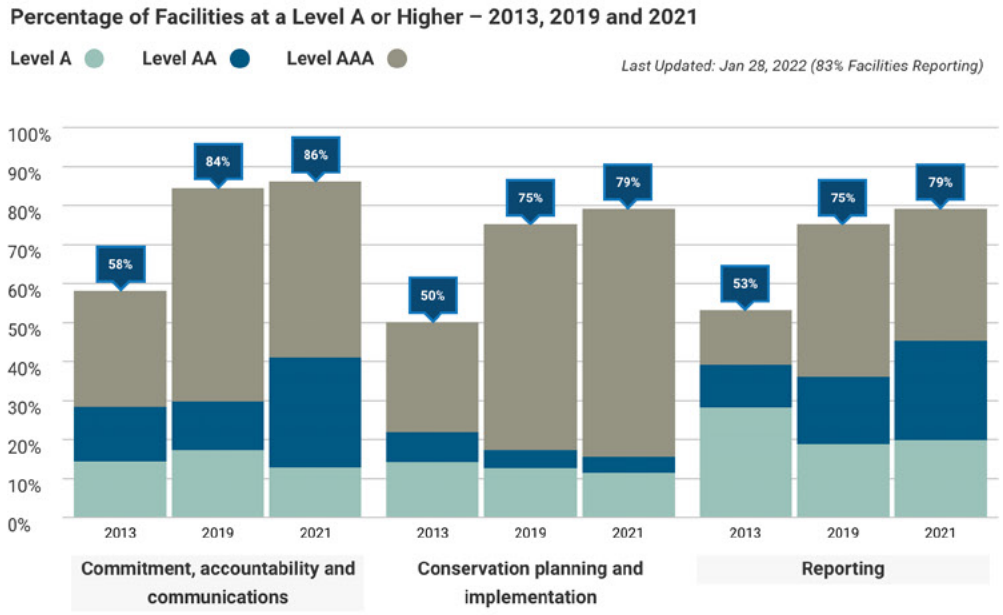
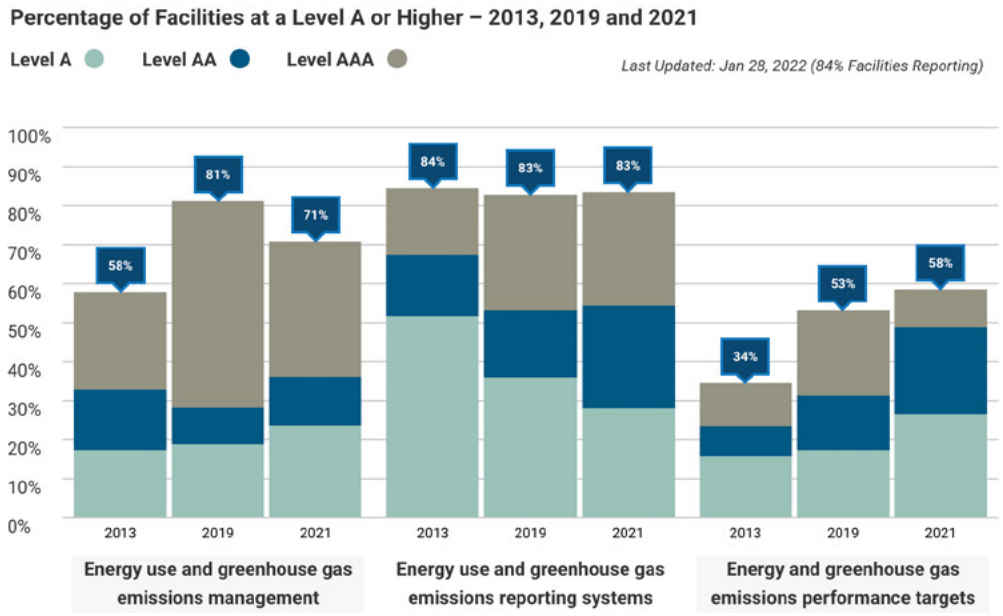


FIGURE 31: ENERGY USE AND GREENHOUSE GAS EMISSIONS MANAGEMENT



In 2022, facilities will begin producing their first internal reports on the new *TSM Climate Change Protocol*, which will replace the *TSM Energy Use and Greenhouse Gas Emissions Management Protocol*. First facility-level public reporting on the new protocol is scheduled for 2023, with a more holistic approach involving mitigation and adaptation measures at both corporate and facility levels.

The updated protocol supports mining companies in responding to emerging investor expectations around climate, including the *Recommendations of the Task Force on Climate-related Financial Disclosures*. This includes requirements for:

- Board and management structures and reporting processes related to the governance of climate-related risks and opportunities.
- A corporate climate change strategy supported by actions and integrated into business planning.
- Analysis and management of material climate-related risks and their impacts on the company's broader business, strategy, and financial planning.
- Reporting of materials on corporate governance, strategy, risk analysis, metrics and targets related to climate action.

At higher levels of performance, companies will be required to make commitments – supported by short- and long-term targets and actions – to climate action consistent with the ambitions of the Paris Agreement to limit global warming to well below 2 degrees Celsius (above pre-industrial levels), as well as commitments corresponding to ambitions to achieve net-zero emissions by 2050.

Adaption to Climate Change

Adaptation to a changing climate is needed across all sectors of society, from municipal infrastructure, to transportation, to agriculture and forestry. Mining is no different, and it is important that there be solutions tailored to both the environments in which mines operate and the infrastructure on which mining depends. MAC's new Guide to Climate Change Adaptation for the Mining Sector provides best practice guidance for the mining industry to assess potential future climate changes at mine sites, assess potential impacts of those changes on mine operations and infrastructure, and develop plans to implement appropriate adaptation measures.

CLEAN ENERGY TECHNOLOGIES AND SYSTEMS

As governments work toward creating the right policy and investment environment to achieve Canada's climate, investment and Indigenous reconciliation objectives, careful attention must also be paid to the technologies that will be needed to support low GHG economic growth. The mining industry will require technologies that support cleaner transportation, power generation, and material processing and manufacturing that either do not currently exist, are economically unviable, or are in an early stage of development at this time.

Small Modular Nuclear Reactors (SMRs)

SMRs could be the future of Canada's nuclear industry, with the potential to provide non-emitting energy for a wide range of applications, from grid-scale electricity generation to use in heavy industries. The opportunity to significantly displace or eliminate GHG emissions from carbon intensive electricity grids in Alberta and Saskatchewan presents a massive opportunity to improve the carbon competitiveness of the production of oil, uranium, potash and other commodities produced in these provinces. The off-grid application of SMRs has the potential to create a cost-effective paradigm shift away from diesel reliance in remote regions, ushering in the possibility of net-neutral off-grid operations: the stuff of dreams only a decade ago.

In 2018, the federal government released its SMR Roadmap, and was poised to release a more substantial SMR Action Plan at the time of writing. On the provincial side, governments in the provinces of Ontario, Saskatchewan, Alberta and New Brunswick have signed a memorandum of understanding to collaborate in the advancement of SMRs.

While the opportunity is great, work remains to be done to pilot and enhance SMR technologies and create the social license and trust required for success. On this last point, it is MAC's view that substantial and meaningful engagement with stakeholders of all kinds, and consultation with Indigenous communities and self-governments, is paramount to establishing the confidence, the understanding of risks and benefits, and ultimately the acceptance of this technology without which its

success in Canada will not be possible, regardless of the opportunity or potential. MAC was pleased to lead a consortium of mining, Indigenous, and nuclear industry organizations to jointly communicate this perspective to federal decision makers in 2020.

Hydrogen

There is increasing interest in the use of hydrogen and fuel cells to decarbonize energy use across economies around the world. Hydrogen is a versatile fuel that can be produced from many sources and act as an energy carrier. Hydrogen fuel cells do not produce emissions, only electrical power, water, and heat, meaning their potential application in the mining industry is diverse. The most recent application in mining in Canada was at Glencore's Raglan mine in northern Quebec, in partnership with TUGLIQ Energy and the federal and provincial governments, where a hydrogen fuel cell was co-deployed with a wind turbine to both minimize the loss of wind energy over longer periods of time and reduce intermittency.

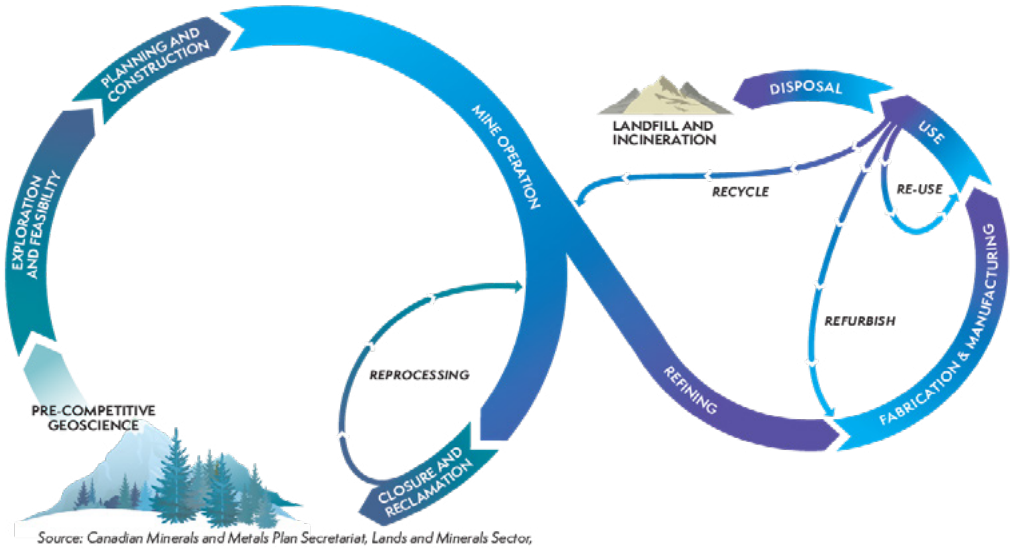
Released in December 2020, MAC was pleased to see that the first of our two recommendations to NRCan was accepted into Canada's national hydrogen strategy: that NRCan should develop and make available a flexible technical scoping tool designed to assess the feasibility of hydrogen technologies in their various applications to mining companies. This model should be updated periodically as technologies improve and potential uptake becomes more realistic.

The second of our recommendations was to create a heavy industry specific fund, eligible for renewal, to make pilot and demonstration project funding available to mining operators where the most promising opportunities are identified from the modelling being developed. As is often the case with new technologies, there are learning and cost curves that need to be flattened to increase the uptake potential. Delivering on the above recommendations would help on both fronts, increasing awareness of the improving efficiency of hydrogen technologies over time, their applicability to mining operations, and the periodic assessment of the improved economic viability of deployment. To support the coordination of activities, MAC co-chairs a CANMET hosted committee on mining and hydrogen use in the mining sector.

Recycling and the Circular Economy

Conventional economic consumption and disposal of resources is increasingly putting pressure on our climate, communities, and in some cases, public health. Transitioning to a cleaner economy starts with modifying practices and technologies to create economic opportunities out of the materials that might otherwise be thrown away.

The circular economy is an idea that supports business practices that extract as much value as possible from resources by recycling, repairing,



Source: Canadian Minerals and Metals Plan Secretariat, Lands and Minerals Sector, Natural Resources Canada, March 2019.

reusing, repurposing, or refurbishing products and materials—eliminating waste and GHG emissions at the design stage.

While minerals and metals are already commonly recycled in Canada at multiple levels, there is an opportunity and growing need to do more. One expanding waste stream that could be more optimally managed is that of electronics.

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. For example, a record 53.6 million metric tonnes of electronic waste was generated worldwide in 2019, up 21% (>10 million tonnes annually) in just five years, according to the UN's Global E-waste Monitor 2020, released in July 2020.

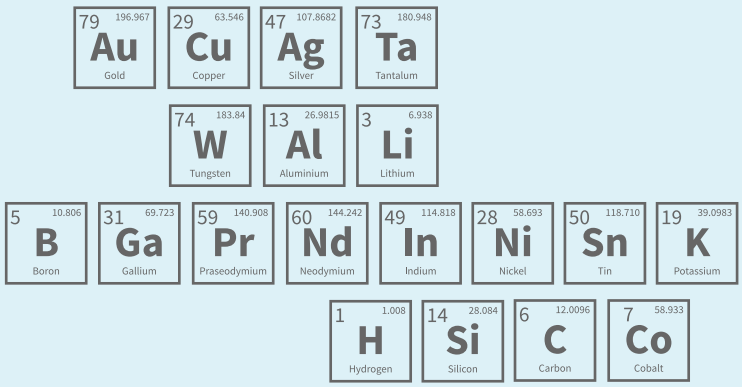
A large portion of e-waste can be recycled, components of which can be recovered as "urban ore." E-waste recycling involves reprocessing obsolete or unwanted electronics that have exhausted their reuse potential and would otherwise be disposed of in landfills. From 50,000 mobile phones, Electronics Product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

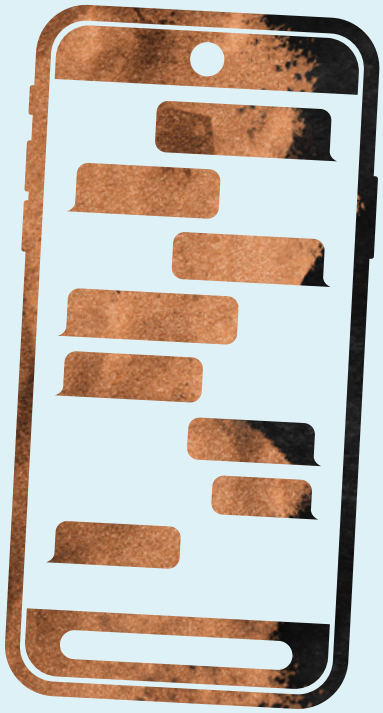
For example, Glencore's Horne smelter, located in Rouyn-Noranda in Quebec, has been recovering copper and precious metals from end-of-life electronics for over 30 years. The smelter receives end-of-life electronics from North America, Europe, Asia and South America and these materials are sampled for accurate value determination and processed to produce copper anodes. These are shipped to a Montreal refinery for further refinement into saleable products. Acknowledging how important recycling and reuse is to tackling climate change, when developing policies governments should be sensitive to ensure that facilities such as these are not unintentionally constrained from their critical recycling activities. Ideally, policies would be put in place that support and reward these activities within Canada's borders.

PRODUCTS THAT RELY ON MINING

SMARTPHONES

Canada's mining industry is providing the responsibly-sourced minerals and metals that power the technologies of today and of the future. In turn, we're helping businesses and their customers be confident in how they're made.





Recycling and other circular economy measures should and will increase as the broader EV battery supply chain expands. While essential, however, these can contribute only modestly to fulfil projected demand. Long product lives and steep demand growth curves mean the supply of secondary material will remain a fraction of total demand for the foreseeable future, so policy must recognize that new mines are essential to meeting projected demand for EV batteries.

Renewable Energy

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

Given that energy costs on average are the third largest of operating mines, companies are giving the benefits of renewable energy technologies greater consideration, with increasing deployments. For example, in an effort to reduce GHG emissions, Agnico Eagle's LaRonde complex installed a large passive solar wall to heat its mill, reducing natural gas consumption. 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, where mining companies are reliant on diesel power. These developments are further supported by improvements in the tax treatment for the instillation of these technologies, such the immediate depreciation of capital costs for renewable technologies and heavy industrial battery electric mobile equipment implemented by Finance Canada.

While renewables are attractive, and will continue to be deployed due to their strengths, there are important limitations that prevent them from being an energy panacea of the mining industry. Just as miners need to go where the viable mineral deposits are located, renewable energy generation is contingent on the strength and reliability of the renewable asset. Unfortunately, the two do not also coincide geographically. Another limitation is the technology's current ability to displace fossil fuels.

To date, off-grid wind deployment at remote mines in Canada have been able to displace ~10% of diesel reliance on average, with greater penetration rates internationally, particularly for solar power in sun-rich regions.

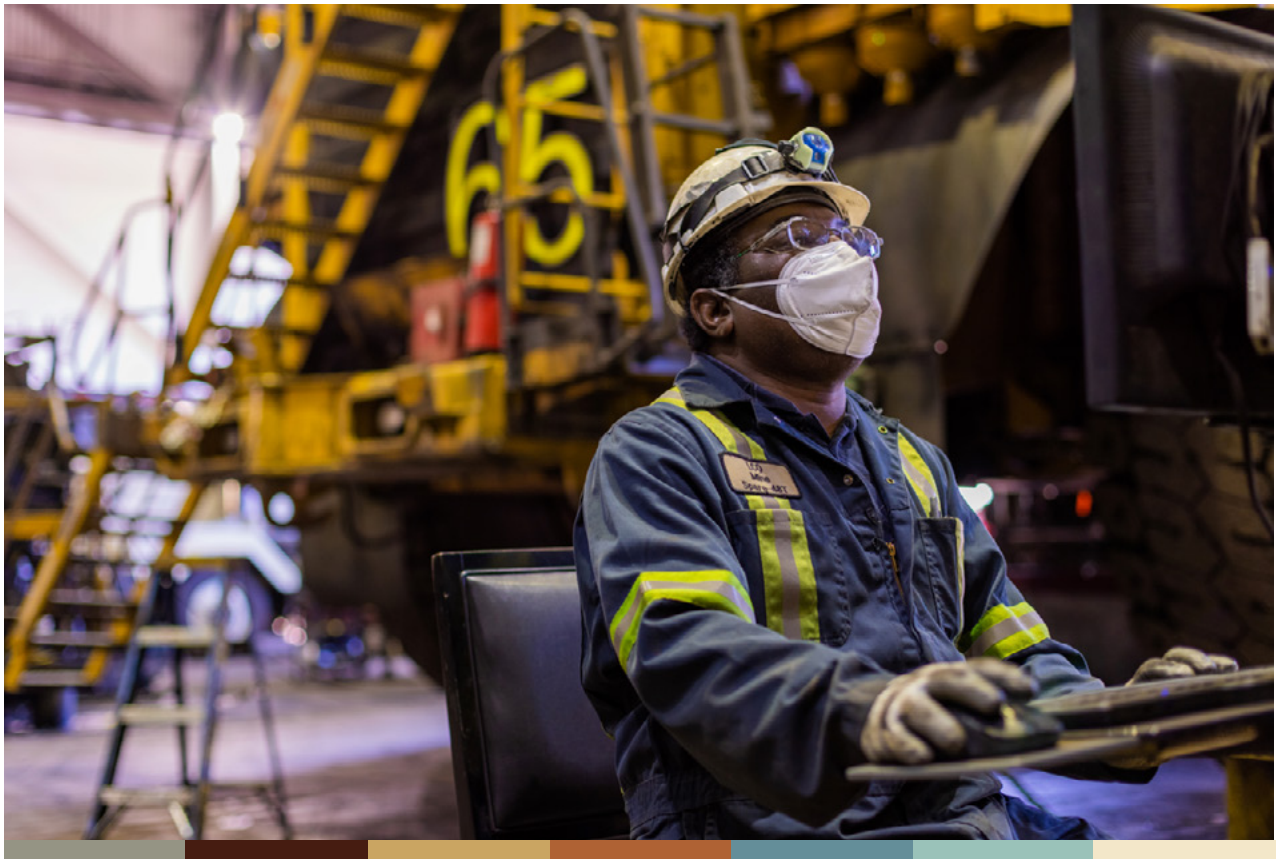
In Canada, these limitations have so far prevented renewable energy generation from being a sole-source industry-wide energy solution. To overcome these geological and capacity constraints, what's most likely is the dual application of renewable technologies with other energy solutions, such as SMRs and hydrogen applications.

Carbon Capture Utilization and Storage

Carbon capture, utilization and storage (CCUS), in conjunction with Direct Air Capture (DAC), holds immense potential for reducing emissions in Canada and elsewhere. In its recent climate plan, the federal government pledged to develop a comprehensive CCUS strategy intended to "help keep Canada globally competitive in this growing industry". Early, strategic, and substantial investments in CCUS will be necessary to ensure that GHG reduction technologies fulfill their full potential. Much work remains to be done to move these technologies down the cost curve and to facilitate their broad deployment at a scale that can match Canada's climate policy ambitions. While capture costs today are high, costs can be lowered as more projects are brought on board and economies of scale are fully realized.

In addition to reducing the cost of capture technology, there are opportunities to build expertise and reduce costs related to the transportation, storage and utilization of CO_2. The establishment of local networks that interconnect major emissions sources with nearby geological storage sites, such as the recently completed Alberta Carbon Trunk Line, could greatly reduce both transportation and storage costs and spark further innovation.

While breakthrough CCUS projects such as SaskPower's Boundary Dam coal-fired power station and Shell Canada's Quest oil sands upgrader created an early advantage for Canada, other countries are moving quickly to cement their place as a key supplier of CCUS technologies. The US, Germany, Norway and the United Kingdom are positioning



CCUS as a key component of their strategies to reduce emissions and create economic opportunity both domestically and abroad. These strategies include robust fiscal frameworks designed to de-risk investments across the value chain and create predictable revenue streams for companies seeking to secure additional private sector investment for CCUS projects.

The introduction of a competitive income tax credit would allow Canada to build on its early-mover advantage and stimulate greater investment in CCUS by offsetting the significant upfront costs. An ITC that is comparable to those available elsewhere – and in particular to the 45Q tax credit available in the US – could help Canada become a location of choice for CCUS projects in North America. It could also help to ensure that emissions-intensive, trade-exposed industries are not placed at a competitive disadvantage. To minimize carbon leakage, it is imperative that Canada provide the level of price, regulatory and investment certainty that is currently available in other jurisdictions. Recognizing that CCUS technologies vary from project to project, MAC supports the Business Council of Canada recommendation of a tax credit of 75% to offset the significant upfront capital costs inherent in such projects.

SECTION 6

The World: International Market Activities and Developments

Creating opportunities through a presence in more than 100 countries, Canada's mining sector is a global leader – one of the few sectors of the Canadian economy that can make this claim. This presence includes making demonstrable and significant contributions in raising living standards and eradicating poverty in host communities and countries.

Through MAC's world-leading, made-in-Canada mining sustainability program, *Towards Sustainable Mining*® (TSM), MAC is providing a path for the industry to meet the expectations of both our customers and investors by offering credible and rigorous assurances that responsible mining practices are in place when it comes to purchasing and investing in minerals.

CANADA'S CRITICAL MINERALS GLOBAL ADVANTAGE

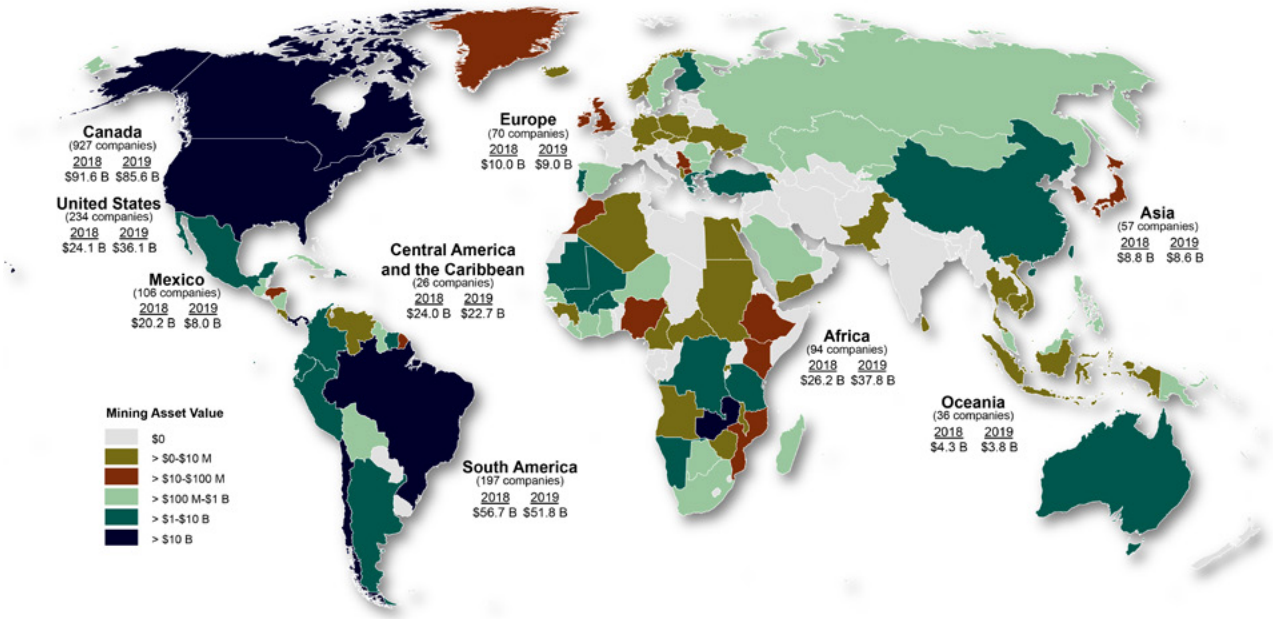
As global demand for minerals and metals continues to grow, there is increasing focus on what are referred to as "critical minerals" – vital in aerospace, defence, healthcare, telecommunications, computing and an array of innovative technologies. More than just rare earth elements, critical minerals encompass several minerals and metals critical to new technology. The very technology that will undermine the energy transition key to meeting global climate targets.

Canada has long been a major supplier of many of these minerals and metals but has an opportunity to play a larger role in this marketplace, as customers around the world look for products made to high environmental standards, exemplified by MAC's TSM program.

The global pandemic has brought the security of supply vulnerabilities into sharp focus for many countries, including Canada, and, combined with these trends, has accelerated the desire of Canadians to source and produce locally, with greater self-reliance. In fact, recent polling data finds that almost 90% of those surveyed for MAC by Abacus Data like the idea of Canada being a preferred global supplier of critical minerals and would like to see government take a number of steps to support this approach.

Additionally, Canada boasts the industry's best exploration firms and a capital market that is home to more than half of the world's publicly traded mining companies. Taken together, Canada's international mining leadership, powered by innovative and dynamic approaches, boosts Canada's already strong reputation for sustainable mining and responsible business conduct, and creates new opportunities to increase investment, particularly in the critical minerals space, and enhances market access for Canadian products, goods and services.

FIGURE 32: THE GEOGRAPHIC DISTRIBUTION OF CANADA'S MINING ASSETS, 2019



CANADIAN MINING'S INTERNATIONAL PRESENCE

Canadian mining companies operate in more than 100 countries around the world. According to NRCan, 621 Canadian companies held mining assets abroad (CMAA) valued at $177.8 billion in 2018 – the most recent year for which data is available. Year-over-year, this represents an increase in value of $3.4 billion or 2%. By comparison, this figure is more than double that of Canadian mining assets at home, which amounted to $85.6 billion, accounting for close to half (48%) of total Canadian mining assets (see Figure 32). While these numbers are significant, context is important to help situate Canada on the global scale of total mining assets value. For example, according to PwC, the world's 40 largest mining companies had a market capitalization of $1.46 trillion in 2020, and BHP, the world's largest mining company, as a single corporate entity was in possession of assets totaling $109 billion in 2021.

As a geographic indicator, the majority of CMAA (67%) was located in the Western Hemisphere (the Americas), where the value of assets declined by 5% to $118.7 billion in 2019. A large portion of the value was situated in the regions of Latin America and the Caribbean. This portion accounted for 46.5% of CMAA with a value of $82.5 billion in 2019, down 22.3% from the previous year. Notable declines were recorded in Mexico (-$12.2 billion), Argentina (-$4.3 billion), the Dominican Republic (-$2.2 billion) and Chile (-$1.3 billion), while smaller increases were registered in Brazil (+$668.1 million) and Ecuador (+$509.4 million). The second highest concentration of CMAA is in Africa, where the overall value of Canadian mining assets increased by $11.6 billion to a record value of $37.8 billion in 2019. Increases in the CMAA value were registered in Mali (+$6 billion), the Democratic Republic of the Congo (+$4.7 billion), Zambia (+$1.2 billion) and Côte d'Ivoire (+$573 million). These gains were marginally offset by a decline in Eritrea.

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 $2.9 billion for Latin American mining projects in 2020 and $761 million in equity capital for African mining projects in the same year. Despite these investments, Canadian mining companies are facing increased competition from other mining jurisdictions operating internationally, including Australia and China.

Canadian Direct Investment Abroad

Canadian Direct Investment Abroad (CDIA), and mining's share of it, is an indicator of the industry's international presence. CDIA was projected at $1.47 trillion in 2020 (see Figure 33). Of that, the mining sector accounted for $91.4 billion, or 6.8% of the total, up modestly from 2019. While fluctuations year-over-year are normal, it remains a significant contributor, and 2019 and 2020 levels represent new peaks of outward investment flows from the sector.

From 2013-2018, mining CDIA has remained relatively consistent, starting at $77 billion, peaking in 2016 at $86 billion, and levelling out to $79 billion in 2018. Preceding 2013, mining CDIA remained roughly consistent from 1999 to 2008 in the mid-$20 billion range, after which, outward flows of mining investment increased significantly – two and half fold – over the subsequent 10 years. While outward flows of investment are essential to any open economy, the sheer scale of the increase in outward investment demonstrates the increasing global strength and reach of our sector.

Foreign Direct Investment in Canada

Canada relies heavily on foreign direct investment (FDI), and the mining industry and downstream value-added manufacturing activities accounted for approximately $60 billion, or 6%, of FDI in 2020. Year-over-year, this sum represents a 1% reduction in the apportionment of the sector relative to Canada's overall FDI envelope, quite possibly due to the substantial volatility the industry and broader economy experienced due to COVID-19, and associated economic contractions. When isolated from this total, 2020 mining FDI into Canada was $39 billion – virtually unchanged year-over-year. This figure accounts for 3.7% of Canada's overall total (see Figure 33).

FIGURE 33: CANADIAN MINERAL INDUSTRY DIRECT INVESTMENT ABROAD AND FOREIGN DIRECT INVESTMENT STOCKS, 2000 - 2020(P)

($ millions)

	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
2000	356,506	319,116	23,666	5,535	2,621	5,009	11,662	4,593	4,881	2,214
2001	399,253	340,429	23,666	7,122	3,257	5,425	14,393	4,266	6,091	2,468
2002	435,494	356,819	22,779	6,069	3,028	5,682	13,281	4,064	5,582	2,442
2003	412,217	373,685	22,374	5,666	2,632	6,276	x	4,428	5,464	2,681
2004	448,546	379,450	22,481	8,611	2,105	6,108	x	5,200	4,624	2,748
2005	452,195	397,828	23,025	10,291	2,237	3,659	x	4,484	4,707	2,198
2006	518,839	437,171	23,849	22,375	6,439	6,243	26,255	9,563	4,458	2,941
2007	515,294	512,266	25,045	23,502	5,590	6,525	26,438	29,126	3,251	3,125
2008	641,920	550,539	27,189	9,544	6,787	7,768	30,828	41,879	3,775	2,920
2009	630,818	573,901	38,801	12,219	6,212	8,158	24,132	37,899	3,420	2,473
2010	637,285	592,406	46,706	16,140	5,953	7,276	4,227	34,201	2,293	2,157
2011	675,020	603,455	54,541	14,701	6,384	8,067	5,636	33,784	2,262	2,968
2012	704,335	633,778	63,782	18,622	5,305	7,881	3,172	32,542	2,010	3,153
2013	778,371	688,873	77,108	21,898	5,835	7,092	4,715	27,954	2,270	3,270
2014	845,203	744,671	78,744	36,871	1,155	7,718	7,299	28,986	3,925	3,504
2015	1,043,822	782,912	82,379	21,064	2,867	8,421	4,442	14,923	3,385	2,384
2016	1,105,175	810,668	84,533	24,020	2,639	7,937	5,960	9,205	6,109	1,945
2017	1,181,911	828,991	83,915	24,429	2,869	9,042	3,748	8,321	4,235	2,362
2018	1,367,237	932,643	79,788	23,177	4,420	8,905	3,920	10,640	5,033	4,325
2019	1,409,733	1,018,340	90,627	39,719	2,109	9,385	3,286	8,257	4,341	4,310
2020(p)	1,469,288	1,046,301	91,470	39,043	2,213	9,263	3,524	7,744	3,879	4,436

Source: Statistics Canada. Table 36-10-0009-01, International investment position.

(p) Preliminary

Symbol legend: X Suppressed to meet the confidentiality requirements of the Statistics Act

Local Procurement and the Sustainable Development Goals

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

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

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

CANADA'S MINERAL TRADE

Despite showing a trade deficit in the third and fourth stages of mining in 2020, the sector as a whole maintained a surplus of $15.4 billion (see Figure 34). 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

At $88.2 billion, exports of mineral products for the first three stages of mining were fairly consistent year-over-year in 2020, decreasing by only $3.2 billion, a positive outcome given the level of COVID-related economic disruption that occurred. Stage 4 exports totalled $18.3 billion and were virtually identical year-over-year. Combined, the exports for the four stages reached $106.6 billion, or 21%, of the total value of Canada's exports (see Figure 35). The value of Canada's mineral and metal exports increased by approximately 28% between 2010 and 2020 (see Figure 36).

Just over half of Canada's mineral and metal exports by value were destined for the US in 2020, with iron and steel, aluminum, gold, silver, platinum, potash, copper, zinc and nickel holding the largest values (see Annex 9). The EU 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.

FIGURE 34: MINING COMPANY INVESTMENT IN HOST COUNTRIES - 2017

		In-Country expenditures			
Country	Total in-country expenditures (US$m)	Total Expenditure (US$m)[1]	As a % of total expenditures	Payments to governments (US$m)[2]	Payments to Suppliers (US$m)
Argentina Total	$726,122,821.56	$830,837,490.19	87%	$5,260,000.00	$415,068,943.13
Australia Total	$141,513,000.00	$141,513,000.00	100%	$10,928,000.00	$86,542,000.00
Bolivia Total	$58,019,394.94	$58,019,394.94	100%	$21,530,000.00	$17,069,864.70
Brazil Total	$556,220,000.00	$664,520,000.00	84%	$5,320,000.00	$474,500,000.00
Burkina Faso Total	$290,702,560.48	$440,362,560.48	66%	$56,260,000.00	$192,214,625.19
Canada Total	$3,889,418,621.53	$4,085,701,002.90	95%	$334,944,284.00	$2,427,537,282.77
Chile Total	$336,741,001.00	$344,771,001.00	98%	$20,356,666.00	$249,924,335.00
Dominican Republic Total	$392,099,378.77	$608,598,757.55	64%	$53,650,000.00	$181,860,000.00
Finland Total	$239,068,983.23	$253,158,116.00	94%	$16,610,000.00	$190,101,197.23
Ghana Total	$238,580,000.00	$304,780,000.00	78%	$30,080,000.00	$154,500,000.00
Greece Total	$220,747,274.02	$245,725,451.22	90%	$330,000.00	$177,287,390.29
Guatamala Total	$59,955,033.29	$65,398,908.00	92%	$12,881,503.00	$29,268,171.55
Mauritania Total	$271,000,000.00	$660,150,000.00	41%	$13,200,000.00	$215,600,000.00
Mexico Total	$2,742,143,948.72	$2,935,836,911.09	93%	$16,030,000.00	$1,435,183,092.03
Papua New Guinea Total	$256,203,000.00	$376,701,000.00	68%	$3,180,000.00	$74,532,250.00
Peru Total	$621,024,556.67	$636,686,740.67	98%	$29,740,000.00	$456,328,872.66
Romania Total	$21,507,800.57	$24,899,305.71	86%	$230,000.00	$19,085,025.78
Russia Total	$461,520,000.00	$526,820,000.00	88%	$163,620,000.00	$208,200,000.00
Saudi Arabia Total	$127,035,000.00	$143,570,000.00	88%	$-	$63,515,000.00
Suriname Total	$281,936,421.00	$407,655,362.10	69%	$100,290,000.00	$145,000,000.00
Turkey Total	$258,362,000.00	$292,392,000.00	88%	$38,850,000.00	$185,950,000.00
USA Total	$3,627,901,714.00	$3,703,106,714.00	98%	$520,591,000.00	$2,211,464,500.00
Zambia Total	$745,720,000.00	$851,780,000.00	88%	$62,740,000.00	$559,210,000.00
Totals	**$16,563,542,509.79**	**$18,602,983,715.85**	**112%**	**$1,516,621,453.00**	**$10,169,942,550.33**

Figure 34 continued, next page.

FIGURE 34: MINING COMPANY INVESTMENT IN HOST COUNTRIES - 2017, CONTINUED

	In-Country expenditures				
Country	Payments to employees	Communities (US$m)	Payments to providers of capital	Total mineral revenue	Number of employees and contractors[3]
Argentina Total	$244,119,811.44	$3,161,352.00	0	$22,178,000,000.00	6,429
Australia Total	$43,955,000.00	$88,000.00	0	$170,500,000.00	329
Bolivia Total	$19,419,530.24	$-	0	$85,887,382.53	596
Brazil Total	$75,000,000.00	$1,400,000.00	0	$447,000,000.00	3,709
Burkina Faso Total	$42,000,000.00	$227,935.29	0	$547,300,000.00	3,234
Canada Total	$1,115,081,758.76	$11,855,296.00	$5,960.80	$4,375,887,837.00	13,673
Chile Total	$64,700,000.00	$1,760,000.00	0	$52,000,000.00	2,787
Dominican Republic Total	$58,974,000.00	$1,614,000.00	0	$1,419,353,915.00	4,793
Finland Total	$31,777,000.00	$580,786.00	0	$249,300,000.00	957
Ghana Total	$53,100,000.00	$900,000.00	0	$317,600,000.00	1,899
Greece Total	$41,252,508.76	$1,877,374.97	0	$53,481,725.04	492
Guatamala Total	$13,666,259.74	$4,139,099.00	0	$87,011,504.00	559
Mauritania Total	$40,400,000.00	$1,800,000.00	0	$298,400,000.00	4,917
Mexico Total	$1,075,032,571.69	$4,812,100.00	0	$2,414,181,486.50	2,950
Papua New Guinea Total	$178,068,000.00	$422,750.00	0	$-	2,862
Peru Total	$80,296,484.01	$8,909,200.00	0	$1,019,715,024.89	2,849
Romania Total	$2,036,780.73	$155,994.06	0	$-	318
Russia Total	$88,900,000.00	$800,000.00	0	$726,900,000.00	2,620
Saudi Arabia Total	$63,515,000.00	$5,000.00	0	$371,000,000.00	216
Suriname Total	$35,846,421.00	$800,000.00	0	$385,610,000.00	1,709
Turkey Total	$32,690,000.00	$872,000.00	0	$337,900,000.00	1,609
USA Total	$894,420,514.00	$1,425,700.00	0	$1,676,800,000.00	9,858
Zambia Total	$120,950,000.00	$2,820,000.00	0	$-	4,211
Totals	**$4,415,201,640.37**	**$50,426,587.32**	**$5,960.80**	**$37,213,828,874.96**	**73,576**

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 35: BALANCE OF CANADA'S MINERAL TRADE, 2020

Stage	Domestic Exports ($000)	Total Exports ($000)	Total Imports ($000)	Balance of Trade ($000)
Stage 1	32,436,785	32,491,149	10,163,510	22,327,639
Stage 2	38,918,816	39,110,607	19,728,894	19,381,713
Stage 3	14,912,023	16,595,213	23,185,201	-6,589,988
Stage 4	16,067,896	18,354,669	38,036,980	-19,682,311
Total	102,335,520	106,551,638	91,114,585	15,437,053

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 36: VALUE OF CANADA'S MINING AND MINERAL PROCESSING INDUSTRY TRADE, 2003-2020

	Domestic Exports	Total Exports	Imports	Balance of Trade
($ billions)				
2003	45.6	47.0	45.0	2.1
2004	53.7	55.5	51.9	3.6
2005	61.0	63.2	56.3	6.8
2006	71.4	74.2	61.6	12.5
2007	80.1	83.6	62.2	21.4
2008	90.2	93.0	68.7	24.3
2009	62.7	65.0	54.7	10.3
2010	80.2	83.2	66.1	17.1
2011	95.9	100.3	76.7	23.6
2012	88.1	91.1	75.5	15.6
2013	86.9	90.0	73.4	16.6
2014	89.6	93.2	79.9	13.4
2015	92.0	96.2	80.9	15.3
2016	88.7	92.9	79.1	15.9
2017	97.4	101.4	84.0	19.9
2018	104.5	108.2	89.8	21.1
2019	106.0	109.7	89.4	20.3
2020	102.3	106.6	91.1	15.4

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.

Imports

Total imports for the first three stages of mining increased by 12% year-over-year, coming in at $53 billion. Combined, the four stages totalled $91.1 billion in imports. Of Canada's total mineral imports by value in 2020, 45% came from the US, which normalizes the balance of trade between the two countries for minerals and metals (see Annex 10).

CANADA'S TRADE POLICIES

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

Investment agreements, complete with dispute resolution mechanisms, provide mining investors with greater certainty over the investments that companies make in foreign jurisdictions. Labour mobility and regulatory cooperation mechanisms enable companies to secure the key skills they need for project development and operation and promote dialogue through the complex process of obtaining regulatory approvals.

However, international agreements do not alone facilitate trade. Trade-enabling transportation infrastructure is essential for companies to get their goods to market. Beyond infrastructure expansion, the efficient operation of Canadian modes of transportation, such as rail, is critical. Further, the efforts of Canada's Trade Commissioner Service, and other outward looking programs, including Export Development Canada, are critical supports for Canadian companies operating aboard.

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

Investor State Dispute Settlement (ISDS) Mechanisms

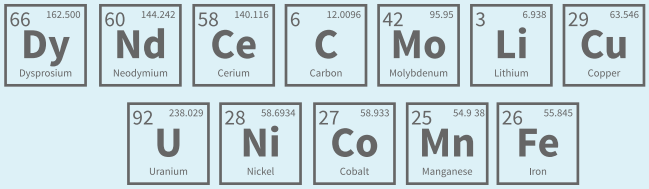
ISDS is a mechanism in a free trade agreement (FTA) or investment treaty that provides foreign investors, including Canadian investors overseas, with the right to access an international tribunal to resolve investment disputes. ISDS protections are critically important to the Canadian mining industry due to unique factors that define mineral investments. First, mining companies must go to where commercially developable mineral and metal deposits are located. While Canada is rich in many minerals and metals, a significant number of our members also have operations overseas, with particularly high concentrations in some countries.

Mining operations are more vulnerable than those of other sectors due to the tremendous up-front capital costs involved with mineral development. It is common for an average mine's initial capital expenditure to exceed $1 billion before any minerals

PRODUCTS THAT RELY ON MINING

ELECTRIC CARS

The mining industry plays an essential role in the transition to a low-carbon future by providing the building blocks of clean and low energy technologies, like electric car batteries. In fact, the growing adoption of these technologies is increasing the demand for minerals and metals.



are produced or processed. After production begins, mines typically operate for several years to recover capital before any profit is realized. In the event of an interruption of mineral production beyond the miner's control, that investment is immobile as it is grounded in the host country.

Trade Relations with the US

With the departure of President Trump and the arrival of the new Biden administration there were hopes in some quarters that a new level of trade equilibrium might be restored between Canada and the US. Since the election of President Joe Biden, while the tone of engagement has become more cordial, there has been an escalation of irritants in the trade relationship, including: the cancellation of the then under construction KXL Pipeline, inaction on the dispute over Line 5 pipeline, and most recently a doubling of softwood lumber tariffs.

Most relevant to the Canadian mining industry is the *Build Back Better Act*. This legislation – having passed the House of Representatives and being reviewed by the Senate at the time of writing – proposes to offer sizeable tax credits to the buyers of new EVs. The credits are structured in a way to increase – peaking at $12,500 – relative to the extent of American content, manufacturing activity and union employment.

How the government responds to recently advanced "Buy American" EV tax credits is a critical determinant of Canada's ability to maximize EV and battery market participation. It is our view that the government should pursue a two-tiered approach that:

1. Continues to advocate for more balanced market access with the US in line with the principles and outcomes negotiated in the Canada-US-Mexico Agreement (CUSMA).
2. Aggressively advances measures that build up capacity in areas of the supply chain that are unhindered by the proposed US EV tax credits or the automotive rules of origin provisions in CUSMA.

Pursuing both objectives maximizes Canada's potential benefit while hedging our bets if the US protectionist agenda prevails. Further, it is our view that a deepened and strongly signalled commitment to expand Canadian critical minerals production and manufacturing - including and especially into battery grade materials and components - presents both substantial domestic economic and climate benefits while being complementary with US geopolitical and supply chain security objectives. This approach would position Canada as a meaningful partner in the broader North American EV and battery supply chain transformation and increase the US's receptiveness to Canada's concerns over the proposed "Buy American" provisions.

Trade Relations with China

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

China is Canada's third-largest market for the export of minerals and metals after the US and the EU, with an export value exceeding $5.4 billion in 2018, or approximately 5% of our overall total.

Chinese dominance in Critical Minerals and Rare Earth Elements

To date, China has dominated the global market for rare earth elements (REE), controlling the majority of production and distribution, resulting in an over-reliance by the rest of the world on one country for procurement. Simultaneously, Canada's fiscal and regulatory competitiveness has been declining steadily over the last decade, as consecutive reviews of environmental legislation and new regulations have created uncertainty and a growing compliance burden. Canada's mining sector cannot compete with Chinese state-owned enterprises without targeted government action to develop, protect and sustain REE and critical minerals supply chains.

MAC and its members continue to urge the federal government to take steps to enhance the industry's competitiveness and support its global position.

China-Canada Trade

While the prospect of a free-trade agreement (FTA) with China was once viewed as a potentially significant opportunity for Canada to capture greater share of Chinese market demand for raw materials, diplomatic incidents and tensions between the two countries in recent years have scuttled any prospect of an agreement. Indeed, with the general increase in geo-political tension between China and the US, and recent inflammatory actions and statements by China in Hong Kong and over Taiwan, the distance between the West and China is perhaps greater than ever before.

Despite this, with the release in 2021 of the "two Michaels", there is a potential for a de-escalation in tension in Canada/China relations. Should the focus shift back to economic relations and trade in the future, Canada's North American advantage remains, namely that that the Ports of Metro Vancouver and Prince Rupert are, on average, three days closer to multiple Asian ports, including Chinese ports, than competitors.

Mercosur

Mercosur is a South American sub-regional common market trade bloc whose current full members are Argentina, Brazil, Paraguay and Uruguay. On March 9th, 2018 in Asuncion, Paraguay, negotiations toward a comprehensive Canada-Mercosur FTA were launched, and remain ongoing to date.

MAC has supported the government's efforts to reassess the viability of a FTA with Mercosur and participated in consultations on the matter. Given the assets of Canadian companies operating in Brazil and Argentina alone exceed $10 billion each, Mercosur is critically important to our mining industry.

Beyond investments and assets, MAC and its members are exporting best practices in mining sustainability to Mercosur countries. The most significant recent example of this is in Argentina, Brazil and Colombia, where the Cámara Argentina de Empresarios Mineros (Argentina's national mining association), the Instituto Brasileiro de Mineração (the national mining chamber for Brazil) and the Asociación Colombiana de Minería (Colombia's national mining chamber) have adopted MAC's *Towards Sustainable Mining*® (TSM) initiative. The adoption of TSM by these countries is an important step forward in cooperation on responsible mining standards between Canada and major mining jurisdictions in Latin America.

Pacific Alliance

The Pacific Alliance is a regional initiative created in 2011 by Chile, Colombia, Mexico and Peru that seeks the free movement of goods, services, capital and people. Each of the above countries are significant destinations for Canadian mineral investment, and closer trade-ties with this alliance is something that MAC supports.

With a combined GDP of $2.5 trillion, and 223 million inhabitants, the Pacific Alliance constitutes an important market for Canada. The Alliance's overarching goals are to foster the free movement of goods, services, capital and people and to promote greater competitiveness and economic growth for member countries.

AND THEN THERE WERE TEN: THE INCREASING INTERNATIONAL ADOPTION OF MAC'S *TOWARDS SUSTAINABLE MINING*® SUSTAINABILITY STANDARD

Canada was the first country to develop an externally-verified performance system for mining operations. Since then, countries around the world have adopted TSM to draw from Canada's expertise.

MAC established TSM in 2004 with the main objective of enabling mining companies to meet society's needs for minerals, metals and energy products in the most socially, economically and environmentally responsible way. TSM reflects our commitment to leaving a positive legacy where mining companies operate. In turn, we're helping businesses and their customers be confident in how their products are made.

To support and encourage responsible mining globally, MAC freely shares TSM with any country interested in promoting responsible mining and global interest in TSM continues to grow at a rapid pace.

Over the past several years, TSM has spread beyond Canada to nine other countries on six continents, where national mining associations have formally adopted the program to improve the performance of their domestic mining sectors. These countries include Australia (Minerals Council of Australia), Finland (FinnMin), Argentina (Cámara Argentina de Empresarios Mineros), Botswana (Botswana Chamber of Mines), the Philippines (Chamber of Mines of the Philippines), Spain (Confederación Nacional de Empresarios de la Minería y de Metalurgia), Brazil (Instituto Brasileiro de Mineração), Norway (Norsk Bergindustri) and, most recently, Colombia (Asociación Colombiana de Minería). Many other countries have expressed interest in the program and are exploring adoption.

THE CANADIAN INVESTMENT REGIME

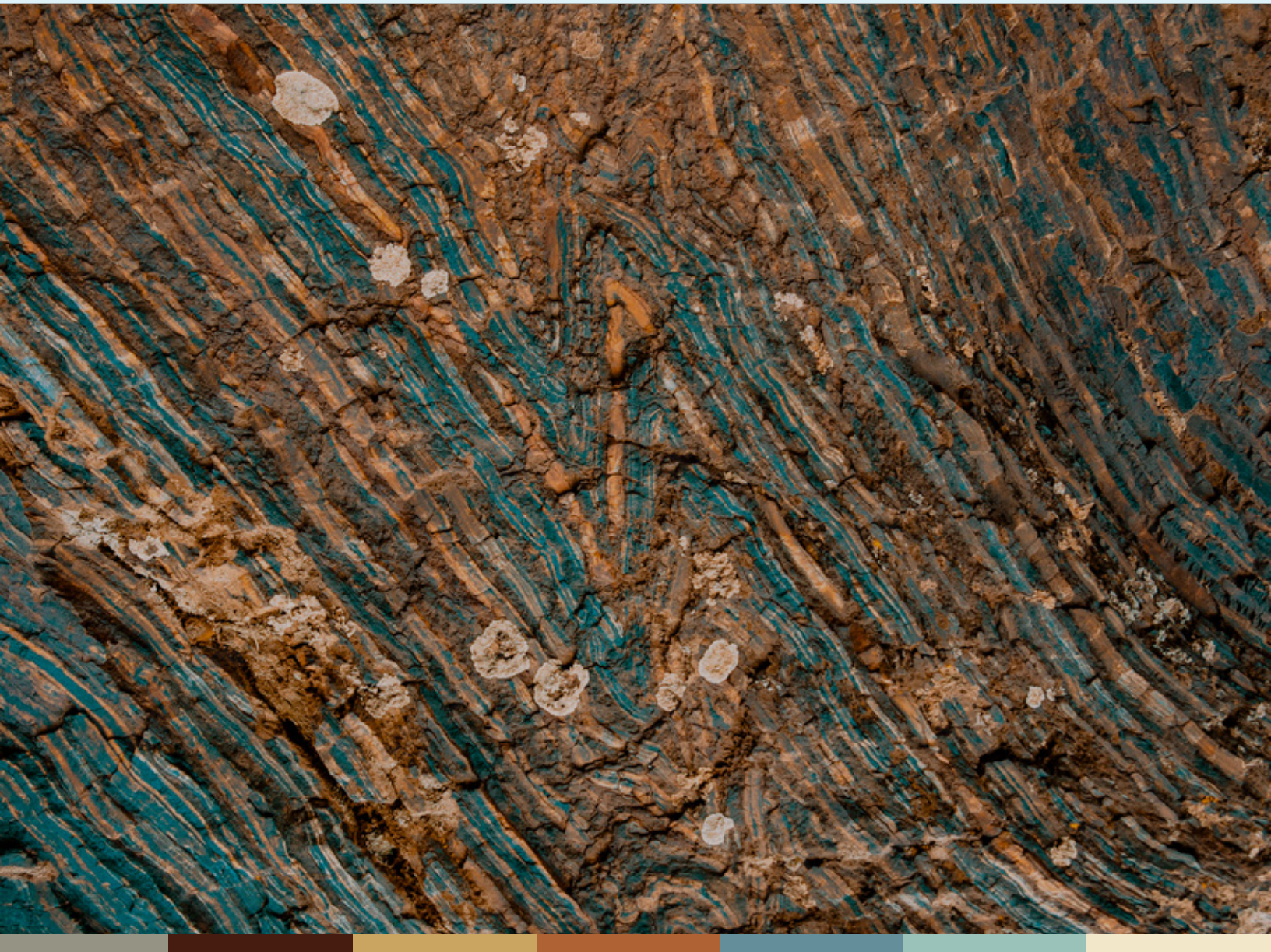
Foreign investment gives Canadian businesses easier access to new technologies and ideas and enhances connectivity to larger markets and production chains. Ensuring that two-way flows of capital remain fair and open is essential. Negotiating safeguards for industry investment abroad, while enabling foreign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

Foreign Investment Promotion and Protection Agreements (FIPA)

A FIPA is a bilateral agreement aimed at protecting and promoting foreign investment through legally binding rights and obligations. At the time of writing, Canada had 38 FIPAs in force, had signed two others yet to come into force, concluded negotiations with five additional countries, and remains engaged in ongoing negotiations with 14 other countries.

While the enforcement components of FIPAs are rarely used, such as the ISDS mechanisms discussed above, 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. Global Affairs Canada (GAC) recently concluded a review of their FIPA program, and MAC was pleased to see that ISDS mechanisms will persist as an important component of FIPA negotiations. While ISDS will persist, the outcome of the consultation resulted in several technical changes to the ISDS mechanism, a comprehensive list of which can be found on GAC's website.

Annexes



ANNEX 1: PRODUCING MINES IN CANADA, 2020

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Newfoundland & Labrador				
Beaver Brook Antimony Mine Inc.	Beaver Brook	(U., C.)	Glenwood	Sb
Rambler Metals and Mining Canada Limited	Nugget Pond	(C.)	Snook's Arm	Cu
Rambler Metals and Mining Canada Limited	Ming	(U.)	Baie Verte	Cu, Au, Ag
Anaconda Mining Inc.	Point Rousse (Pine Cove)	(P., C.)	Baie Verte	Au
Vale Newfoundland and Labrador Limited	Voisey's Bay	(P., C.)	Voisey's Bay	Ni, Cu, Co
Tacora Resources Inc.	Scully	(P., C.)	Wabush	Fe
Iron Ore Company of Canada (IOC)	Carol Lake	(P., C.)	Labrador City	Fe
Tata Steel Minerals Canada Limited	DSO (Timmins)	(P., C.)	Menihek	Fe
Canada Fluorspar (NL) Inc.	St. Lawrence	(P., U., C.)	St. Lawrence	Fluorspar
Barite Mud Services Inc.	Buchans	(P.)	Buchans	Barite
Trinity Resources Ltd.	Conception Bay South	(P.)	Conception Bay South	Pyrophyllite
Nova Scotia				
St Barbara Limited	Moose River Consolidated	(P., C.)	Upper Musquodoboit	Au
Nova Scotia Power Inc.	Glen Morrison	(P.)	Cape Breton	Limestone
Antigonish Limestone Ltd.	Southside Antigonish Harbour	(P.)	Southside Antigonish Harbour	Limestone, lime
Mosher Limestone Company Limited	Upper Musquodoboit	(P.)	Upper Musquodoboit	Limestone, dolomite
Lafarge Canada Inc.	Brookfield	(P., Plant)	Brookfield	Limestone
National Gypsum (Canada) Ltd.	East Milford	(P.)	Milford	Gypsum
K+S Windsor Salt Ltd.	Pugwash	(U.)	Pugwash	Salt
Compass Minerals Canada Corporation	Amherst (Nappan)	(solution mining)	Amherst	Salt
Kameron Collieries ULC	Donkin	(U.)	Cape Breton	Coal (metallurgical, thermal)
Pioneer Coal Ltd.	Stellarton	(P.)	Stellarton	Coal (thermal)
Nova Construction Ltd.	Brierly Brook	(P.)	Antigonish	Gypsum
New Brunswick				
Trevali Mining Corp.	Caribou	(P., U., C.)	Bathurst	Zn, Pb, Cu, Ag
Graymont Inc.	Havelock	(P., Plant)	Havelock	Limestone, lime
Nutrien Ltd.	Picadilly	(U.)	Sussex	Salt
Brookville Manufacturing Company	Brookville	(P., Plant)	Saint John	Dolomitic lime
Elmtree Resources Ltd.	Sormany	(P., Plant)	Sormany	Limestone
Hammond River Holdings Ltd	Upham East	(P.)	Upham	Gypsum
Quebec				
Rio Tinto Fer et Titane inc.	Tio	(P.)	Havre-Saint-Pierre	Ilmenite
Champion Iron Ltd	Bloom Lake	(P.)	Fermont	Fe
ArcelorMittal Mining Canada G.P.	Mont-Wright	(P., C.)	Fermont	Fe
Tata Steel Minerals Canada Limited	DSO (Goodwood)	(P.)	Schefferville	Fe
ArcelorMittal Mining Canada G.P.	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
Newmont Corp.	Éléonore	(U., C.)	Opinaca Reservoir	Au
Nyrstar NV	Langlois	(U., C.)	Lebel-sur-Quévillon	Zn, Cu, Au, Ag
Glencore Canada Corporation	Bracemac-McLeod	(U., C.)	Matagami	Zn, Cu, Au, Ag

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Eldorado Gold	Lamaque	(U., C.)	Val-d'Or	Au
Agnico Eagle Mines Limited	Goldex	(U., C.)	Val-d'Or	Au, Ag
Abcourt Mines Inc.	Sleeping Giant	(C.)	north of Amos	Au, Ag
Agnico Eagle Mines Limited and Yamana Gold Inc.	Canadian Malartic	(P., C.)	Malartic	Au, Ag
Agnico Eagle Mines Limited	LaRonde	(U., C.)	Preissac	Au, Zn, Cu, Pb, Ag
Agnico Eagle Mines Limited	LaRonde - Zone 5	(U.)	Preissac	Au
IAMGOLD Corporation	Westwood-Doyon	(U., C.)	Cadillac	Au, Cu, Ag, Zn
Abcourt Mines Inc.	Elder	(U.)	Rouyn-Noranda	Au, Ag
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
Ciment Québec inc.	Quebec	(P., Plant)	City of Québec	Limestone
Graymont Inc.	Marbleton	(P., Plant)	Marbleton	Limestone, lime
Ciment Québec inc.	Saint-Basile	(P., Plant)	Saint-Basile	Limestone
Graymont Inc.	Les Carrières Calco	(P., Plant)	St-Marc-des-Carrières	Calcium carbonate
Stornoway Diamond Corporation	Renard	(P., U., C.)	Mistissini	Diamonds
Carrière d'Acton Vale ltée	Acton Vale	(P., Plant)	Acton Vale	Calcium carbonate
Graymont Inc.	Bedford	(P., Plant)	Bedford	Limestone, lime
OMYA (Canada) Inc.	Saint-Armand	(P., Plant)	Saint-Armand	Calcium carbonate
CRH Canada Group Inc.	Joliette	(P., Plant)	Joliette	Limestone
Graymont Inc.	Joliette	(P., Plant)	Joliette	Limestone, lime
Lafarge Canada Inc.	St-Constant	(P., Plant)	St-Constant	Limestone
Demix Agrégats	Laval	(P., Plant)	Laval	Limestone
Ciment Québec inc.	Laval	(P., Plant)	Laval	Limestone
Imerys Mica Suzorite, Inc.	Lac Letondal	(P.)	Parent, Suzor Twp.	Mica
Colacem Canada inc.	Kilmar	(P., Plant)	Calumet	Limestone
Imerys Graphite and Carbon	Lac-des-Îles	(P., Plant)	Saint-Aimé-du-Lac-des-Îles	Graphite
Ontario				
Kirkland Lake Gold Ltd.	Detour Lake	(P., C.)	Matagami	Au
Kirkland Lake Gold Ltd.	Holloway-Holt	(U., C.)	Timmins	Au
Kirkland Lake Gold Ltd.	Macassa	(U., C.)	Kirkland Lake area	Au, Ag
McEwen Mining Inc.	Black Fox	(P., U., C.)	Matheson	Au
Kirkland Lake Gold Ltd.	Taylor	(U.)	Cochrane	Au
Alamos Gold Inc.	Young-Davidson	(U., C.)	Kirkland Lake area	Au
Glencore Canada Corporation	Nickel Rim South	(U.)	Sudbury	Ni, Cu, Co, PGM, Au
Vale Canada Limited	Garson	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Vale Canada Limited	Clarabelle	(C.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Vale Canada Limited	Copper Cliff North	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Newmont Corp.	Hoyle Pond	(U.)	south of Porcupine	Au
Pan American Silver Corp.	Bell Creek	(U., C.)	Timmins	Au
Vale Canada Limited	Creighton	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Newmont Corp.	Hollinger	(P.)	Timmins	Au
Vale Canada Limited	Coleman	(U.)	Sudbury	Ni, Cu, Co, PGM, Au, Ag, Se, Te
Glencore Canada Corporation	Fraser	(U.)	Sudbury	Ni, Cu, Co, PGM

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
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
Vale Canada Limited	Totten	(U.)	Worthington	Ni, Cu, Co, PGM, Au
Pan American Silver Corp.	Timmins West	(U.)	Timmins	Au
Newmont Corp.	Borden	(P., U.)	Chapleau	Au
Alamos Gold Inc.	Island	(U., C.)	Dubreuilville	Au
Harte Gold Corp.	Sugar Zone	(U., C.)	White River	Au
Wesdome Gold Mines Ltd.	Mishi	(P., C.)	Wawa	Au
Wesdome Gold Mines Ltd.	Eagle River	(U.)	Wawa	Au
Barrick Gold Corporation	Hemlo (Williams)	(P., U., C.)	Marathon	Au
Impala Canada Ltd.	Lac des Iles	(P., U., C.)	Thunder Bay	PGM, Ni, Au, Cu, Co
Newmont Corp.	Musselwhite	(U., C.)	north of Pickle Lake	Au, Ag
Evolution Mining Ltd.	Red Lake	(U., C.)	Balmertown	Au, Ag
Evolution Mining Ltd.	Cochenour	(U.)	Cochenour	Au
New Gold Inc.	Rainy River	(P., U., C.)	Fort Frances	Au, Ag, Ni, Cu, Co
Canadian Wollastonite	St. Lawrence	(P.)	Kingston	Wollastonite
OMYA (Canada) Inc.	Tatlock	(P.)	Tatlock	Calcium carbonate
Lafarge Canada Inc.	Bath	(P.)	Bath	Limestone
ESSROC Canada Inc.	Picton	(P.)	Picton	Limestone
CRH Canada Group Inc.	Ogden Point	(P.)	Ogden Point	Limestone
Covia Canada Ltd.	Blue Mountain	(P., Plant)	Blue Mountain	Nepheline syenite
St. Marys CBM (Canada) Inc.	Bowmanville	(P.)	Bowmanville	Limestone
Miller Minerals (Miller Paving Co.)	Bucke	(P., Plant)	New Liskeard	Limestone
Carmeuse Lime (Canada) Limited	Dundas	(P.)	Dundas	Dolomitic lime
Lafarge Canada Inc.	Dundas	(P.)	Dundas	Limestone
Gebr. Knauf KG	Hagersville	(U., Plant)	Hagersville	Gypsum
Carmeuse Lime (Canada) Limited	Beachville	(P., Plant)	Ingersoll	Limestone, lime
E.C. King Contracting Ltd. (Miller Paving Co.)	Sydenham	(P.)	Owen Sound	Dolomite
St Marys CBM (Canada) Inc.	St Marys	(P.)	St. Marys	Limestone
Compass Minerals Canada Corporation	Goderich	(solution mining)	Goderich	Salt
Boreal Agrominerals Inc.	Spanish River Carbonite	(P.)	northwest of Sudbury	Vermiculite
Compass Minerals Canada Corporation	Goderich	(U., Plant)	Goderich	Salt
IMERYS Talc	Penhorwood	(P.)	Penhorwood	Talc
K+S Windsor Salt Ltd.	Windsor	(solution mining)	Windsor	Salt
K+S Windsor Salt Ltd.	Ojibway	(U.)	Windsor	Salt
Lafarge Canada Inc.	Meldrum Bay	(P., Plant)	Manitoulin Island	Limestone, dolomite
KGHM Polska Miedz S.A.	McCreedy West	(U.)	Sudbury	Cu, PGM, Au, Ag
Owen Sound Ledgerock Ltd.	Owen Sound	(P.)	Owen Sound	Dolomite
Manitoba				
Rare Metals Resources Co. Limited	Tanco	(U., C.)	Lac-du-Bonnet	Cs
Vale Canada Limited	Thompson (T-1 and T-3)	(P., U., C.)	Thompson	Ni, Cu, Co, PGM
HudBay Minerals Inc.	Lalor Lake	(U., C.)	Snow Lake	Zn, Au, Cu, Ag
HudBay Minerals Inc.	777	(U., C.)	Flin Flon	Cu, Zn, Au, Ag
Graymont Inc.	Faulkner	(P., Plant)	Faulkner	Limestone, lime
CertainTeed Gypsum Canada, Inc.	Amaranth	(P.)	Harcus	Gypsum
ERCO Worldwide	Hargrave	(U., Plant)	Virden	Sodium chlorate
Saskatchewan				
SSR Mining Inc.	Santoy	(U.)	Santoy Lake	Au

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
SSR Mining Inc.	Seabee	(C.)	Laonil Lake	Au
Cameco Corporation	Cigar Lake	(U.)	Waterbury Lake	U
Nutrien Ltd.	Rocanville	(U., Plant)	Rocanville	Potash
The Mosaic Company	Esterhazy (K-1, K-2 and K-3)	(U., Plant)	Esterhazy	Potash, salt
Compass Minerals Canada Corporation	Wynyard (Big Quill)	(Plant)	Wynyard	Potassium sulphate
The Mosaic Company	Belle Plaine	(U., Plant)	Belle Plaine	Potash, salt
Nutrien Ltd.	Lanigan	(U.)	Lanigan	Potash
K+S Potash Canada	Bethune	(U., Plant)	Bethune	Potash
Nutrien Ltd.	Allan	(U., Plant)	Allan	Potash
Nutrien Ltd.	Patience Lake	(U., Plant)	Blucher	Potash
Saskatchewan Mining and Minerals Inc.	Chaplin Lake	(P., Plant)	Chaplin	Sodium sulphate
Nutrien Ltd.	Cory	(U., Plant)	Cory	Potash
Nutrien Ltd.	Vanscoy	(U., Plant)	Vanscoy	Potash, salt
Compass Minerals Canada Corporation	Unity	(solution mining)	Unity	Salt
Westmoreland Coal Company	Estevan	(P.)	Bienfait	Coal (thermal)
Westmoreland Coal Company	Poplar River	(P.)	Coronach	Coal (thermal)
Orano Canada Inc.	McClean Lake	(C.)	McClean Lake	U
Alberta				
K+S Windsor Salt Ltd.	Lindbergh	(solution mining)	Elk Point	Salt
Hammerstone Corporation Fort McMurray	Steepbank	(P.)	north of	Limestone
Hammerstone Corporation	Muskeg Valley	(P.)	north of Fort McMurray	Limestone
Jarodon Resources Ltd.	Sunnynook	(solution mining)	Cessford	Salt
Suncor Energy Inc.	Fort McMurray West	(P.)	Fort McMurray	Limestone
Calcium Incorporated	Calling Lake	(solution mining)	Calling Lake	Salt
Tiger Calcium Services Inc.	Mitsue	(solution mining)	Slave Lake	Salt
Graymont Inc.	Summit	(P., Plant)	Coleman	Limestone, lime
Graymont Inc.	Exshaw (Gap)	(P., Plant)	Exshaw	Limestone, lime
Lafarge Canada Inc.	Exshaw	(P., Plant)	Exshaw	Limestone
Burnco Rock Products Ltd.	Clearwater	(P., Plant)	Clearwater River	Limestone
Lehigh Cement Company	Mcleod	(P.)	Cadomin	Limestone
Westmoreland Coal Company	Sheerness	(P.)	Hanna	Coal (thermal)
Westmoreland Coal Company	Paintearth	(P.)	Forestburg	Coal (thermal)
Westmoreland Coal Company	Genesee	(P.)	Genesee	Coal (thermal)
Transalta Corporation	Highvale	(P.)	Seba Beach	Coal (thermal)
Westmoreland Coal Company	Coal Valley	(P.)	Edson	Coal (thermal)
Bighorn Mining Ltd.	Vista	(P.)	Hinton	Coal (thermal)
Teck Resources Limited	Cardinal River (Cheviot)	(P.)	Hinton	Coal (metallurgical)
CST Canada Coal Limited	Grande Cache	(P., U.)	Grande Cache	Coal (metallurgical)
Imperial Oil Ltd.	Kearl	(P.)	Fort McMurray	Upgraded crude oil
Suncor Energy Inc.	Millennium and Steepbank	(P.)	Fort McMurray	Upgraded crude oil
Canadian Natural Resources Limited	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
Canadian Natural Resources Limited	Muskeg River	(P.)	Fort MacKay	Upgraded crude oil
Suncor Energy Inc.	Fort Hills	(P.)	Fort MacKay	Upgraded crude oil
Canadian Natural Resources Limited	Horizon	(P.)	Fort MacKay	Upgraded crude oil

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
British Columbia				
New Gold Inc.	New Afton	(U., C.)	Kamloops	Au, Ag, Cu
Copper Mountain Mining Corporation	Copper Mountain	(P., C.)	Princeton	Cu, Au, Ag
Teck Resources Limited	Highland Valley	(P., C.)	Logan Lake	Cu, Mo
Taseko Mines Limited	Gibraltar	(P., C.)	north of Williams Lake	Cu, Mo
Centerra Gold Inc.	Mount Milligan	(P., C.)	Fort St. James	Cu, Au
Newcrest Mining Ltd.	Red Chris	(P., C.)	Kinaskan Lake	Au, Ag, Cu
Pretium Resources Inc.	Brucejack	(U., C.)	Stewart	Au, Ag
Cœur Mining	Silvertip	(P., U.)	Liard	Ag, Zn, Pb, 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
Lafarge Canada Inc.	Falkland	(P., Plant)	Falkland	Gypsum
Absorbent Products Ltd.	Bud	(P.)	Princeton	Calcium, clay
Absorbent Products Ltd. leonardite	Red Lake	(P.)	Kamloops	Diatomite, bentonite,
Imperial Limestone Co. Ltd.	Van Anda	(P.)	Texada Island	Limestone
Texada Quarrying Ltd. (Lafarge Canada Inc.)	Texada	(P.)	Texada Island	Limestone
Fireside Minerals Ltd.	Fireside	(P.)	Fireside	Barite
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)
Conuma Coal Resources Ltd.	Wolverine	(P., Plant)	Tumbler Ridge	Coal (metallurgical)
Conuma Coal Resources Ltd.	Brule	(P.)	Tumbler Ridge	Coal (metallurgical)
Conuma Coal Resources Ltd.	Willow Creek	(P.)	Chetwynd	Coal (metallurgical)
Nyrstar NV	Myra Falls	(U.)	Strathcona	Zn, Cu, Pb, Au, Ag
Yukon				
Victoria Gold Corporation	Eagle (Dublin Gulch)	(P., C.)	Mayo	Au
Pembridge Resources plc	Minto	(P., U., C.)	Pelly Crossing	Cu, Au, Ag
Alexco Resource Corporation	Keno Hill Silver District	(U., C.)	Mayo	Ag, Pb, Zn
Northwest Territories				
De Beers Canada Inc.	Gahcho Kué	(P., Plant)	Lac de Gras	Diamonds
Diavik Diamond Mines Inc.	Diavik	(U., Plant)	Lac de Gras	Diamonds
Dominion Diamond Corporation	Ekati	(U., Plant)	Lac de Gras	Diamonds
Nunavut				
Baffinland Iron Mines Corporation	Mary River	(P.)	Pond Inlet	Fe
Agnico Eagle Mines Limited	Meliadine	(P., U., C.)	Rankin Inlet	Au
Agnico Eagle Mines Limited	Meadowbank	(C.)	Baker Lake	Au
Agnico Eagle Mines Limited	Amaruq	(P.)	Baker Lake	Au
TMAC Resources Inc.	Hope Bay	(U., C.)	Cambridge Bay	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 2020.

ANNEX 2: MINING ESTABLISHMENTS IN CANADA, BY MINERAL, PROVINCE OR TERRITORY, 2018

Metals	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	YT	NT	NV	TOTAL
Iron Ore	1	-	-	-	3	-	-	-	-	-	-	-	1	5
Gold & Silver Ore	1	-	1	-	14	13	1	1	-	1	-	-	2	34
Lead-zinc ore	-	-	-	1	-	-	-	-	-	1	-	-	-	2
Nickel-copper ore	1	-	-	-	2	3	1	-	-	-	-	-	-	7
Copper, copper-zinc ore	1	-	-	-	2	1	1	-	-	7	1	-	-	13
Uranium	-	-	-	-	-	-	-	2	-	-	-	-	-	2
Other Metals	-	-	-	-	3	1	1	2	-	-	-	-	-	7
TOTAL METALS	**4**	**0**	**1**	**1**	**24**	**18**	**4**	**5**	**0**	**9**	**1**	**0**	**3**	**70**

Non-metals	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	YT	NT	NV	TOTAL
Diamonds	-	-			1	1	-			-	-	3	-	5
Gypsum	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Peat	1	3	1	19	14	-	5	1	5	1	-	-	-	50
Potash	-	-	-	-	-	-	-	10	-	-	-	-	-	10
Salt	-	-	2		1	4	-	3	2	-	-	-	-	12
Sand and gravel	2	-	2	9	62	207	10	50	149	79	1	-	-	571
Stone	3	-	13	9	91	104	8	-	21	16	-	-	-	265
Shale, Clay and other efractory minerals	-	-	1		3	2		-	-	2			-	8
Other nonmetals	-	-	-	-	3	2	-	1	-	3	-	-	-	9
TOTAL NON-METALS	**6**	**3**	**19**	**37**	**175**	**320**	**23**	**65**	**177**	**102**	**1**	**3**	**0**	**931**

ANNEX 3: CANADIAN PRODUCTION OF LEADING MINERALS BY PROVINCE AND TERRITORY, 2020 [P]

	GOLD		COAL		COPPER		POTASH (K_2O)[1]		IRON ORE	
	kilograms	$000	kilotonnes	$000	tonnes	$000	kilotonnes	$000	kilotonnes	$000
Newfoundland	x	x			x	x			22,921	1,945,434
Prince Edward Island										
Nova Scotia	x	200,280	x	x						
New Brunswick										
Quebec	56,289	3,938,487			36,170	283,453			32,119	3,161,487
Ontario	73,799	5,070,747			123,630	888,114				
Manitoba	2,668	x			22,384	145,246				
Saskatchewan	x	x	x	x			13,410	3,735,520		
Alberta	x	x	x	x						
British Columbia	19,015	938,799	x	x	255,688	2,236,742				
Yukon	x	x			x	x				
Northwest Territories										
Nunavut	x	x							5,020	502,837
Canada	**182,352**	**12,320,820**	**40,792**	**3,957,956**	**475,898**	**3,859,973**	**13,410**	**3,735,520**	**60,060**	**5,609,758**

	NICKEL		DIAMONDS		SAND AND GRAVEL[2]		STONE		PLATINUM GROUP	
	tonnes	$000	000 carats	$000	kilotonnes	$000	kilotonnes	$000	kilograms	$000
Newfoundland	32,987	610,261			912	5,599	4,230	20,867	19	1,200
Prince Edward Island					12	194	158	984		
Nova Scotia					7,780	84,384	7,915	107,653		
New Brunswick					3,116	14,312	3,618	34,186		
Quebec	55,196	916,856	1,624	166,213	18,943	146,640	49,488	596,125	6,724	407,032
Ontario	64,900	1,045,037	x	225,816	63,403	589,396	51,845	526,295	23,536	1,398,528
Manitoba	14,160	262,160			8,330	70,910	5,489	46,980	239	11,444
Saskatchewan					8,096	73,490				
Alberta					34,687	415,792	7,301	159,122		
British Columbia					35,996	326,029	11,081	137,868		
Yukon					180	2,352	25	1,250		
Northwest Territories			x	1,150,164	12	180	50	1,250		
Nunavut					6	..				
Canada	**167,243**	**2,834,315**	**15,036**	**1,542,193**	**181,471**	**1,729,277**	**141,201**	**1,632,580**	**30,519**	**1,818,203**

Sources: Natural Resources Canada; Statistics Canada.

[p] Preliminary; - Nil; x Confidential; Not available for specific reference period.

[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.

ANNEX 4: CANADA'S WORLD ROLE AS A PRODUCER OF CERTAIN IMPORTANT MINERALS, 2020[(P)]

			RANK OF FIVE LEADING COUNTRIES					
		World	1	2	3	4	5	
			Canada	Russia	Belarus	China	Germany	
Potash (K_2O equivalent)	000 t	43,190	14,000	7,600	7,300	5,000	3,000	
(mine production)	% of world total		32.4	17.6	16.9	11.6	6.9	
			Russia	Canada	Botswana	Angola	South Africa	
Gemstones	Millions$	74,000	24,000	17,000	13,000	8,000	4,000	
	% of world total		32.4	23.0	17.6	10.8	5.4	
			Brazil	Canada				
Niobium (mine production)	t	78,000	71,000	6,200				
	% of world total		91.0	7.9				
			Kazakhstan	Canada	Australia	Namibia	Uzbekistan	
Uranium (metal content)	t	54,752	22,808	6,938	6,613	5,476	3,500	
(2019 mine production)	% of world total		41.7	12.7	12.1	10.0	6.4	
			Russia	Botswana	Canada	Congo	Australia	
Diamonds (precious)	000 carats	107,077	31,187	16,941	13,104	12,743	10,945	
	% of world total		29.1	15.8	12.2	11.9	10.2	
			South Africa	Russia	Canada	Zimbabwe	United States	
Platinum group metals	kg	380,000	190,000	112,000	27,800	26,000	18,000	
(metal content)	% of world total		50.0	29.5	7.3	6.8	4.7	
			China	South Korea	Canada	Japan	Kazakhstan	Mexico tied with Kazakhstan
Cadmium (metal)	t	23,000	8,200	3,000	1,800	1,800	1,500	
	% of world total		35.7	13.0	7.8	7.8	6.5	
			China	South Africa	Australia	Canada	Mozambique	
Titanium concentrate	000 t	7,600	2,300	1,000	800	680	600	
(Ilmenite)	% of world total		30.3	13.2	10.5	8.9	7.9	
			China	India	Russia	Canada	UAE	
Aluminum (primary metal)	000 t	65,200	37,000	3,600	3,600	3,100	2,600	
	% of world total		56.7	5.5	5.5	4.8	4.0	
			China	South Korea	Japan	Canada	France	
Indium	000 t	900	500	200	65	50	50	
	% of world total		55.6	22.2	7.2	5.6	5.6	
			China	India	Mexico	Canada	Finland	
Wollastonite	000 t	1,100	890	120	100	20	11	
	% of world total		80.9	10.9	9.1	1.8	1.0	
			China	Australia	Russia	United States	Canada	
Gold (mine production)	t	3,200	380	320	300	190	170	
	% of world total		11.9	10.0	9.4	5.9	5.3	
			China	United States	Russia	S.Arabia	Canada	
Sulphur, elemental	000 t	78,000	17,000	8,100	7,500	6,500	6,300	
(mine production)	% of world total		21.8	10.4	9.6	8.3	8.1	

			RANK OF FIVE LEADING COUNTRIES					
		World	1	2	3	4	5	
			China	Japan	Russia	Sweden	Canada	
Tellerium	t	490	300	50	50	40	35	
	% of world total		61.2	10.2	10.2	8.2	7.1	
			China	Finland	United States	Madagascar	South Korea	Canada is 6th
Mica (natural)	000 t	350	95	65	35	30	20	18
	% of world total		27.1	18.6	10.0	8.6	5.7	5.1
			Indonesia	Philippines	Russia	New Caledonia	Australia	Canada is 6th
Nickel (mine production)	000 t	2,500	760	320	280	200	170	150
	% of world total		30.4	12.8	11.2	8.0	6.8	6
			China	United States	India	Germany	Australia	Canada is 6th
Salt (mine production)	000 t	270,000	60,000	39,000	28,000	14,000	12,000	10,000
	% of world total		22.2	14.4	10.4	5.2	4.4	3.7
			Congo	Russia	Australia	Philippines	Cuba	Canada is 6th
Cobalt (mine production)	t	140,000	95,000	6,300	5,700	4,700	3,600	3,200
	% of world total		67.9	4.5	4.1	3.4	2.6	2.3
			Finland	Germany	Belarus	Sweden	Ireland	Canada is 7th
Peat	000 t	29,000	10,000	4,000	2,600	2,500	2,000	1,300
	% of world total		34.5	13.8	9.0	8.6	6.9	4.5
			Australia	Brazil	China	India	Russia	Canada is 8th
Iron ore (mine production)	mt	2,400	900	400	340	230	95	57
(Usable ore)	% of world total		37.5	16.7	14.2	9.6	4.0	2.4
			China	Russia	United States	India	Indonesia	Canada is 8th
Nitrogen (fixed)--ammonia	000 t	144,000	144,000	38,000	15,000	14,000	13,000	3,940
	% of world total		100.0	26.4	10.4	9.7	9.0	2.7
			China	Australia	Peru	India	United States	Canada is 9th
Zinc (mine production)	000 t	12,000	4,200	1,400	1,200	720	670	280
	% of world total		35.0	11.7	10.0	6.0	5.6	2.3
			China	Chile	United States	Peru	Mexico	Canada is 9th
Molybdenum (Mo content)	t	300,000	120,000	58,000	49,000	30,000	17,000	2,700
(mine production)% of world total			40.0	19.3	16.3	10.0	5.7	0.9
			Chile	Peru	China	Congo	United States	Canada is 11th
Copper (mine production)	000 t	20,000	5,700	2,200	1,700	1,300	1,200	570
	% of world total		28.5	11.0	8.5	6.5	6.0	2.9
			China	Mozambique	Brazil	Madagascar	India	Canada is 10th
Graphite	000 t	1,100	650	120	95	47	34	10
	% of world total		59.1	10.9	8.6	4.3	3.1	1
			China	Russia	Brazil	Norway	United States	Canada is 13th
Silicon	000 t	8,000	5,400	540	340	330	290	
	% of world total		67.5	6.8	4.3	4.1	3.6	

			RANK OF FIVE LEADING COUNTRIES					
		World	1	2	3	4	5	
			United States	Iran	China	Oman	Turkey	Canada is 14th
Gypsum (mine production)	000 t	150,000	22,000	16,000	16,000	11,000	10,000	
	% of world total		14.7	10.7	10.7	7.3	6.7	
			United States	Netherlands	Spain	Italy	India	Canada 14th
Sand and Gravel (Industrial)	000 t	265,000	71,000	51,000	34,000	13,000	11,000	
	% of world total		26.8	19.2	12.8	4.9	4.2	
			China	India	Indonesia	United States	Australia	Canada is 16th
Coal	Mt	7,742	3,902	757	563	485	477	
	% of world total		50.4	9.8	7.3	6.3	6.2	
			China	United States	India	Russia	Brazil	Canada is 18th
Lime	000 t	420,000	300,000	16,000	16,000	11,000	8,100	
	% of world total		71.4	3.8	3.8	2.6	1.9	
			China	Vietnam	Russia	Mongolia	Bolivia	Canada not on list
Tungsten (mine production)	t	84,000	69,000	4,300	2,200	1,900	1,400	
	% of world total		82.1	5.1	2.6	2.3	1.7	
			China	Australia	Peru	United States	Mexico	Canada not on list
Lead (mine production)	000 t	4,400	1,900	480	240	290	240	
	% of world total		43.2	10.9	5.5	6.6	5.5	
			Mexico	Peru	China	Russia	Poland	Canada not on list
Silver	t	25,000	5,600	3,400	3,200	1,800	1,300	
	% of world total		22.4	13.6	12.8	7.2	5.2	

Sources: U.S. Geological Survey (USGS); bp Statistical Review of World Energy; World Nuclear Association; Kimberley Process
n.a. Not applicable.

ANNEX 5: MINERAL PRODUCTION OF CANADA, 2011-2020[(P)]

	Unit	2011		2012		2013		2014		2015	
		(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
METALLIC MINERALS											
Antimony	t	x	x	x	x	148	1,562	4	45	1	5
Bismuth	t	136	3,346	110	2,370	103	2,006	4	97	2	29
Cadmium	t	1,516	4,135	247	500	160	316	129	276	68	102
Cesium	t	x	x	x	x	x	x	x	x	x	x
Cobalt	t	3,741	146,768	3,698	114,604	4,005	118,114	3,907	137,844	4,339	156,720
Copper	t	553,725	4,831,801	560,476	4,453,541	620,989	4,695,298	654,468	4,983,772	697,322	4,905,661
Gold	kg	101,975	5,087,438	106,373	5,704,878	131,404	6,141,048	151,472	6,817,154	160,751	7,667,339
Ilmenite	000 t	x	x	x	x	x	x	x	x	x	x
Indium	kg	x	x	x	x	x	x	x	x	x	x
Iron ore	000 t	35,705	5,505,772	38,892	4,875,068	42,063	5,348,433	43,173	4,173,516	46,220	2,854,585
Iron, remelt	000 t	x	x	x	x	x	x	x	x	x	x
Lead	t	62,548	166,003	62,014	127,438	22,895	50,506	3,579	8,288	3,699	8,485
Lithium	t	-	-	-	-	-	-	x	x	-	-
Molybdenum	t	8,543	x	8,936	x	7,956	186,788	9,358	259,876	2,505	48,846
Nickel	t	211,417	4,787,323	203,970	3,546,420	218,026	3,372,864	218,233	4,069,165	225,351	3,408,431
Niobium (Columbium)	t	4,551	x	4,705	x	4,916	x	5,774	x	5,385	x
Platinum group	kg	22,337	749,572	22,490	644,195	25,465	767,363	31,386	1,058,992	33,248	1,059,512
Selenium	t	128	17,500	145	16,656	138	10,411	142	8,879	156	6,575
Silver	t	582	658,514	657	659,005	620	489,872	472	320,274	371	239,656
Tantalum	t	-	-	-	-	40	12,698	-	-	-	-
Tellurium	t	9	3,167	10	1,540	8	895	8	1,066	10	990
Tungsten	t	2,466	73,707	2,554	88,436	3,017	86,293	2,708	84,331	2,289	62,339
Uranium	t	9,017	1,307,174	9,520	1,197,441	7,889	806,418	9,780	933,583	13,279	1,609,476
Zinc	t	591,004	1,281,887	601,514	1,171,147	412,277	811,361	322,605	771,026	275,410	632,892
TOTAL, METALLIC MINERALS		..	**25,569,557**	..	**23,558,411**	..	**23,497,305**	..	**24,225,029**	..	**23,125,240**

	Unit	2016		2017		2018		2019		2020	
		(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
METALLIC MINERALS											
Antimony	t	0	3	1	11	5	54	2	19	2	19
Bismuth	t	2	31	4	59	5	58	4	47	4	47
Cadmium	t	60	113	158	381	148	595	140	492	140	492
Cesium	t	x	x	x	x	x	x	-	-	-	-
Cobalt	t	4,216	149,145	3,704	290,783	3,279	310,086	4,623	162,013	4,279	156,408
Copper	t	679,524	4,379,532	580,097	4,639,616	527,510	4,422,120	717,095	4,246,604	475,898	3,859,973
Gold	kg	161,497	8,590,179	172,877	9,069,125	191,882	10,118,125	180,310	10,690,001	182,352	12,320,820
Ilmenite	000 t	x	x	x	x	x	x	x	x	x	x
Indium	kg	x	x	x	x	x	x	6,286	2,329	6,286	2,329
Iron ore	000 t	46,731	3,165,022	50,300	4,693,042	52,755	4,949,188	75,985	5,798,548	60,060	5,609,758
Iron, remelt	000 t	x	x	x	x	x	x	x	x	x	x
Lead	t	12,020	29,785	13,494	40,589	15,605	45,131	x	x	x	x
Lithium	t	-	-	-	-	x	x	-	-	-	-
Molybdenum	t	2,783	53,105	4,765	112,054	5,048	152,725	4,385	142,908	2,671	92,780
Nickel	t	230,210	2,926,428	206,354	2,787,020	175,761	2,970,887	193,057	3,435,124	167,243	2,834,315
Niobium (Columbium)	t	6,099	x	x	x	x	x	x	x	x	x
Platinum group	kg	31,471	947,560	27,342	1,016,402	28,596	1,206,948	33,346	1,947,152	30,519	1,818,203
Selenium	t	175	3,886	72	3,204	85	4,133	102	4,941	102	4,941
Silver	t	385	282,666	368	261,688	392	254,759	350	245,379	295	217,312
Tantalum	t	-	-	-	-	-	-	-	-	-	-
Tellurium	t	18	870	18	885	x	x	13	1,337	23	1,337
Tungsten	t	-	-	-	-	-	-	-	-	-	-
Uranium	t	14,133	1,248,600	12,207	876,473	6,975	490,077	6,979	524,781	4,085	370,932
Zinc	t	301,210	832,545	305,314	1,146,760	287,632	1,087,538	256,243	840,313	161,784	397,743
TOTAL, METALLIC MINERALS		**..**	**23,302,112**		**25,738,171**		**27,058,554**		**28,924,261**		**28,516,476**

	Unit	2011		2012		2013		2014		2015	
		(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
NON-METALLIC MINERALS											
Barite	000 t	x	x	x	x	x	x	x	x	x	x
Carbonatite	000 t	x	x	x	x	x	x	x	x	x	x
Cement [1]	000 t	11,914	1,587,136	12,553	1,621,476	12,022	1,618,827	12,136	1,692,131	12,334	1,689,851
Chrysotile	000 t	x	x	x	x	x	x	x	x	x	x
Clay products [2]	000 t	..	135,422	..	136,502	..	122,577	..	118,012	..	124,446
Diamonds	000 ct	10,752	2,509,232	10,529	2,005,764	10,600	1,964,125	12,012	2,236,043	11,677	2,148,583
Gemstones	t	42	2,941	178	3,217	554	4,607	6,919	5,991	8,233	7,953
Graphite	000 t	x	x	x	x	x	x	x	x	x	x
Gypsum [3]	000 t	2,449	34,632	1,832	24,987	1,837	25,872	1,793	25,474	1,726	19,675
Lime	000 t	1,937	294,909	1,965	316,322	1,856	308,127	1,995	344,816	1,852	335,489
Magnesite	000 t	x	x	x	x	x	x	x	x	x	x
Marl	000 t	-	-	-	-	-	-	-	-	-	-
Mica	000 t	x	x	x	x	x	x	x	x	x	x
Nepheline syenite	000 t	602	58,377	586	61,892	646	72,911	654	83,805	614	97,880
Peat	000 t	1,139	213,359	1,277	238,018	1,173	213,798	1,178	249,078	1,297	257,030
Phosphate	000 t	x	x	x	x	x	x	-	-	-	-
Potash (K_2O) [4]	000 t	10,686	7,569,282	8,976	6,342,562	10,196	5,768,609	10,818	5,581,264	11,462	6,132,751
Potassium sulphate	000 t	x	x	x	x	x	x	x	x	x	x
Pumice	000 t	x	x	x	x	x	x	x	x	x	x
Quartz (silica) [3]	000 t	1,620	84,280	1,517	85,256	2,331	80,064	2,011	90,441	2,053	107,377
Salt	000 t	12,757	697,404	10,820	487,686	12,244	655,848	14,473	752,321	14,343	791,980
Sand and gravel	000 t	222,288	1,560,213	239,307	1,822,978	241,113	1,941,867	223,407	1,831,464	228,030	1,884,531
Soapstone, talc, pyrophyllite	000 t	116w	25,244	130	30,249	175	34,223	90	38,985	175	50,335
Sodium sulphate	000 t	x	x	x	x	x	x	x	x	x	x
Stone [3]	000 t	161,729	1,591,511	152,977	1,559,358	147,746	1,509,427	147,739	1,541,321	158,034	1,687,916
Sulphur, elemental	000 t	5,970	637,250	5,594	581,611	5,624	342,937	5,252	326,335	5,187	423,452
Sulphur, in smelter gas	000 t	638	116,022	665	132,230	677	129,197	590	100,125	558	114,383
Titanium dioxide	000 t	x	x	x	x	x	x	x	x	x	x
Wollastonite	000 t	-	-	-	-	-	-	-	-	-	-
Zeolite	000 t	x	x	x	x	x	x	-	-	-	-
TOTAL, NONMETALLIC MINERALS (including cement[1])		..	**17,839,820**	..	**16,471,421**	..	**15,476,804**	..	**15,778,620**	..	**16,519,513**
TOTAL, NONMETALLIC MINERALS (excluding cement[1])		..	**16,252,684**	..	**14,849,945**	..	**13,857,977**	..	**14,086,489**	..	**14,829,662**

	Unit	2016		2017		2018		2019		2020	
		(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
NON-METALLIC MINERALS											
Barite	000 t	x	x	x	x	x	x	x	x	x	x
Carbonatite	000 t	x	x	x	x	-	-	-	-	-	-
Cement [1]	000 t	11,820	1,615,674	..	..	..	..	..	..	..	..
Chrysotile	000 t	x	x	-	-	-	-	-	-	-	-
Clay products [2]	000 t	..	140,122	..	147,131	..	131,928	245	x	296	x
Diamonds	000 ct	13,315	1,888,732	23,199	2,677,723	22,789	2,704,302	17,560	1,941,445	15,036	1,542,193
Gemstones	t	154	5,852	89	4,612	87	2,349	69	1,746	78	4,266
Graphite	000 t	x	x	14	20,336	11	19,156	-	x	9	23,874
Gypsum [3]	000 t	1,679	17,655	3,001	33,120	3,240	40,157	2,445	38,361	2,915	48,583
Lime	000 t	1,807	330,366	1,842	336,642	1,785	335,739	1,657	267,255	2,063	257,411
Magnesite	000 t	x	x	x	x	x	x	x	x	x	x
Marl	000 t	-	-	-	-	-	-	-	-	-	-
Mica	000 t	x	x	x	x	x	x	x	x	x	x
Nepheline syenite	000 t	571	81,219	612	64,712	565	131,689	506	115,844	506	118,721
Peat	000 t	1,452	330,653	1,459	330,991	1,306	314,924	1,327	353,628	1,379	361,749
Phosphate	000 t	-	-	-	-	-	-	-	-	-	-
Potash (K_2O) [4]	000 t	10,790	3,735,632	12,563	4,371,065	14,024	5,726,798	12,765	5,047,363	13,410	3,735,520
Potassium sulphate	000 t	x	x	x	x	x	x	x	x	x	x
Pumice	000 t	5	273	x	x	x	x	x	x	x	x
Quartz (silica) [3]	000 t	2,256	95,614	2,540	99,278	4,864	202,387	4,184	152,091	3,721	122,879
Salt	000 t	10,252	445,891	11,424	476,674	10,713	488,535	11,936	562,654	13,261	636,957
Sand and gravel	000 t	280,550	2,398,633	231,219	2,095,005	245,815	2,284,402	184,232	1,743,274	181,471	1,729,277
Soapstone, talc, pyrophyllite	000 t	199	55,513	215	51,754	279	42,635	x	x	153	44,802
Sodium sulphate	000 t	x	x	x	x	x	x	x	x	x	x
Stone [3]	000 t	160,016	1,664,188	169,518	1,747,125	188,974	1,987,973	143,545	1,592,799	141,201	1,632,580
Sulphur, elemental	000 t	4,746	193,877	4,803	206,740	4,828	449,441	4,254	370,108	4,349	234,860
Sulphur, in smelter gas	000 t	635	110,307	524	72,739	505	87,206	555	95,706	555	95,706
Titanium dioxide	000 t	x	x	x	x	x	x	x	x	x	x
Wollastonite	000 t	x	x	x	x	x	x	x	x	x	x
Zeolite	000 t	x	x	1	5	1	12	1	10	x	x
TOTAL, NONMETALLIC MINERALS (including cement[1])		..	**13,724,154**	..	..	..	..	..	..	..	..
TOTAL, NONMETALLIC MINERALS (excluding cement[1])		..	**12,108,480**	..	**13,304,062**	..	**15,530,709**	..	**13,173,639**	..	**11,405,888**

	Unit	2011		2012		2013		2014		2015	
		(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
MINERAL FUELS											
Coal	000 t	67,113	7,471,408	66,471	5,880,836	68,751	4,886,804	69,035	3,896,746	61,985	3,126,266
TOTAL MINERAL FUELS		**67,113**	**7,471,408**	**66,471**	**5,880,836**	**68,751**	**4,886,804**	**69,035**	**3,896,746**	**61,985**	**3,126,266**
TOTAL MINERAL PRODUCTION (including cement[1])		**..**	**50,880,785**	**..**	**45,910,667**	**..**	**43,860,914**	**..**	**43,900,395**	**..**	**42,771,019**
TOTAL MINERAL PRODUCTION (excluding cement[1])		**..**	**49,293,649**	**..**	**44,289,191**	**..**	**42,242,087**	**..**	**42,208,264**	**..**	**41,081,168**

	Unit	2016		2017		2018		2019		2020	
		(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)	(quantity)	($000)
MINERAL FUELS											
Coal	000 t	61,332	4,009,353	60,750	6,280,947	54,599	6,459,413	51,746	5,625,050	40,792	3,957,956
TOTAL MINERAL FUELS		**61,332**	**4,009,353**	**60,750**	**6,280,947**	**54,599**	**6,459,413**	**51,746**	**5,625,050**	**40,792**	**3,957,956**
TOTAL MINERAL PRODUCTION (including cement[1])		**..**	**41,035,618**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**
TOTAL MINERAL PRODUCTION (excluding cement[1])		**..**	**39,419,944**	**..**	**45,323,180**	**..**	**49,048,676**	**..**	**47,722,950**	**..**	**43,880,320**

Sources: Natural Resources Canada; Statistics Canada.

(p) Preliminary; x Confidential; – Nil; . . Not available.

Notes:

(1) As of reference year 2017, Statistics Canada has ceased the collection of the cement data. NRCan is no longer deducting the quantity and value of gypsum, sand and gravel, silica, and stone used in the manufacture of cement products from the totals for gypsum, sand and gravel, silica, and stone.

(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, 1978-2019 [P]

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	965
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	636	5,005	222	5,665	947
2009	7,290	3,301	451	4,250	215	6,254	918
2010	10,747	3,074	400	4,133	254	6,916	1,473
2011	10,570	2,936	247	4,812	256	6,954	2,225
2012	10,364	2,617	126	4,163	256	5,598	2,148
2013	11,198	2,673	116	3,532	145	5,212	2,158
2013	10,777	2,682	116	3,532	145	5,013	2,140
2014	10,214	2,287	88	2,972	121	5,498	2,070
2015	9,937	2,725	83	3,009	101	5,345	1,984
2016	9,101	2,604	40	2,231	98	3,626	1,910
2017	8,984	2,790	165	2,286	96	5,074	2,578
2018	8,115	2,296	118	1,913	77	4,865	2,597
2019[p]	7,235	2,235	192	1,751	72	4,280	2,311

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.

ANNEX 7: EMPLOYMENT AND ANNUAL COMPENSATIONS IN THE CANADIAN MINING, SMELTING AND REFINING INDUSTRIES, 2008-2020

	Number of Employees	Compensation per job [1]
Metal Mines		
2008	30,345	101,814
2009	27,680	109,886
2010	28,820	111,457
2011	30,060	115,820
2012	30,920	122,663
2013	39,170	119,936
2014	38,705	125,384
2015	34,325	131,043
2016	38,765	128,753
2017	39,360	128,807
2018	40,795	132,766
2019	41,100	136,994
2020	41,605	141,937
Non-metal Mines		
2008	19,665	85,949
2009	17,410	90,750
2010	18,785	93,164
2011	19,100	99,984
2012	17,965	106,873
2013	21,865	99,572
2014	22,670	104,860
2015	22,650	108,072
2016	22,490	105,121
2017	24,280	104,830
2018	25,255	110,153
2019	25,300	106,195
2020	25,845	106,203
Coal Mines		
2008	5,095	119,209
2009	5,070	126,699
2010	6,200	109,394
2011	6,885	114,992
2012	7,095	121,355
2013	9,095	124,854
2014	7,795	122,805
2015	6,135	131,178
2016	7,320	128,847
2017	7,045	133,656
2018	7,535	141,715
2019	7,845	140,128
2020	7,000	118,759

	Number of Employees	Compensation per job [1]
Smelting & Refining [2]		
2008	59,595	92,958
2009	46,205	96,382
2010	51,540	95,795
2011	54,920	97,723
2012	47,420	104,420
2013	46,915	108,527
2014	45,550	108,099
2015	46,090	109,609
2016	46,225	108,806
2017	46,230	113,691
2018	45,235	119,547
2019	46,650	121,064
2020	45,480	116,158
Total Mining, Smelting and Refining		
2008	114,700	95,265
2009	96,365	100,838
2010	105,345	100,411
2011	110,965	104,086
2012	103,400	111,463
2013	117,045	111,941
2014	114,720	114,290
2015	109,200	117,240
2016	114,800	116,098
2017	116,915	118,143
2018	118,820	123,494
2019	120,895	124,605
2020	119,930	123,107

Source: Statistics Canada; Natural Resources Canada.
Table: 36-10-0489-01 (formerly CANSIM 383-0031)

[1] Compensation for Smelting and Refining and Total based on weighted average.

[2] Comprised of NAICS 3311, NAICS 3313, and NAICS 3314.

ANNEX 8: TOTAL COMPENSATION PER JOB, BY SELECT CANADIAN INDUSTRIAL SECTOR, 2007-2020 [P]

	Forestry and logging	Mining, Smelting and Refining [1]	Manufacturing	Construction	Finance & Insurance
2008	66,507	95,265	65,306	63,762	63,686
2009	67,491	100,838	65,774	63,733	63,968
2010	67,541	100,411	66,181	64,486	64,539
2011	70,877	104,086	67,564	66,741	66,667
2012	75,671	111,463	70,057	69,552	68,751
2013	79,452	111,941	71,980	71,875	71,279
2014	82,927	114,290	74,025	74,675	74,867
2015	86,326	117,240	75,593	74,891	78,622
2016	83,208	116,098	75,068	73,225	80,984
2017	83,783	118,143	76,051	72,933	83,013
2018	86,558	123,494	78,549	75,461	89,259
2019	88,278	124,605	80,575	77,812	89,240
2020[p]	100,291	123,107	86,029	85,841	94,264

Sources: Statistics Canada Table 36-10-0489-01; Natural Resources Canada.

[1] Based on a weighted average of NAICS 212, 3311, 3313, and 3314 (refer to Annex 7).

ANNEX 9: DOMESTIC EXPORTS OF MINERALS AND MINERAL PRODUCTS, BY COMMODITY AND COUNTRY OF DESTINATION, 2020

METALS	U.S.A.($)	United Kingdom ($)	European Union (EU-27) ($)	China ($)	Japan ($)	Other Countries ($)	Total ($)
Aluminum	9,360,978,037	39,408,295	1,034,060,041	92,029,264	11,132,264	576,563,819	11,114,171,720
Antimony	818,051	373,812	–	1,250,777	–	8,481,901	10,924,541
Barium	6,637	–	–	–	–	–	6,637
Beryllium	53,881	–	–	–	–	590	54,471
Bismuth	73,018	–	2,773	–	19,191	176,233	271,215
Cadmium	618,951	2,458	2,699,884	1,988,480	–	617,784	5,927,557
Calcium metals	1,885,244	–	44	45,461	–	178,314	2,109,063
Chromium	4,193,266	343,889	–	–	–	4,397	4,541,552
Cobalt	94,223,871	2,085	52,834,446	69,008,977	35,977,666	127,136,008	379,183,053
Copper	3,339,048,550	41,539,215	783,014,145	1,016,135,085	893,440,610	1,205,006,896	7,278,184,501
Germanium	7,605,484	44,160	510,468	13,978,152	10,525,718	5,631,781	38,295,763
Gold	5,596,473,279	15,248,071,963	229,099,434	371,700,017	168,807,587	1,974,587,913	23,588,740,193
Iron and steel	11,446,016,508	27,868,572	205,718,500	88,813,251	10,380,065	1,206,666,973	12,985,463,869
Iron ore	235,664,814	376,790,732	2,352,942,697	2,794,474,544	823,405,783	1,065,128,986	7,648,407,556
Lead	512,603,611	196,087	52,358,608	32,555,908	136,500	35,375,012	633,225,726
Lithium	6,898	–	731	107,359	19,000	391	134,379
Magnesium and magnesium compounds	57,837,861	–	33,131	168,645	–	490,681	58,530,318
Manganese	682,067	–	30,016	–	–	808,804	1,520,887
Mercury	104,205	–	1,557	643	266	13,656	120,327
Molybdenum	39,837,764	–	27,988,318	4,169,044	–	1,333,522	73,328,648
Nickel	1,186,647,370	167,448,446	677,051,551	293,438,088	147,463,520	1,386,288,156	3,858,337,131
Niobium	69,277,445	–	92,708,392	86,560,818	1,599,764	34,291,379	284,437,798
Platinum group metals	2,390,083,754	810,547	19,368,207	19,124	1,738,701	258,643,184	2,670,663,517
Rare earth metals	202,709	–	2,632	2,421	18,173	32,535	258,470
Selenium	674,048	–	774,858	2,078,661	–	2,851,851	6,379,418
Silicon	141,067,104	–	2,018,656	141,254	–	13,532,112	156,759,126
Silver	1,093,840,713	11,365,447	50,611,222	16,404,496	24,719,312	50,589,444	1,247,530,634
Tantalum	2,701,776	–	11,072	25,912	1,235	95,528	2,835,523
Tin	19,616,378	408,628	2,844,233	62,302	2,791	967,320	23,901,652
Titanium metal	62,783,634	2,341,775	27,691,680	9,045,701	2,394,841	7,217,092	111,474,723
Tungsten	16,585,634	7,139	4,452,389	79,244	8,400	1,191,669	22,324,475
Uranium and thorium	526,636,221	34,802,370	317,423,870	12,155,898	15,649,210	202,613,904	1,109,281,473
Vanadium	29,679,351	–	568,917	–	–	6,737,684	36,985,952
Zinc	1,736,322,126	626,131	29,482,460	10,704,864	1,635,088	181,244,442	1,960,015,111
Zirconium	2,360,998	5,517	406,470	7,445,507	353,909	205,794	10,778,195
zz- Other metals	4,599,318,009	91,904,051	1,630,963,060	113,715,662	161,252,625	1,214,345,533	7,811,498,940
TOTAL METALS	**42,576,529,267**	**16,044,361,319**	**7,597,674,462**	**5,038,305,559**	**2,310,682,219**	**9,569,051,288**	**83,136,604,114**

NONMETALS	U.S.A.($)	United Kingdom ($)	European Union (EU-27) ($)	China ($)	Japan ($)	Other Countries ($)	Total ($)
Abrasives	308,125,135	783,382	9,907,623	7,175,544	7,526,728	27,887,650	361,406,062
Barite and witherite	–	–	–	–	–	4,000	4,000
Boron	834,604	87,027	513,332	262,797	10,850	2,202,100	3,910,710
Bromine	2,492,052	–	19,458	–	56,133	7,889	2,575,532
Cement	1,177,643,878	1,085,653	4,779,515	553,345	63,966	6,609,315	1,190,735,672
Chlorine and chlorine compounds	131,711,034	–	448,880	82,603	1,157	245,619	132,489,293
Chrysotile (Asbestos)	5,592,362	26,794	47,467	24,216	152,109	1,466,405	7,309,353
Clay and clay products	17,065,814	1,718,612	2,359,094	1,489,783	88,621	10,185,758	32,907,682
Diamonds	44,023,755	740,603	634,847,231	217,332	27,057	697,582,968	1,377,438,946
Dolomite	28,223,076	–	–	–	–	14,419	28,237,495
Feldspar	35,256	–	–	–	–	0	35,256
Fluorspar	14,070,905	–	157,884	–	1,205	173,613	14,403,607
Glass and glassware products	611,703,985	8,763,906	17,442,190	4,075,366	1,929,003	20,407,624	664,322,074
Granite	40,377,943	–	1,158,664	593,200	–	651,230	42,781,037
Graphite	47,848,771	155,735	8,194,552	6,565,378	1,260,946	6,189,105	70,214,487
Gypsum	108,620,966	66,531	291,525	30,538	13,216	966,709	109,989,485
Iodine	3,888,994	143,679	224,451	45,514	121,353	1,779,837	6,203,828
Lime	54,374,344	–	–	27,004	–	89	54,401,437
Limestone flux and other limestone	18,955,472	–	–	2,063,247	–	686,826	21,705,545
Marble, travertine and other calcareous stones	31,526,835	3,517	809,624	1,191,896	61	228,775	33,760,708
Mica	5,586,580	83,563	553,189	220,592	1,907,443	1,679,319	10,030,686
Mineral pigments	128,434,345	150,163	619,377	258,102	38,950	7,412,895	136,913,832
Nepheline syenite	127,170,528	60,821	1,802,249	1,164,547	1,169,524	2,832,480	134,200,149
Pearls	2,096,689	–	–	–	29,448	32,765	2,158,902
Peat	584,225,446	53,179	765,821	639,126	10,126,526	20,750,799	616,560,897
Phosphate and phosphate compounds	90,794,661	2,070,687	1,284,921	1,270,241	689,444	19,195,521	115,305,475
Potash and potassium compounds	2,947,097,249	23,819	88,657,519	676,162,132	205,829	2,340,636,533	6,052,783,081
Salt and sodium compounds	633,726,869	89,185	13,335,862	2,169,476	28,704,930	24,382,963	702,409,285
Sand and gravel	85,940,558	704,440	5,137	–	–	2,406,907	89,057,042
Sandstone	433,871	–	9,922	–	–	0	443,793
Silica and silica compounds	92,226,720	567,976	2,540,331	1,469,595	45,508	2,301,434	99,151,564
Slate	7,306,403	285,534	1,508,394	–	77,498	65,975	9,243,804
Sulphur and sulphur compounds	309,495,443	1,134	32,590	25,769,465	–	169,283,338	504,581,970
Talc, soapstone and pyrophyllite	43,015,543	–	3,626,875	1,033,837	5,582	833	47,682,670
Titanium oxides	365,105,275	1,707,316	11,210,059	1,570,461	6,284	51,195,966	430,795,361
Other nonmetals	826,731,101	3,544,336	13,317,819	5,465,557	2,389,219	43,113,249	894,561,281
Other structurals	247,810,333	2,398,930	8,649,737	2,676,915	89,005	26,379,756	288,004,676
TOTAL NONMETALS	**9,144,312,795**	**25,316,522**	**829,121,292**	**744,267,809**	**56,737,595**	**3,488,960,664**	**14,288,716,677**
MINERAL FUELS							
Coal	336,119,981	3,989,896	304,779,486	744,112,819	1,242,453,716	2,258,823,116	4,890,279,014
Coke	19,023,840	–	–	–	–	896,354	19,920,194
TOTAL MINERAL FUELS	**355,143,821**	**3,989,896**	**304,779,486**	**744,112,819**	**1,242,453,716**	**2,259,719,470**	**4,910,199,20**
TOTAL MINING DOMESTIC EXPORTS	**52,075,985,883**	**16,073,667,737**	**8,731,575,240**	**6,526,686,187**	**3,609,873,530**	**15,317,731,422**	**102,335,519,999**

Sources: Natural Resouces Canada; Statistics Canada.

- Nil.

Note: Stages 1 to 4 - includes ores, concentrates and semi-fabricated and fabricated metal and mineral products

ANNEX 10: IMPORTS OF MINERAL AND METAL PRODUCTS, BY COMMODITY AND COUNTRY OF IMPORT, 2020

METALS	U.S.A.($)	China ($)	European Union (EU-27) ($)	Mexico ($)	Other ($)	Total Countries ($)
Aluminum	3,001,456,418	1,003,617,021	470,345,307	59,145,739	2,533,980,284	7,068,544,769
Antimony	1,260,426	8,395,119	402,326	9,720	1,679,543	11,747,134
Barium	4,931,778	1,246,175	466,641		125,043	6,769,637
Beryllium	545,451	7,809	18,686		2	571,948
Bismuth	951,955	225,925	55,260	145,887	384,185	1,763,212
Cadmium	11,113,162	145,396	4,543,587	792	28,283,818	44,086,755
Calcium metals	26,857,632	3,768,598	5,753,672	26,004	3,697,385	40,103,291
Chromium	4,069,908	2,268,326	12,085,655	881,206	56,031,106	75,336,201
Cobalt	23,710,940	19,274	7,017,516		22,765,576	53,513,306
Copper	1,743,895,215	173,317,356	186,134,080	78,506,085	1,278,707,798	3,460,560,534
Germanium	8,996,177	127,533	317,251		3,082,199	12,523,160
Gold	4,555,834,166	96,082,323	142,696,797	231,166,638	10,607,711,181	15,633,491,105
Iron and steel	10,977,430,220	3,091,683,845	2,419,146,396	1,190,162,450	4,364,813,210	22,043,236,121
Iron ore	797,698,234	335,699	4,661,612	1,236	4,553,456	807,250,237
Lead	836,077,045	65,200,753	59,134,599	45,875,859	172,677,299	1,178,965,555
Lithium	47,321,796	39,283,206	8,696,138	196,151	65,355,680	160,852,971
Magnesium and magnesium compounds	59,806,242	133,085,370	5,472,525	959,736	23,020,360	222,344,233
Manganese	98,543,411	52,101,961	11,233,337	2,849,491	138,337,697	303,065,897
Mercury	290,589	283,127	601,155	387,350	2,011,518	3,573,739
Molybdenum	38,039,726	5,843,283	1,908,768	7,186,184	15,448,919	68,426,880
Nickel	484,825,473	13,500,779	191,812,130	1,907,558	149,380,729	841,426,669
Niobium	1,493,565		1,282,988		31,939,495	34,716,048
Platinum group metals	642,112,027	506,563	492,124,682	11,352,345	1,279,454,504	2,425,550,121
Rare earth metals	1,278,323	2,493,095	255,152		82,826	4,109,396
Selenium	96,224	4,017	443,316		175,084	718,641
Silicon	4,610,493	1,714,131	947,430		31,537,838	38,809,892
Silver	1,541,882,678	49,992,803	680,064,146	149,102,109	1,652,690,315	4,073,732,051
Strontium	21,908		413,751	271,161	275	707,095
Tantalum	562,218	97,400	146,327	3,446	228,331	1,037,722
Tellurium	78,910	9,623,933	1,635,126		9,018,968	20,356,937
Thallium	7,663				0	7,663
Tin	10,680,203	4,570,508	859,016	967,274	44,433,139	61,510,140
Titanium metal	107,168,546	32,833,015	16,752,546	140,393	107,402,992	264,297,492
Tungsten	12,542,908	6,142,152	872,106		4,476,717	24,033,883
Uranium and thorium	355,916,058	3,344,776	13,381,627		1,364,621,667	1,737,264,128
Vanadium	1,085,308	18,288,635	7,067,979		25,366,502	51,808,424
Zinc	627,008,202	10,302,074	28,281,983	45,139,973	241,986,956	952,719,188
Zirconium	63,488,021	264,714	1,282,791		2,455,987	67,491,513
Other metals	6,561,802,986	2,882,685,331	1,621,743,608	1,257,833,657	2,773,766,715	15,097,832,297
Grand Total	**32,655,492,205**	**7,713,402,025**	**6,400,058,012**	**3,084,218,444**	**27,041,685,299**	**76,894,855,985**

NONMETALS	U.S.A.($)	China ($)	European Union (EU-27) ($)	Mexico ($)	Other ($)	Total Countries ($)
Abrasives	209,218,233	73,155,780	110,583,373	10,934,360	106,340,029	510,231,775
Arsenic	4,114	69,048	199		16,737	90,098
Barite and witherite	3,334,589	1,175,240	572,581		5,058,945	10,141,355
Boron	35,328,596	587,331	831,807	267	24,552,474	61,300,475
Bromine	1,415,634	92,074	5,419		2,652,984	4,166,111
Cement	482,113,839	143,264,387	76,500,873	28,477,380	103,445,716	833,802,195
Chlorine and chlorine compounds	110,614,759	16,755,882	12,295,286	1,473,459	4,936,500	146,075,886
Chrysotile (Asbestos)	149,770,649	8,248,235	10,107,155	227,752	15,105,479	183,459,270
Clay and clay products	323,785,238	447,662,294	303,839,417	84,125,225	194,409,536	1,353,821,710
Diamonds	53,744,419	4,090,984	23,590,020		326,644,083	408,069,506
Dolomite	9,740,544	35,100	7,152	13	83,847	9,866,656
Feldspar	774,774		4,818	1	14,736	794,329
Fluorspar	21,219,783	2,621,115	9,849,880	41,487,481	20,166,293	95,344,552
Glass and glassware products	2,081,372,477	710,983,264	296,622,682	280,336,133	207,676,621	3,576,991,177
Granite	9,859,979	15,016,788	8,110,441	2,260	32,635,605	65,625,073
Graphite	169,274,339	251,267,411	133,422,656	6,313,006	62,514,238	622,791,650
Gypsum	179,852,095	671,458	22,468,246	11,780,981	2,736,727	217,509,507
Iodine	7,026,984	51,620	31,722		10,920,778	18,031,104
Lime	38,317,224	2,979	501,065		3,462,449	42,283,717
Limestone flux and other limestone	31,952,384	2,776,725	173,151	3	831,715	35,733,978
Marble travertine and other calcareous stones	16,994,861	24,347,903	30,541,138	1,768,937	24,423,181	98,076,020
Mica	4,355,159	500,810	1,343,307	21,321	936,020	7,156,617
Mineral pigments	169,939,733	10,672,908	34,672,584	1,643,661	17,124,652	234,053,538
Nepheline syenite	1,981,897	120,560			3,169	2,105,626
Olivine	5,783,645	15,122,491	2,229,066	12,024	3,742,267	26,889,493
Pearls	7,556,934	15,701,400	2,317,631	74,298	8,020,163	33,670,426
Peat	21,657,505	33,816	5,494,998		4,465,618	31,651,937
Perlite	17,328,999	29	1,011		1,440	17,331,479
Phosphate and phosphate compounds	769,017,577	25,844,861	12,873,479	7,805,793	157,340,288	972,881,998
Potash and potassium compounds	74,851,722	13,130,795	5,202,178	266,945	22,448,278	115,899,918
Salt and sodium compounds	589,286,426	50,185,432	47,264,881	25,758,712	116,019,663	828,515,114
Sand and gravel	27,813,800	774,781	159,829	89,273	515,671	29,353,354
Sandstone	1,026,575	15,180	15,677		3,748,315	4,805,747
Silica and silica compounds	333,622,999	30,027,142	26,208,589	7,991,339	18,249,067	416,099,136
Slate	1,140,452	1,815,221	55,863	306	1,839,935	4,851,777
Sulphur and sulphur compounds	26,599,037	2,927,426	1,718,397	6,135	2,363,705	33,614,700
Talc soapstone and pyrophyllite	15,305,227	368,407	953,136		305,274	16,932,044
Titanium oxides	219,830,127	100,079,275	23,660,209	26,154,361	16,879,489	386,603,461
Other nonmetals	1,103,133,021	45,761,331	148,233,367	17,579,461	142,495,542	1,457,202,722
Other structurals	128,432,119	41,653,943	16,063,075	4,123,094	28,072,169	218,344,400
Grand Total	**7,454,378,468**	**2,057,611,426**	**1,368,526,358**	**558,453,981**	**1,693,199,398**	**13,132,169,631**
MINERAL FUELS						
Coal	714,565,144	1,351,517	7,670,425	14,108	144,330,781	867,931,975
Coke	206,694,118	35	9,616,467		3,316,771	219,627,391
TOTAL MINERAL FUELS	**921,259,262**	**1,351,552**	**17,286,892**	**14,108**	**147,647,552**	**1,087,559,366**
TOTAL MINING IMPORTS	**41,031,129,935**	**9,772,365,003**	**7,785,871,262**	**3,642,686,533**	**28,882,532,249**	**91,114,584,982**

Sources: Natural Resouces Canada; Statistics Canada.

- Nil.

Note: Stages 1 to 4 - includes ores, concentrates and semi-fabricated and fabricated metal and mineral products

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