BC Mining and Carbon Pricing

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Executive Summary

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The Mining Industry is a Key Component of the BC Economy

The BC Mining Industry (the "Industry") has long been one of BC's most important industries. It includes operating mines, smelters, exploration projects and wide range of suppliers that provide the Industry with goods and services. At present, the Industry includes 14 operating mines and two smelters that are located in regions around the province. A summary of the economic effects that the Industry has in BC is shown in Table A.

TABLE A. SUMMARY OF MINING'S ECONOMIC REACH IN BC

Direct Employment[1], full time jobs (2019)	11,784
Total Employment[2], full time jobs (2019) Including Direct Employment and Additional Employment with Suppliers and Related Businesses	35,000
Number of Industry Suppliers in BC[3] (2018)	3,730
Number of BC Communities in which Suppliers are Based[4] (2018)	215
Industry Spending on Suppliers[5] (2018)	$2.9 billion
Contribution to BC GDP[6] (2019)	$6.1 billion
Direct taxes, Levies, and other Payments to Government[7] (2019)	$1.1 billion

1 The Mining Industry in British Columbia, 2019, PwC.

2 Estimate from MABC based on Statistics Canada Input-Output Multipliers.

3 One Province, One Economy, 2018, MABC.

4 Ibid.

5 Ibid.

6 Statistics Canada. Table 36-10-0402-01.

7 The Mining Industry in British Columbia, 2019, PwC. The report adds: "it's important to note, [these payments] do not include the income taxes paid by employees of the industry or the corporate income taxes paid by the companies that run these mines. These additional payments would also amount to hundreds of millions of dollars paid to governments from the BC mining industry."

The Vast Majority of BC Mining Products are Sold in Global Markets

BC produces a range of mining products with the principal ones being steelmaking coal (also called metallurgical coal), copper ores and concentrates, and unwrought aluminum. BC is Canada's largest producer of steelmaking coal and copper, and has the only aluminum smelter in Canada outside of Quebec. The vast majority of BC mining products are sold into the global marketplace and form a critically important part of BC's total exports. Steelmaking coal is BC's top export, and, together with copper and aluminum account for almost one quarter of all of BC's exports.

TABLE B. VALUE OF BC EXPORTS OF MINING PRODUCTS ($,000,000)

	2015	2016	2017	2018	2019
Coal[8]	$3,163	$4,212	$6,617	$7,396	$6,740
Copper Ore	$2,988	$2,729	$2,639	$2,892	$2,898
Unwrought Aluminum	$215	$886	$1,143	$1,272	$758
Combined Value of Coal, Copper and Aluminum	**$6,366**	**$7,827**	**$10,399**	**$11,560**	**$10,396**
Total Value of All BC Exports	$35,497	$38,423	$43,241	$46,340	$43,474
Steelmaking Coal, Copper Ore, and Unwrought Aluminum as a Percent of All BC Exports	**17.9%**	**20.4%**	**24.0%**	**24.9%**	**23.9%**

The BC Mining Industry Must Compete Globally for Customers

While mining products constitute a major part of BC's exports, they account for only a relatively small amount of mining products purchased by BC's customers through the global marketplace. BC's exports of steelmaking coal account for less than 10% of the steelmaking coal imported by BC's main customer nations. BC's exports of copper account for less than 5% of the copper sold to BC's main customer nations, and BC's exports of aluminum account for less than 5% of the aluminum imported by the United States, BC's main customer nation for aluminum. As a result, the BC Mining Industry needs to be able to produce its products at competitive prices or they stand to be replaced with similar mining products from competitor nations.

8 Virtually all of BC coal exports are steelmaking coal.

BC Mining Products Result in Substantially Lower Greenhouse Gas (GHG) Emissions than the Same Products Sold by Competitor Nations

In 2019, the Government of BC and the Business Council of BC collaborated on a comprehensive study called the BC Low Carbon Industrial Strategy (LCIS) that examined the GHG intensities of BC Emissions-Intensive and Trade-Exposed industries (EITEs) with their competitors in other jurisdictions. In particular, the LCIS included an in-depth analysis of GHGs produced though the production and export of BC's three principal mineral products – steelmaking coal, copper, and aluminum.[9]

The LCIS study concluded that the annual production and export of BC steelmaking coal, copper and aluminum resulted in between 6.016 million tonnes of carbon dioxide equivalent (CO_2e) and 8.570 million tonnes of CO_2e fewer GHG emissions than had the same products been sold to BC's customers by competitor nations.

The amount of "avoided GHG emissions" through the production and export of BC steelmaking coal, copper and aluminum is substantial. To put it in context, the annual amount of avoided GHG emissions is equivalent to those produced by the operation of 1.3 million to 1.9 million standard passenger vehicles.[10] Consequently, from a GHG perspective, if steelmaking coal, copper and aluminum were to be supplied to BC's customers from competitor nations instead of from BC, it would have the same effect as adding an extra 1.3 million to 1.9 millon standard passenger vehicles to BC roads – an increase equivalent to 40% to 60% of the current number of passenger vehicles in BC.[11]

TABLE C. LCIS ESTIMATED ANNUAL AMOUNT OF AVOIDED GHG EMISSIONS THROUGH THE EXPORT OF BC MINING PRODUCTS

	Annual Amount of GHG Emissions Avoided Through Export of BC Mining Products (Tonnes CO_2e)	
	Low Estimate	High Estimate
Steelmaking Coal	3,354,177	
Copper	138,543	
Aluminum	2,523,968	5,077,625
Total	**6,016,688**	**8,570,345**

9 More information on the LCIS is available on the Business Council of BC website. A summary of results is available at: https://bcbc.com/dist/assets/images/photo-gallery/lowcarbonadvantage/MNP-LCIS-Sector-Results.pdf.

10 Passenger vehicles with internal combustion engines. https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle.

11 Statistics Canada. Table 23-10-0067-01 Vehicle registrations, by type of vehicle.

BC's Carbon Pricing System

Governments place a price on carbon with the goal of reducing global emissions of GHGs. Governments employ two main types of carbon pricing: carbon taxes and emissions trading systems (ETS). A carbon tax sets a price directly on carbon by defining a tax rate on the carbon content of fossil fuels. The amount of emission reduction achieved from a carbon tax is not pre-defined but instead depends on the degree to which the carbon tax discourages the consumption of the fossil fuels.

An ETS (also known as a "cap-and-trade" system) caps the total level of GHG emissions and divides it among industries using a mechanism called allowances. Companies are authorized to emit GHGs equal to the number of allowances they hold, and companies with extra allowances can sell them to companies that require more. As a result, a market for GHG emissions is established through an ETS. Another common aspect of an ETS is that not all allowances are paid for; some are given for free or at low cost to industries, commonly EITEs, that are deemed to be at-risk.[12]

In BC, carbon pricing occurs through the BC Carbon Tax (BC does not have an ETS). The BC Carbon Tax was first introduced in 2008. It is a broad-based tax which applies to the purchase and use of fossil fuels that are used throughout the economy. The tax started at $10 per tonne of CO_2e and is currently $40 per tonne of CO_2e.[13] A planned increase to $45 per tonne in 2020 was deferred to March 31, 2021, in response to the COVID-19 pandemic.

BC's Clean Industrial Incentive Program (CIIP) is BC's approach to providing some support to EITEs. The CIIP sets energy intensity benchmarks for facilities in a sector. If a facility meets or emits less than the applicable benchmark a portion of its carbon tax paid is returned. However, the amounts returned are relatively small since they only apply to some of the carbon taxes paid. Notwithstanding the CIIP, BC's carbon price is the highest in North America, and among the highest in the world.

BC is the Only Jurisdiction with Carbon Pricing That Does Not Provide a Comprehensive System of Support for its EITE Industries

At present, 46 national and 32 subnational jurisdictions place a price on carbon. Aside from BC, all jurisdictions with robust carbon pricing regimes, including all jurisdictions with an ETS, provide support for their EITE industries to prevent "carbon leakage"[14] and to protect their domestic industries.

12 The amount of free allowances issued can be large. Since its inception, most allowances issued under the EU ETS have been free allowances. At present, 40% of allowances issued under the EU ETS are free allowances.

13 A planned increase to $45 per tonne in 2020 was deferred in response to the COVID-19 pandemic to March 31, 2021.

14 Carbon leakage refers to the phenomenon of industrial activity or investment – and thus emissions – shifting or "leaking" from a jurisdiction with a price on carbon to one without a similar price. If this happens, it undermines the ultimate environmental objective of reducing global emissions and harms the jurisdiction's economy through lost production or investment.

Of particular importance for BC's Mining Industry is that mining industries in BC's main competitor nations pay little or no price for carbon. Mining and smelting companies in Australia, Russia and the Middle East pay no price for carbon, while mining companies in Chile pay carbon tax on their electricity generation only at a low rate of US$5 per tonne CO_2e. As a result, the BC Mining Industry finds itself at a significant competitive disadvantage relative to its competitors in other jurisdictions.

The following table compares carbon pricing in BC with carbon pricing in BC's main mining competitor nations and in other regions in Canada.[15]

TABLE D. COMPARISON OF CARBON PRICES IN MINING COMPETITOR NATIONS AND OTHER CANADIAN REGIONS

Jurisdiction	System	Carbon Price (in US$/$tCO_2e$[16])	Amount Less than BC[17]	Percent Less than BC
Australia	None	$0	$30.08	100%
Russia	None	$0	$30.08	100%
United Arab Emirates	None	$0	$30.08	100%
Chile	Carbon Tax	$5.00	$25.08	83%
California/Quebec	ETS	$17.00	$13.08	43%
Alberta (TIER)	Carbon Tax	$22.56	$7.52	25%
Canada Federal OBPS	Carbon Tax	$22.56	$7.52	25%

15 A list of jurisdictions with carbon pricing regimes is included in Appendix C.

16 Note: does not consider that these prices are paid only on a portion of emissions. For a summary of carbon pricing by jurisdiction please see Appendix C.

17 Estimated in $US using an exchange rate of $1US = $1.33CDN.

Carbon Leakage

GHG emissions affect the global environment regardless of where the emissions occur. When governments price emissions, costs increase for industries. For industries that supply only a domestic market, a portion (or all) of those costs are passed onto consumers. For EITE industries, however, the situation is much different. Since the prices for their goods are set in international markets, EITE industries, such as mining, generally do not have the ability to pass on the increased costs to consumers.

Carbon leakage refers to the phenomenon of industrial activity or investment – and thus emissions – shifting or "leaking" from a jurisdiction with a price on carbon to one without a similar price. If this happens, it undermines the ultimate environmental objective of reducing global emissions and harms the jurisdiction's economy through lost production, employment, and investment.[18]

The need to prevent carbon leakage and protect local economies by providing support to certain industries, especially EITE industries, has been recognized by all jurisdictions with ETSs. Each jurisdiction with an ETS has lists, definitions, and regulations that identify at-risk industries and protect them using mechanisms such as the allocation of free or low-cost allowances.[19]

While the need to prevent carbon leakage from BC's EITE industries, including the BC Mining Industry, has been acknowledged, meaningful economic support does not currently exist.

18 Government of Canada. https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/pricing-pollution/7112_OBPS%20Proceeds%20Paper_EN_FINAL.pdf.

19 Quebec: Allocation of Emission Units at No Charge: http://mddefp.gouv.qc.ca/changements/carbone/Allocation-gratuite-en.htm. European Union: Carbon Leakage List 2015-2020: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32014D0746; Carbon leakage list 2021-2050: https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5046070_en. California: https://ww3.arb.ca.gov/cc/capandtrade/allowancealloca-tion/allowanceallocation.htm.

1. Introduction

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1.1 About the BC Mining Industry

The BC Mining Industry (the "Industry") has long been one of BC's most important industries. It includes operating mines, smelters, exploration projects and wide range of suppliers that provide the Industry with goods and services. At present, the Industry includes 14 operating mines and two smelters that are located in regions across the province.[20]

The Industry has a long track record of creating high paying and highly skilled jobs directly at mining operations. However, perhaps less well-known, is that the Industry creates even more jobs across BC through its purchases of goods and services from supplier companies and related businesses. In 2018, the Industry supported nearly 12,000 full-time jobs directly with BC mining operations, while at the same time creating an estimated 23,000 additional full-time jobs with BC suppliers and related businesses from across BC.[21] According to a 2018 survey of mining companies, the Industry spent approximately $2.9 billion on BC goods and services, including purchases from more than 3,700 small and medium sized businesses in 215 BC communities.[22]

In 2019, the Industry contributed more to BC's Gross Domestic Product (GDP) that any other natural resource industry, and surpassed other major industries such as non-residential construction and food and beverage processing.[23] As well, in 2019, the Industry returned approximately $1.1 billion to governments through direct taxes, levies and other payments.[24]

20 More information on the extent of BC Mining operations is available in the following document. Provincial Overview of Exploration and Mining in British Columbia, 2019. British Columbia Geological Survey, Information Circular 2020-01.

21 The mining industry in British Columbia 2019, PwC; Mining Association of BC.

22 One Province, One Economy, Benefits of British Columbia's Mining Supply Chain, 2019. Mining Association of BC.

23 https://www2.gov.bc.ca/gov/content/data/statistics/economy/bc-economic-accounts-gdp.

24 The Mining Industry in British Columbia, 2019, PwC. The report adds: "it's important to note, [these payments] do not include the income taxes paid by employees of the industry or the corporate income taxes paid by the companies that run these mines. These additional payments would also amount to hundreds of millions of dollars paid to governments from the BC mining industry."

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Number of BC Communities in which Suppliers are Based[28] (2018)	215
Industry Spending on Suppliers[29] (2018)	$2.9 billion
Contribution to BC GDP[30] (2019)	$6.1 billion
Direct taxes, Levies, and other Payments to Government[31] (2019)	$1.1 billion

1.2 BC Mining Products

BC produces a range of mining products with the principal ones being steelmaking coal (also called metallurgical coal), copper ores and concentrates, and unwrought aluminum. BC is Canada's largest producer of steelmaking coal and copper and has the only aluminum smelter in Canada outside of Quebec.

As its name suggests, steelmaking coal is a key ingredient in steel manufacturing. Steel is one of the most important engineering and construction materials in the world, and is used in products such as appliances, all modes of transportation (personal vehicles, ships, trains, trucks), infrastructure such as bridges, tunnels, hydroelectric facilities, wind and solar energy components, buildings of all kinds, and any number of consumer products. Global demand for steel, and thus steelmaking coal, continues to grow.

25 The Mining Industry in British Columbia, 2019, PwC.

26 Estimate from MABC based on Statistics Canada Input-Output Multipliers.

27 One Province, One Economy, 2018, MABC.

28 Ibid.

29 Ibid.

30 Statistics Canada. Table 36-10-0402-01.

31 The Mining Industry in British Columbia, 2019, PwC. The report adds: "it's important to note, [these payments] do not include the income taxes paid by employees of the industry or the corporate income taxes paid by the companies that run these mines. These additional payments would also amount to hundreds of millions of dollars paid to governments from the BC mining industry."

It is important not to confuse steelmaking coal with thermal coal which is a completely different product. Thermal coal is used to generate electricity and is not used in steelmaking.

Copper is used in many products for infrastructure and construction. It is used in electrical wires and cables for its conductivity, and in plumbing, industrial machinery and construction materials for its durability, machinability, corrosion resistance and ability to be cast with high precision. The major global uses of copper in 2018 were equipment manufacturing (31%), followed by building construction (28%), infrastructure (16%), transportation (13%) and industrial uses (12%).[32]

There is also a growing role for copper in low-carbon technologies, including renewable electricity generation, electric vehicles, and grid infrastructure, which is expected to support copper usage over the medium term. An electric car contains about five times more copper than an equivalent internal combustion engine car. A hybrid electric vehicle typically contains 85 pounds of copper, a plug-in hybrid electric vehicle uses about 130 pounds of copper, and a battery electric vehicle typically contains more than 180 pounds of copper.[33]

Aluminum is widely used in construction, the electrical and electronics industries, and packaging, including beverage cans and foils. The automotive and transportation industry relies on a variety of aluminum alloys in the manufacture of various components, because of its lightness and durability, which reduces a vehicle's weight and, in turn, improves fuel consumption and lowers greenhouse gas emissions.

The major uses of aluminum globally in 2018 were for automotive and transportation (24%), followed by construction (23%), consumer goods (14%), foil and packaging (13%), electrical engineering and electronics (11%), machinery and equipment (9%), and other applications (6%).[34]

A significant component of future aluminum demand is expected to come from energy efficient vehicles and electric vehicles, which contain a high proportion of aluminum components. Automakers are working to replace internal combustion engines with electrical engines and are seeking to reduce vehicle weight by increasing the use of aluminum.

32 https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/copper-facts/20506#L1.

33 https://www.mining-technology.com/comment/electric-vehicle-revolution-drive-copper-demand/.

34 https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/aluminum-facts/20510.

1.3 Exports of BC Mining Products

The vast majority of BC mining products are sold into the global marketplace and form a major part of BC's total exports. Steelmaking coal is BC's top export, accounting for roughly $7 billion in exports annually. Steelmaking coal, together with copper and aluminum, accounted for almost one quarter of all of BC's exports in 2019.[35]

TABLE 2. VALUE OF BC EXPORTS ($,000,000)

	2015	2016	2017	2018	2019
Coal[36]	$3,163	$4,212	$6,617	$7,396	$6,740
Copper Ore	$2,988	$2,729	$2,639	$2,892	$2,898
Unwrought Aluminum	$215	$886	$1,143	$1,272	$758
Combined Value of Coal, Copper and Aluminum	**$6,366**	**$7,827**	**$10,399**	**$11,560**	**$10,396**
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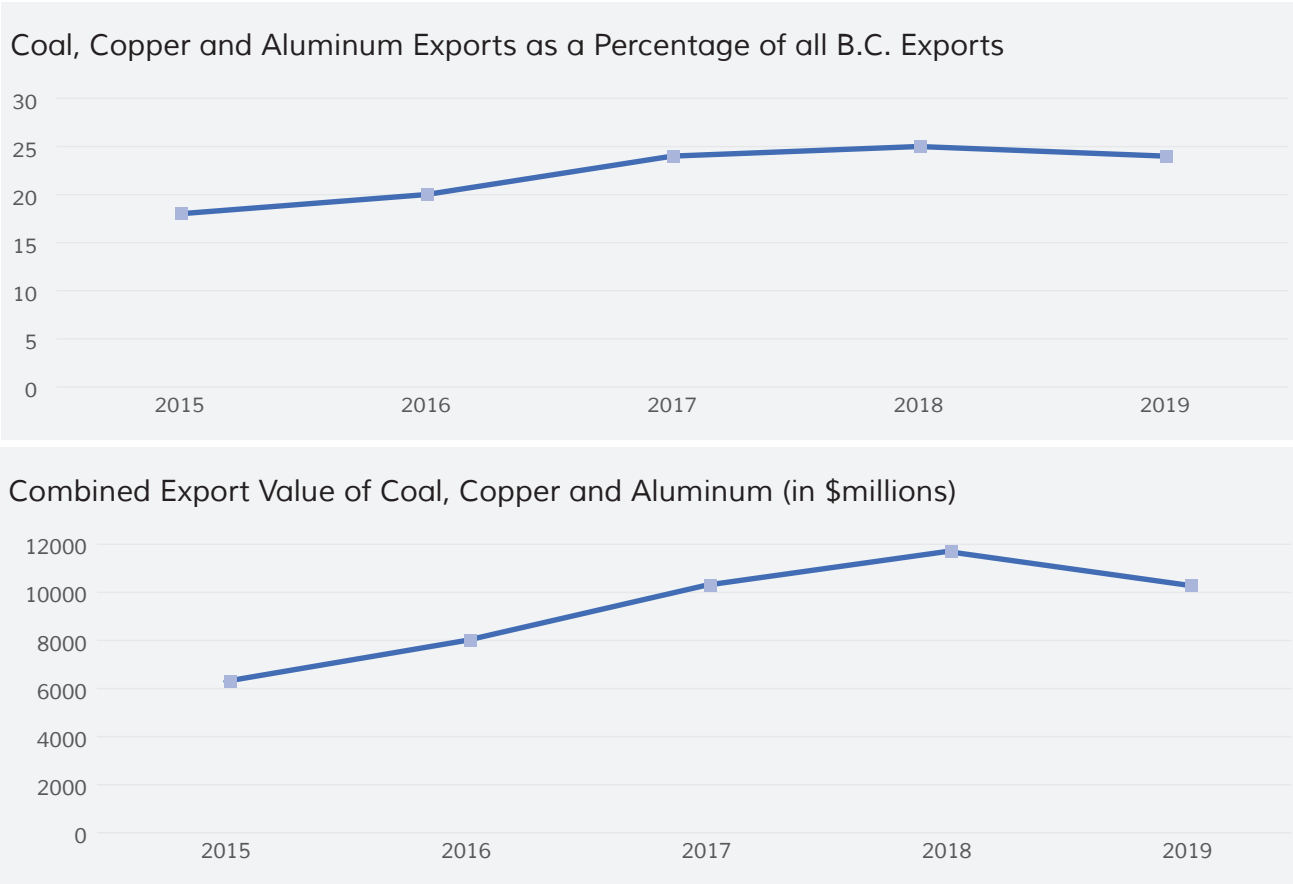
35 https://www2.gov.bc.ca/gov/content/data/statistics/business-industry-trade/trade/trade-data/country-trade-profile.

36 Virtually all of BC coal exports are steelmaking coal.

FIGURE 1. BC STEELMAKING COAL, COPPER ORE AND UNWROUGHT ALUMINUM EXPORTS



Almost 75% of BC's steelmaking coal exports go to Japan, South Korea, India, and China, with the same four countries accounting for over 90% of BC's copper exports. BC aluminum is exported primarily to the United States.

While mining products constitute a major part of BC's exports, they account for only a relatively small amount of the total mining products sold in the global marketplace. The following sections summarize the proportion of imported mining products that BC's principal mining exports account for in BC's main customer nations.

Steelmaking Coal

As shown in Table 3, BC's exports of steelmaking coal account for less than 10% of steelmaking coal purchased by BC's main customer nations.

TABLE 3. EXPORTS OF BC STEELMAKING COAL AND ESTIMATED TOTAL STEELMAKING COAL IMPORTS BY COUNTRY (2019) [37]

	Value of BC Steelmaking Coal Exported to Country ($ millions)	Estimated Total Value of Steelmaking Coal Imported from All Sources by Country ($ millions)	Percent of Imports for Which BC Accounts
Japan	$1,784	$11,475	16%
South Korea	$1,438	$9,034	16%
India	$1,011	$12,940	8%
China	$756	$18,311	4%
EU	$628	$10,010	6%
Subtotal	**$5,617**	**$61,770**	**9.1%**
Other Countries	$1,123	N.A.	N.A.
Total	**$6,740**	**N.A.**	**N.A.**

Copper

As shown in Table 4, BC's exports of copper account for less than 5% of copper purchased by BC's main customer nations.

37 Estimated from public data, including Government of Australia Resources and Energy Quarterly, International Energy Agency and World Bank.

TABLE 4. EXPORTS OF BC COPPER AND ESTIMATED TOTAL COPPER IMPORTS BY COUNTRY (2019)[38]

	Value of BC Copper Exported to Country ($ millions)	Estimated Total Value of Country Imported from All Sources by Country ($ millions)	Percent of Imports for Which BC Accounts
China	$1,015	$42,142	2%
Japan	$813	$12,194	7%
South Korea	$572	$12,194	5%
India	$304	$3,596	8%
Subtotal	**$2,704**	**$70,127**	**3.9%**
Other Countries	$194	N.A.	N.A.
Total	**$2,898**	**N.A.**	**N.A.**

Aluminum

As shown in Table 5, BC's exports of aluminum to the USA account for less than 5% of aluminum it purchases.

TABLE 5. EXPORTS OF BC ALUMINUM AND TOTAL ALUMINUM IMPORTS BY COUNTRY (2019)[39]

	Value of BC Unwrought Aluminum Exported to Country ($ millions)	Estimated Total Value of Unwrought Aluminum Imported from All Sources by Country ($ millions)	Percent of Imports for Which BC Accounts
USA	$435	$11,895	3.7%
Other Countries	$277	N.A.	N.A.
Total	**$758**	**N.A.**	**N.A**

38 Ibid.

39 Estimated from public data, including US government and worldstopexports.com.

2. GHG Emissions

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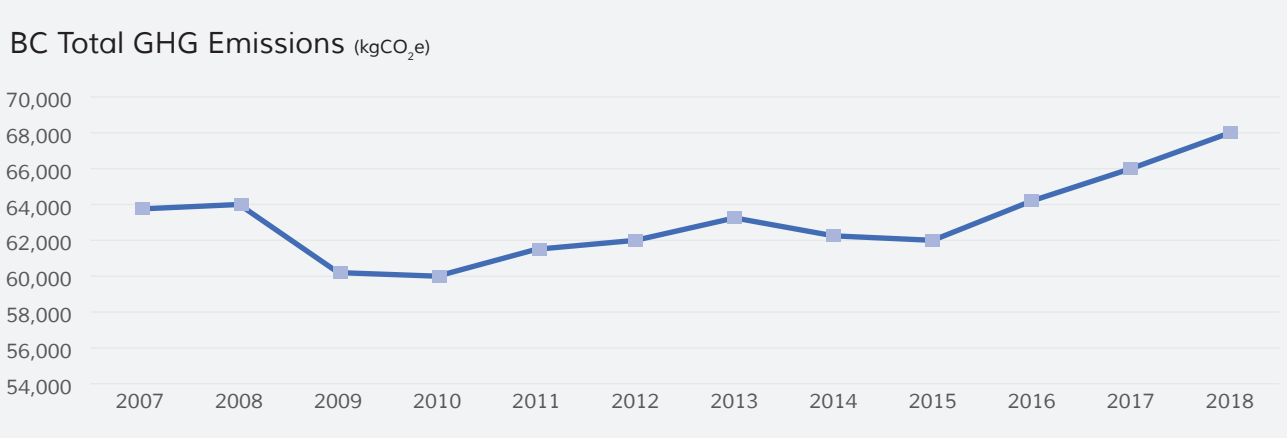
2.1 GHG Emissions in BC

All mining operations and smelters create greenhouse gas emissions (GHGs) emissions as part of their production and transportation processes. Mining industries in jurisdictions such as BC that export their products to global markets are referred to as being Emissions-Intensive and Trade-Exposed (EITE). EITE industries exist in nearly every country and cover a diverse range of products. In many countries EITE businesses are responsible for the production of goods that form the backbone of modern economies, including fresh food, building materials, important industrial chemicals, and industrial metals.

In BC, GHGs are estimated using the British Columbia Greenhouse Gas Provincial Inventory Methodology, which uses data from provincial-level sources and Canada's National Inventory Report. The emissions are usually reported in terms of tonnes of carbon dioxide equivalent (tCO_2e), kilotons of carbon dioxide equivalent ($ktCO_2e$) or megatons of carbon dioxide equivalent ($MtCO_2e$). One kiloton being equal to one thousand tons, and one megaton being equal to one thousand kilotons.

In 2018, British Columbia's total gross GHG emissions, as reported in the Provincial Inventory, were 67.9 $MtCO_2e$.[40] This was an increase of 4.5 $MtCO_2e$ (7%) from 63.4 $MtCO_2e$ in 2007, the baseline year for BC's emission reduction targets.

FIGURE 2. TOTAL GHG EMISSIONS IN BC FROM ALL SOURCES[41]



40 The Climate Action Secretariat prepares and publishes the Provincial Inventory annually, with up to a two-year delay to allow time to assemble the information. The 1990-2018 Provincial Inventory was published in August 2020.

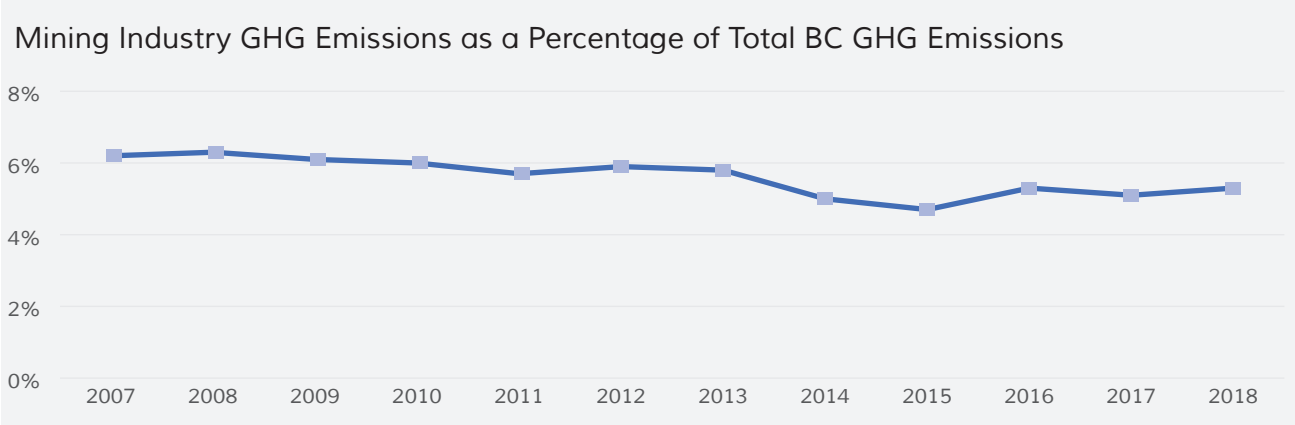
41 https://rhg.com/research/preliminary-china-emissions-2019/.

BC's GHG emissions account for only a small portion (less that 0.15%) of global GHG emissions. In contrast, China, the world's largest producer of GHGs, emitted an estimated 13,920 $MtCO_2e$ in 2019, which was an increase of about 2.6%, or roughly 350 $MtCO_2e$ from the year before. To place BC's GHG emissions in perspective, BC's annual GHG emissions are less than the GHG emissions produced in China in two days. The increase in emissions in China from 2018 to 2019 would, by itself, amount to over five times BC's annual GHG emissions.

2.2 Emissions from Mining and Smelting

In 2018, GHGs from BC mining and smelting operations accounted for approximately 5.3% of BC's total emissions, which was a decrease from 2007 when mining and smelting accounted for roughly 6.2% of BC's total emissions.

FIGURE 3. MINING AND SMELTING GHG EMISSIONS AS A PERCENT OF GHG EMISSIONS IN BC FROM ALL SOURCES [42]



42 https://rhg.com/research/preliminary-china-emissions-2019/.

3. Mining GHG Emissions in BC and Competitor Nations

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3.1 The BC Low Carbon Industrial Strategy (LCIS)

A key question regarding GHGs for any EITE is: "How does the amount of GHGs it produces compare with the amount produced by the same industry in another jurisdiction?" For several of BC's most important EITEs, including the Mining Industry, this question was answered recently through analysis done for the Low Carbon Industrial Strategy (LCIS) study. The LCIS study was a joint initiative between the Province of BC and the Business Council of BC that involved carrying out comparisons of the amount of GHGs produced by EITEs in BC and the same industries in competitor countries.[43]

The LCIS study was comprehensive and used the best available information obtained from industry and government sources. It involved a collaborative effort by senior Provincial Government and private sector representatives, together with Provincial Government and independent technical experts. The LCIS followed a "model-to-model" approach that represented industry average production and/or specific facility emissions. It involved estimating emissions throughout the product life cycle, including upstream emissions (e.g., from the use of electricity), operations emissions, and downstream emissions (e.g., shipping to designated jurisdictions).

3.2 LCIS Results for the BC Mining Industry

The LCIS study included an examination of the GHG emissions from BC steelmaking coal, copper, and aluminium compared with the emissions produced by BC's main competitor nations for those mining products.

Steelmaking Coal

The LCIS study determined the most relevant comparison for steelmaking coal was between BC and Australia. Australia is by far the largest steelmaking coal exporting nation, exporting an estimated 184 million tonnes of steelmaking coal in 2019. In contrast, Canada was third, exporting an estimated 30 million tonnes in 2019.

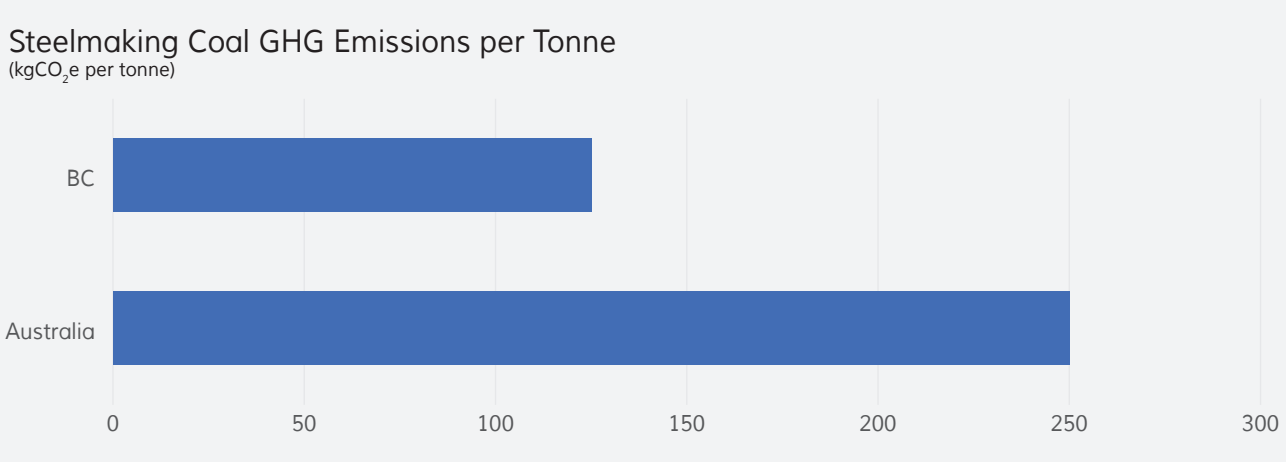
43 More information on the LCIS is available on the Business Council of BC website. A summary of results is available at: https://bcbc.com/dist/assets/images/photo-gallery/lowcarbonadvantage/MNP-LCIS-Sector-Results.pdf.

TABLE 6. LARGEST EXPORTERS OF STEELMAKING COAL (2019)[44]

	Millions of Tonnes
Australia	184
United States	50
Canada	30
Russia	26
Mongolia	31

The LCIS study found that the production and transportation of BC steelmaking coal resulted in an average of 124.5 $kgCO_2e$ per tonne. In comparison, the production and transportation of Australian steelmaking coal resulted in an average of 250.6 $kgCO_2e$ per tonne. In other words, the production and transportation of steelmaking coal from BC was estimated to result in 50% fewer GHG emissions than the production and transportation of steelmaking coal from Australia.

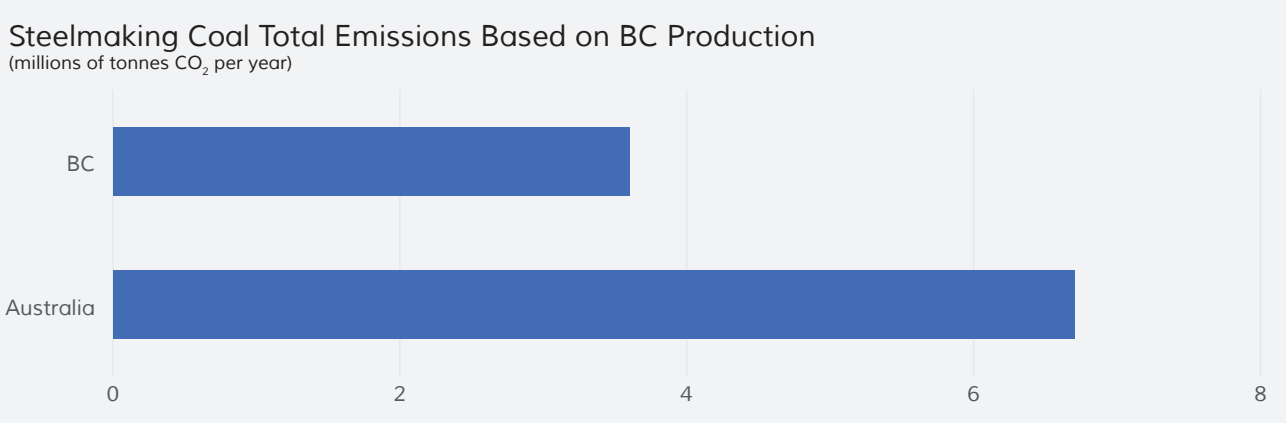
FIGURE 4. LCIS RESULTS FOR STEELMAKING COAL – EMISSIONS PER TONNE



The LCIS study concluded that, on an annual basis, the production and transportation of BC steelmaking coal resulted in approximately 3.354 million tonnes of CO_2e fewer than had the same amount of steelmaking coal been produced in Australia and sold to BC's customers.

44 Resources and Energy Quarterly June 2020. Retrieved from www.industry.gov.au/OCE.

FIGURE 5. LCIS RESULTS FOR STEELMAKING COAL – TOTAL EMISSIONS



The results from the LCIS study mirror analysis from the International Council of Mining and Minerals (ICMM) which reported BC's steelmaking coal to be among the least carbon intensive in the world, with emissions per unit of production about 55% less than the world-wide industry average. [45]

Copper

The LCIS study determined that the most relevant comparison for copper was between BC and Chile. Chile is the largest copper producer in the world, while Canada is the tenth largest.

45 International Council of Mining and Metals (https://www.icmm.com/) ICMM reports a production weighted emissions intensity based on information reported by ICMM members.

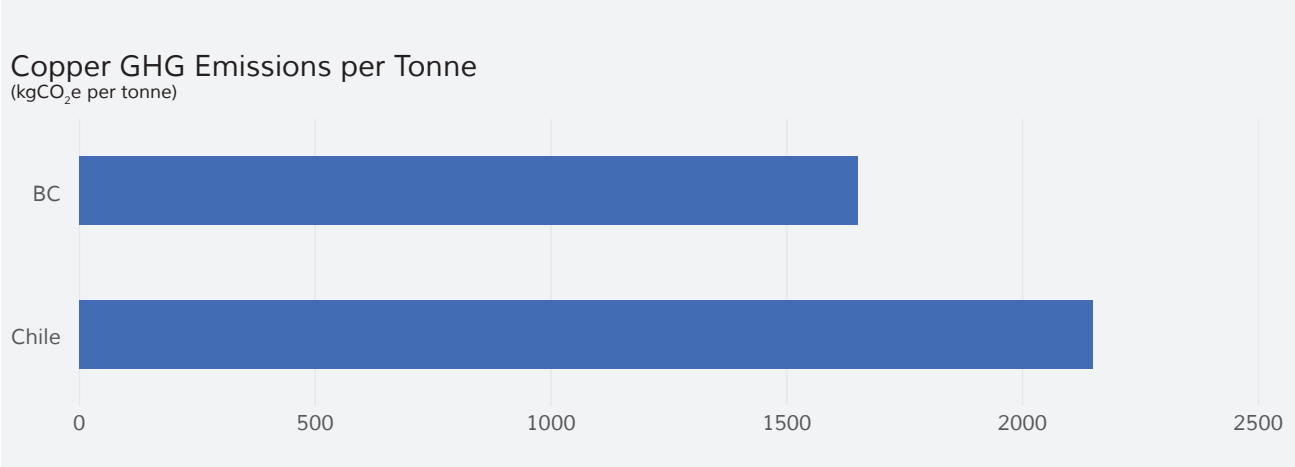
TABLE 7. WORLD MINE PRODUCTION OF COPPER (2018)[46]

	Thousands of Tonnes
Chile	5,832
Peru	2,372
China	1,742
United States	1,333
Australia	979
Zambia	957
Congo, D.R.	946
Indonesia	763
Russia	656
Canada	587

The LCIS study found that the production and transportation of BC copper resulted in an average of 1,647 kgCO_2e per tonne. In comparison, the production and transportation of Chilean copper resulted in an average of 2,126 kgCO_2e per tonne. In other words, the production and transportation of copper from BC was estimated to result in 23% fewer GHG emissions than the production and transportation of copper from Chile.

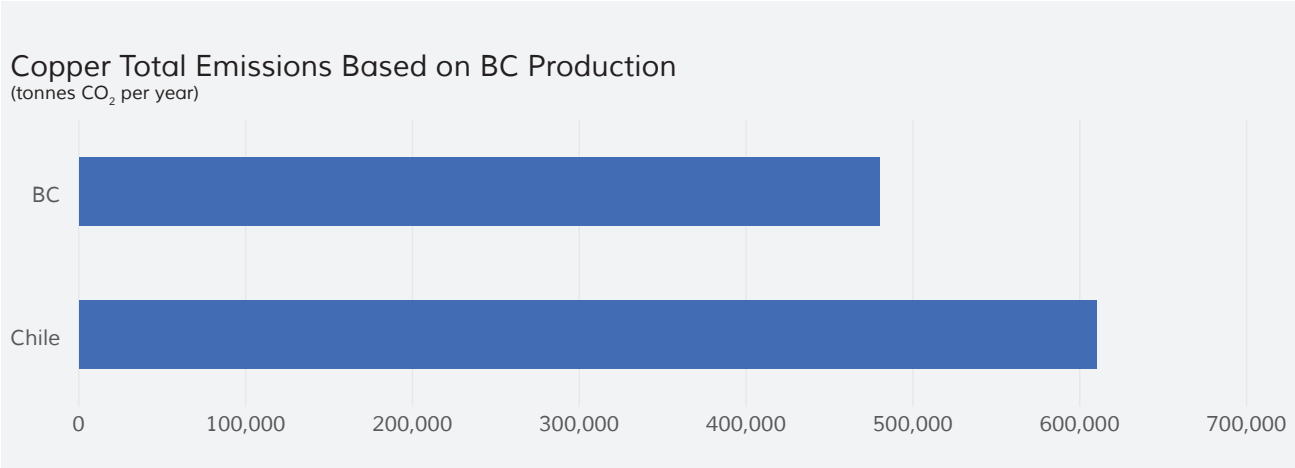
46 https://www.nrcan.gc.ca/our-natural-resources/minerals-mining/copper-facts/20506.

FIGURE 6. LCIS RESULTS FOR COPPER – EMISSIONS PER TONNE



The LCIS study concluded that, on an annual basis, the production and transportation of BC copper resulted in approximately 138,000 tonnes of CO_2e fewer than had the same amount of copper been produced in Chile and sold to BC's customers.

FIGURE 7. LCIS RESULTS FOR COPPER – TOTAL EMISSIONS



As was the case for steelmaking coal, the results from the LCIS study again echoed those reported by the ICMM which reported BC's copper to be among the least carbon intensive in the world, with emissions per unit of production about 59% less than the world-wide industry average.[47]

47 International Council of Mining and Metals (https://www.icmm.com/) ICMM reports a production weighted emissions intensity based on information reported by ICMM members.

Aluminum

The LCIS study determined that the most relevant comparisons for aluminum were between BC and Russia and the United Arab Emirates. Canada is the world's largest exporter of aluminum, while Russia is the fourth largest and the United Arab Emirates are the third largest.

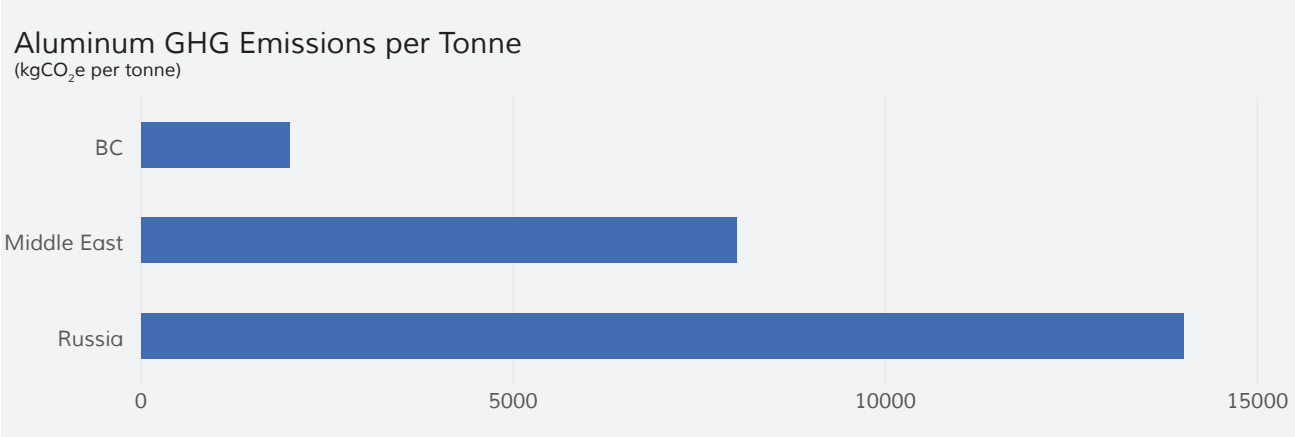
TABLE 8. EXPORTERS OF ALUMINUM (2019)[48]

	Billions $US
Canada	5.3
Netherlands	5.12
United Arab Emirates	5.11
Russia	4.6
India	3.8

The LCIS study found that the production and transportation of BC aluminum resulted in an average of 2,168 $kgCO_2e$ per tonne. In comparison, the production and transportation of aluminum in Russia resulted in 14,000 $kgCO_2e$ per tonne, and the production and transportation of aluminum in the United Arab Emirates resulted in 8,000 $kgCO_2e$ per tonne. In other words, the production and transportation of aluminum from BC was estimated to result in 85% fewer GHG emissions than the production and transportation of aluminum from Russia, and 73% fewer GHG emissions than the production and transportation of aluminum from the United Arab Emirates.

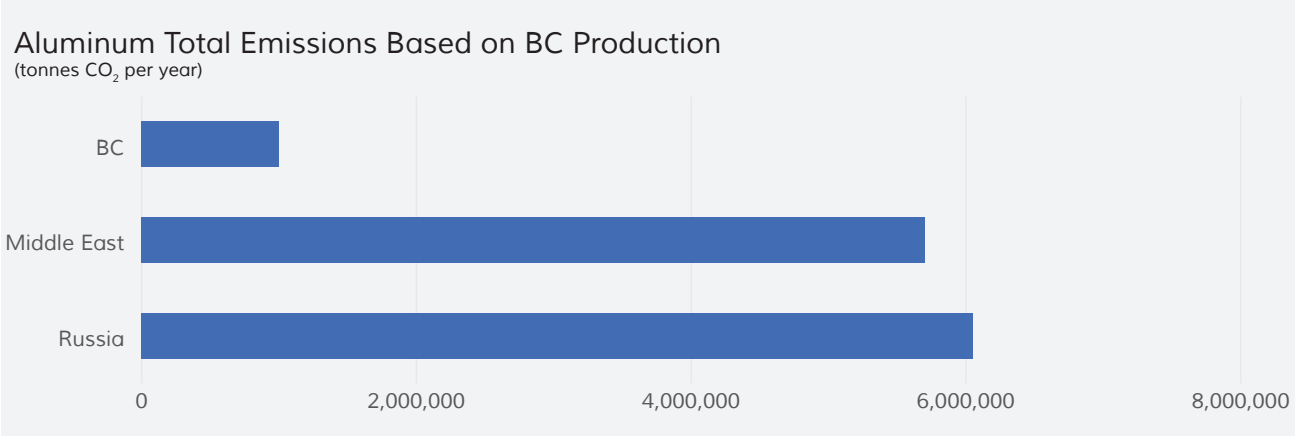
48 http://www.worldstopexports.com/top-aluminum-exporters-by-country/.

FIGURE 8. LCIS RESULTS FOR ALUMINUM – EMISSIONS PER TONNE



The LCIS study concluded that, on an annual basis, the total production and transportation of BC aluminum resulted in approximately 5.078 million tonnes of CO_2e fewer than had the same amount of aluminum been produced in Russia and sold to BC's customers, or about 2.534 million tones of CO_2e fewer than had the same amount of aluminum been produced in the United Arab Emirates and sold to BC's customers.

FIGURE 9. LCIS RESULTS FOR ALUMINUM – TOTAL EMISSIONS



3.3 Summary of Results from the LCIS study

The LCIS study concluded that the combined annual production and export of BC steelmaking coal, copper and aluminum resulted in between 6.016 million tonnes of CO_2e to 8.570 million tonnes of CO_2e fewer than had the same products been supplied to BC's customers by competitor jurisdictions.

The amount of "avoided GHG emissions" through the production and export of BC steelmaking coal, copper and aluminum is substantial. To put it in context, the annual amount of avoided GHG emissions is equilvent to those produced by the operation of 1.3 million to 1.9 million passenger vehicles with internal combustion engines.[49] Consequently, from a GHG perspective, if steelmaking coal, copper and aluminum were to be sold to BC's customers from competitor nations instead of from BC, it would have the same effect as adding an extra 1.3 million to 1.9 millon passenger vehicles with internal combustion engines to BC roads – an increase equivalent to 40% to 60% of the current number of passenger vehicles in BC.[50]

TABLE 9. LCIS ESTIMATED ANNUAL AMOUNT OF AVOIDED GHG EMISSIONS THROUGH THE EXPORT OF BC MINING PRODUCTS

	Annual Amount of GHG Emissions Avoided Through Export of BC Mining Products (Tonnes CO_2e)	
	Low Estimate	High Estimate
Steelmaking Coal	3,354,177	
Copper	138,543	
Aluminum	2,523,968	5,077,625
Total	**6,016,688**	**8,570,345**

49 https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle.

50 Statistics Canada. Table 23-10-0067-01 Vehicle registrations, by type of vehicle.

4. Carbon Pricing

4. Carbon Pricing

4.1 Types of Carbon Pricing

Governments place a price on carbon with the goal of reducing global emissions of GHGs. Governments employ two main types of carbon pricing: carbon taxes and emissions trading systems (ETSs). A carbon tax sets a price directly on carbon by defining a tax rate on the carbon content of fossil fuels. The amount of emission reduction achieved from a carbon tax is not pre-defined but instead depends on the degree to which the carbon tax discourages the consumption of the fossil fuels.

An ETS (also known as a "cap-and-trade" system) caps the total level of GHG emissions and divides it among industries using a mechanism called allowances. Companies are authorized to emit GHGs equal to the number of allowances they hold, and companies with extra allowances can sell them to companies that require more. As a result, a market for GHG emissions is established through an ETS. Another common aspect of an ETS is that not all allowances are paid for; some are given for free or at low cost to industries, commonly EITEs, that are deemed to be at-risk.[51]

All ETSs have the same basic components, including:

- Limits regarding how much CO_2e can be released for a specific subset of activities over a specified period (known as the cap).
- A procedure for the allocation of the cap among participants in the system (usually industrial facilities).
- A procedure for the issuing of allowances of emissions, including free or low-cost allowances.
- A market and governance structure for the trading, monitoring, and reporting of allowances, as well as the collection of revenues.

A key difference between a carbon tax and an ETS is the link between allowances and support for industries that are judged to be economically "at-risk". Without exception, all jurisdictions that have adopted an ETS offer support for industries that are judged to be economically at-risk.

The most common form of support under an ETS is the awarding of what are called "free allowances" (also known as the free allocation of emissions). The way in which free allowances are used in the European Union (EU) ETS[52] typifies how they are used to support industries. Under the EU ETS,

51 The amount of free allowances issued can be large. Since its inception, most allowances issued under the EU ETS have been for free. At present, 40% of allowances issued under the EU ETS are free allowances.

52 The EU ETS covers heavy industries, electricity installations, and aviation, and encompasses all EU Member States plus Norway, Liechtenstein and Iceland.

legislation defines the annual maximum number of allowances available (the "cap"). Companies need an allowance for each tonne of CO_2e emitted. Allowances are obtained either through auctions – where they are bought and sold – or, as is the case for economically at-risk industries, are provided to them for free or low cost.

If a company receives more than enough allowances to cover its emissions it can decide to keep the surplus or sell them. If a company does not receive enough allowances to cover its emissions it must acquire the balance at auction or from other companies.

The EU's ETS uses free allowances to discourage EU businesses from transferring activity to non-EU countries with lower environmental standards, as that would reduce investment in the EU and increase global emissions. At present, free allowances make up over 40% of all available allowances under the EU ETS.[53]

4.2 Carbon Pricing in B.C

In BC, carbon pricing occurs through the BC Carbon Tax. BC does not have an emissions trading system. The BC Carbon Tax was first introduced in 2008. It is a broad-based tax which applies to the purchase and use of fossil fuels that are used throughout the economy. The initial pricing for the tax was $10 per tonne of CO_2e with a $5 per year scheduled increase. It was frozen in 2013, restored in 2018, made consistent with the federal backstop carbon tax target of $50 per tonne by 2022, and increased to $40 per tonne in 2019. A planned increase to $45 per tonne in 2020 was deferred to March 2021 in response to the COVID-19 pandemic.

The BC Carbon Tax is applied at different rates for different fuels. The calculation is volume based and the tax amount must be included on sales invoices. More details on the BC Carbon Tax is contained in Appendix B.

A feature of the BC Carbon Tax is that it applies only to fuel use within BC boundaries. As a result, it can work to discourage production in BC of goods for exports. For example, diesel fuel used to transport BC minerals for smelting within BC has the carbon tax applied to it. But diesel fuel used to transport BC minerals for smelting out of the province is tax exempt (i.e., the carbon tax is rebated).

The original concept for BC Carbon Tax was that it would be "revenue neutral", where personal and business income taxes were reduced in tandem with the gradually escalating carbon tax. The original plan was that approximately 60% of carbon tax revenues would finance individual income tax rate cuts, and approximately 40% would finance corporate tax rate cuts. On implementation, the

53 Special Report on the EU's Emissions Trading System, European Court of Auditors, 2020.

BC Government cut the general corporate income tax rate from 12% to 10%, keeping the original commitment to industry. However, corporate tax rates climbed back up to 12% over time undermining the original concept of the tax. In addition, in 2017, "revenue neutrality" was eliminated. The proceeds of the BC Carbon Tax now flow to general Provincial Government revenues.

4.3 Canada's Federal Carbon Pricing System

Canada's federal carbon pricing system was introduced in 2019 and applies only to the provinces and territories without their own carbon prices. The federal system has two parts:

- A regulatory charge on fuel (federal fuel charge).
- A regulatory trading system for industry – the federal Output-Based Pricing System (OBPS).

The fuel charge is equivalent to a carbon tax that is applied to 21 types of fuel and also applies to combustible waste that is burned for the purpose of produce heat or energy.[54] As of 2020, the federal fuel charge was $30/t$CO_2$e and is planned to increase by $10/t$CO_2$e per year until it reaches $50/t$CO_2$e in 2022.

The goals of the federal OBPS are described as follows: "The federal OBPS is a regulatory trading system for industry. It is designed to provide a financial incentive for industrial emitters that are energy-intensive and trade-exposed (EITE) to reduce their emissions while remaining competitive. Such a system helps to protect against carbon leakage, which occurs when production and related emissions move to another jurisdiction with less stringent carbon policies."[55]

The OBPS applies to facilities that emit over 50,000 tonnes CO_2e per year. Emissions reductions obligations are determined using an output-based standard (OBS), which becomes stricter over time. The OBS varies based on the industrial activity and competitiveness analysis on the sector. Output standards are set per industrial activity based on the sectors' average emissions intensity. The starting point for industry is 70%. Sectors that have been identified as having high competitiveness risk have an OBS of 90% of their average emissions intensity.

Under the OBPS, facilities pay a carbon price if their emissions exceed the applicable output standard. Facilities that emit less than the applicable output standard earn credits they can sell. In this regard the OBPS behaves similarly to allowances under an ETS framework.

54 https://laws.justice.gc.ca/eng/regulations/SOR-2018-12187/page-1.html.

55 Office of the Parliamentary Budget Officer. https://www.pbo-dpb.gc.ca/web/default/files/Documents/Reports/RP-2021-019-S/RP-2021-019-S_en.pdf

4.4 Comparison of BC Carbon Pricing with Carbon Pricing in Other Jurisdictions

At present, 46 national and 32 subnational jurisdictions place a price on carbon. Aside from BC, all jurisdictions with robust carbon pricing regimes, including all jurisdictions with an ETS, provide support for their EITE industries to prevent "carbon leakage"[56] and to protect their domestic industries.

Of particular importance for BC's Mining Industry is that mining industries in BC's main competitor nations pay little or no price for carbon. Mining and smelting companies in Australia, Russia and the Middle East pay no price for carbon, while mining companies in Chile pay carbon tax on their electricity generation only at US$5 per tonne CO_2e. As a result, the BC Mining Industry finds itself at a significant competitive disadvantage, relative to its competitors in other jurisdictions, including competitors in jurisdictions that have adopted carbon pricing.

The following table compares carbon pricing in BC with that in BC's main mining competitor nations and in other regions in Canada. A list of countries with carbon pricing regimes is included in Appendix C.

TABLE 10. COMPARISON OF CARBON PRICES IN SELECT JURISDICTIONS

Jurisdiction	System	Carbon Price (in US$/$tCO_2e$[57])	Amount Less than BC[58]	Percent Less than BC
Australia	None	$0	$30.08	100%
Russia	None	$0	$30.08	100%
United Arab Emirates	None	$0	$30.08	100%
Chile	Carbon Tax	$5.00	$25.08	83%
California/Quebec	ETS	$17.00	$13.08	43%
Alberta (TIER)	Carbon Tax	$22.56	$7.52	25%
Canada Federal OBPS	Carbon Tax	$22.56	$7.52	25%

56 Carbon leakage refers to the phenomenon of industrial activity or investment – and thus emissions – shifting or "leaking" from a jurisdiction with a price on carbon to one without a similar price. If this happens, it undermines the ultimate environmental objective of reducing global emissions and harms the jurisdiction's economy through lost production or investment.

57 Note: does not consider that these prices are paid only on a portion of emissions. For a summary of carbon pricing by jurisdiction please see Appendix C.

58 Estimated in $US using an exchange rate of $1US = $1.33CDN.

5. Carbon Leakage and Support of EITE Industries

5. Carbon Leakage and Support of EITE Industries

5.1 Carbon Leakage

Greenhouse gas emissions affect the global environment regardless of where the emissions occur. When governments price emissions, costs increase for industries. For industries that supply only a domestic market a portion (or all) of those costs are then passed onto consumers. For EITE industries, however, the situation is different. Since the prices for their goods are set in international markets, EITE industries generally do not have the ability to pass on the increased costs on to consumers.

Carbon leakage refers to the phenomenon of industrial activity or investment – and thus emissions – shifting or "leaking" from a jurisdiction with a price on carbon to one with fewer emissions constraints. When that happens, it undermines the ultimate environmental objective of reducing global emissions and harms the jurisdiction's economy through lost production, investment, and employment. It is for these reasons that jurisdictions have recognized the need to offer support for their EITE industries.

As noted earlier, BC is at present the only jurisdiction in the world with a robust carbon pricing regime that provides essentially no support to its EITE industries. As a result, the risk of carbon leakage from BC is accentuated. As articulated in a bulletin from the BC Business Council that followed the report of the LCIS: "The ultimate result of the path BC is presently taking on carbon policy will be reduced BC emissions but not lower global emissions. Instead, the province is at risk of experiencing creeping "deindustrialization" in key sectors of the export economy, along with a loss of high-paying jobs and reduced demand for the goods and services that other BC industries supply to local producers of traded goods".[59]

5.2 EITE Support Policies

For jurisdictions with a carbon tax, the absence of a mechanism that behaves like allowances, makes it more difficult to target vulnerable industries than under an ETS. However, in the case of the Canadian government, the federal carbon tax uses an output-based performance standard which behaves much like a free allowance. Under the federal carbon tax if a facility performs at or below the prescribed level no payment is required. If a facility exceeds the prescribed level payment is remitted. This incents emission reduction while protecting production, investment, and employment.

The need to provide support for EITE industries has been recognized by all jurisdictions with emission trading systems, including the European Union, California, Quebec, the Regional Greenhouse Gas

59 BC Business Council, 2019. The BC Government's Budget 2020 also acknowledged the problem facing BC EITEs: "it would be unhelpful to the global fight against climate change if low-carbon intensity BC operations were shut down, with the same production activities replaced elsewhere with higher GHG emissions."

Initiative (RGGI, Eastern seaboard of the United States, for electricity generation), South Korea and China. Each has lists, definitions, and regulations[60] that identify at-risk industries and "protect" them through the use and allocation of free or low-cost allowances.

In Canada, Alberta, Ontario, and New Brunswick use emissions performance standards like the federal output-based pricing system that are set out in regulation. Quebec uses an ETS that is linked with California (i.e., they share an allowance auction market). Quebec provides free allowances to at-risk industries, including aluminum smelting, steel mills, cement plants, and pulp and paper plants. Nova Scotia has a closed ETS, with allowance trading only within province.

In BC, some facilities may receive a small refund under the CleanBC industrial incentive program (CIIP).[61] CIIP was implemented in 2018 in response to concerns around industry competitiveness. Return of carbon taxes paid under CIIP is based on performance against emissions intensity by industry. If a facility performs better than the standard, it may be eligible for a refund on the tax paid above $30/tCO2. On average in the mining sector, facilities will receive a payment of 65% of incremental carbon tax paid above $30 per tonne.

The amount refundable through CIIP is small relative to that available in other jurisdictions. For example, listed California industries pay no carbon price on 75% or more of their emissions and in 2021 new rules will see the California Air Resources Board use a 100% assistance factor for all listed industries, regardless of their carbon leakage risk classification. So today, a hypothetical plant emitting 100,000 tonnes CO_2e in BC would pay CDN$4 million (US$3 million). A similar plant in California would pay only US$0.45 million. A plant in Chile, would pay only US$5 per tonne CO_2e on emissions from electricity generation (the cost would be included in the plant's electricity bill or otherwise paid directly if the operation was not connected to the grid).

Even under the federal OBPS industries pay less carbon price than under the BC Carbon Tax. As a simple example one can compare an open pit copper mine emitting 100,000 tonnes of CO_2e. Under both the BC Carbon Tax and under the federal OBPS the mine must meet a GHG benchmark. In BC, if the mine does not meet its current CIIP benchmark the carbon tax remittance would be a maximum of $4 million (or $40 per tonne CO_2e if production created 100,000 of emissions), otherwise its carbon tax remittance would be $3.35 million (i.e., $30 per tonne on 100,000 tCO_2e plus $3.50/$tCO_2e$ on 100,000 tCO_2e). If the same mine were to be subject to the federal carbon tax it would pay $30/tonne on 20% of its total emissions or $600,000, a $2.65 million difference from a similar mine operating in BC.

60 Quebec: Allocation of Emission Units at No Charge: http://mddefp.gouv.qc.ca/changements/carbone/Allocation-gratuite-en.htm. European Union: Carbon Leakage List 2015-2020: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32014D0746; Carbon leakage list 2021-2050: https://ec.europa.eu/info/law/better-regulation/initiatives/ares-2017-5046070_en. California: https://ww3.arb.ca.gov/cc/capandtrade/allowancealloca-tion/allowanceallocation.htm.

61 https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/cleanbc-industrial-incentive-program.

Appendices

Appendix A – Glossary

Economic Terms

Term	Definition
Economic Output	Output is the total gross value of goods and services produced by a given company or industry measured by the price paid to the producer. This is the broadest measure of economic activity, Output measures the value of all sales of goods and services, including all final purchase and intermediate inputs, which results in the double counting of intermediate purchases. For example, a furniture manufacturer buys wood from a sawmill for $100 and adds value to it by producing a piece of furniture which is then sold for $300. Economic output would total $400—the value of all sales in the chain of activity. The value of the wood is therefore counted twice—once as an intermediate good for the furniture manufacturer and again in the value of the furniture.
Gross Domestic Product (GDP)	Gross Domestic Product ("GDP"), or value-added, refers to the additional value of a good or service over the cost of inputs used to produce it from the previous stage of production. Thus, GDP is equal to the unduplicated value of goods and services produced. GDP isolates only the additional value of goods and services produced and is defined as economic output less intermediate inputs. In the previous example of the furniture manufacturer, the value-added totals only $300 (as opposed to $400 economic output). This is because value added subtracts the sale of the purchased wood (intermediate input) of $100 from the total sales price of $400, resulting in value-added of $300.
Employment	Employment is measured in terms of full-time equivalents ("FTEs"). One FTE is the equivalent of one person working full-time for a full year. One FTE is also the same as one "person-year" of employment. For example, one person working full time for a year equates to one FTE. Two people each working full time for half a year also equate to one FTE.
Direct Economic Impacts	Direct impacts are changes that occur in "front-end" businesses that would initially receive expenditures and operating revenue as a direct consequence of the operations and activities of an industry, organization, or project. Example: A project spends money on hiring and employing staff. Those staff members would be considered the direct employment created by the project.

Term	Definition
Indirect Economic Impacts	Indirect impacts are changes that occur at suppliers to the "front-end" businesses. Example: The project spends money purchasing office equipment, which in turn supports employment at an office equipment supplier. The employment created at the supplier would be considered indirect employment created by the project.
Induced Economic Impacts	Induced impacts are due to shifts in spending on goods and services as a consequence of the payroll of the directly and indirectly affected businesses. Example: As a result of project spending, wages are received by project staff and by employees with the office supply company. Those staff and employees, in turn, make consumer purchases that create jobs within the general economy. The employment created within the general economy by the spending of staff and employees would be considered indirect employment created by the project.

Abbreviations

GHG	Greenhouse gas
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
tCO_2e	Metric ton (or "tonne") of carbon dioxide equivalent. One metric ton equals 1,000 kilograms
$ktCO_2e$	Kiloton of carbon dioxide equivalent. One kiloton equals 1,000 metric tons.
$MtCO_2e$	Megaton of carbon dioxide equivalent. One megaton equal 1,000 kilotons or 1,000,000 metric tons.

Appendix B – BC Carbon Pricing

In BC carbon pricing occurs through the BC Carbon Tax. BC does not have an emissions trading system. The BC Carbon Tax was first introduced in 2008. It is a broad-based tax which applies to the purchase and use of fossil fuels that are used throughout the economy. The initial pricing for the BC Carbon Tax was $10 per tonne of CO_2e with a $5 per year scheduled increase. It was frozen in 2013, restored in 2018, made consistent with the federal backstop carbon tax target of $50 per tonne by 2022, and increased to $40 per tonne in 2019. A planned increase to $45 per tonne in 2020 was deferred to March 31, 2021 in response to the COVID-19 pandemic.

The BC Carbon Tax applies to:

- 70% of provincial GHGs.
- The purchase or use (i.e., not combusted) of fuels with some exemptions as well as use of combustibles, such as peat and tires, when used to produce heat or energy.
- Biodiesel and straight vegetable oil (SVO) at the same rate(s) as diesel (motor fuel tax) and light fuel oil – diesel (carbon tax).
- Ethanol at the same rate as gasoline.
- Propane (unless exempt).

The tax is applied at different rates for different products. The calculation is volume based and the tax amount must be included on sales invoices. The following table shows the current rates for different fuels.

TABLE B1. BC CARBON TAX RATES FOR DIFFERENT FUELS

Fuel	
Clear Gasoline	8.89c/litre
Clear Diesel (Motive Fuel/Light Fuel Oil)	10.23c/litre
Coloured (marked) Gasoline	8.89c/litre
Coloured (marked) diesel	10.23c/litre
Propane	8.86c/litre
Natural gas	7.60/m3 or 1.9864/GJ

Methanol blends	
Methanol portion	4.36¢/litre
Gasoline portion	8.89¢/litre
Diesel portion	10.23¢/litre
For Fuels/Substances not used in Internal Combustion Engines	
Light Fuel Oil – Heating Oil/Industrial Oil, non-motor fuel oil	10.23c/litre
Kerosene	10.44¢/ litre
Naphtha	10.20¢/litre
Methanol	4.36¢/litre
Propane	6.16¢/litre
Gas Liquids	6.60¢/ litre
Butane	7.04¢/ litre
Ethane	3.92¢/ litre
Pentanes Plus (includes Iso-octane)	7.04¢/ litre
Refinery Gas	7.04¢/m3
Coke Oven Gas	6.44¢/m3
Low Heat Value Coal – coal of any type with a heat value of up to and including 27,000 kilojoules per kilogram	$71.08/tonne
High Heat Value Coal – coal of any type with a heat value greater than 27,000 kilojoules per kilogram	$83.08/tonne
Coke	$99.48/tonne
Petroleum Coke	14.68¢/litre

Appendix C – Carbon Pricing in Other Jurisdictions

Table C1 summarizes carbon taxes by jurisdiction in 2020.

TABLE C1. CARBON TAXES BY JURISDICTION (2020)

Sourced from country data, World Bank and I4CE

Jurisdiction	Price US$/$tCO_2e$	Coverage (Percent)
EU non-industry		
Denmark	27	40
Estonia	2	3
Finland	73	36
France	53	35
Iceland	32	29
Ireland (transport fuels)	24	49
Latvia	10	15
Liechtenstein	99	26
Norway (upper)	62	60
Poland	<1	4
Portugal	15	29
Slovenia	19	24
Spain	18	
Sweden	130	40
Switzerland	99	33
UK	24	23
Ukraine	<1	71
Japan	3	68

Mexico	4	46
Chile	5	39
Colombia	5	24
Argentina most liquid fuels (US$1 for fuel oil, mineral coal, petroleum coke)	6	20
Singapore	4	80
South Africa	7	
Canada		
B.C.	30	70
N.B (Canada OBPS)	23	40
P.E.I (Canada OBPS)		35
Ontario (Canada OBPS)		
Nunavut (Canada OBPS)		
Saskatchewan (partial OBPS)		
Yukon (Canada OBPS)		
NWT		
Alberta (TEIR)	23	45
Manitoba (fuels OBPS equivalent for industry, >= 50k tonnes CO_2e)	19	
Newfoundland	15	91

Table C2 summarizes Emissions Trading Systems in 2020.

TABLE C2. EMISSIONS TRADING SYSTEM BY JURISDICTION (2020)

Sourced from country data, World Bank and I4CE		
Jurisdiction	Price US$/$tCO_2e$	Coverage (Percent)
EU (all industry in 27 EU members)	$28	45
New Zealand	17	51
Tokyo – Saitama	6	18
South Korea	22	70
Kazakhstan	1	50
China		30
Beijing	12	45
Guangdong	4	60
Shanghai	5	57
Shenzhen	2	40
Tianjin	3	55
Chongqing	5	50
Hubei	4	35
Fujian	1	60
Canada		
Nova Scotia	18	
Quebec	17	85
California (linked with Quebec)	17	80
RGGI (electricity only)	7	18
Mexico (pilot as of Jan 2020)	unknown	37

The following section contains additional details of carbon pricing systems used in a selection of jurisdictions (Alberta, Quebec, Nova Scotia, California, Europe, Australia, and Chile).

Alberta Technology and Innovation Emissions Reduction Regulation (TIER)

TIER[62] applies to any facility emitting 100,000 tonnes or more of CO_2e in 2016, or any subsequent year. A facility below the threshold (between 10,000 tCO_2e and 100,000 tCO_2e) may opt in if it competes with a firm captured by the TEIR criteria. TEIR does not apply to electricity generation facilities. Some facilities are aggregated if they are managed by the same entity.

As elsewhere, facilities are benchmarked and must reduce their emissions by 10% relative to an historical production weighted average emissions intensity.

Regulated emissions include both direct and indirect emissions. The latter are linked with facility specific imports of electricity, industrial heat, and hydrogen. Industrial processes emissions are included in the benchmarking. Methane and NOx are considered regulated emissions.

Facility specific benchmarks decline by 1% per year beginning in 2021. This approach behaves similarly to the federal Output Based Pricing System. For example, if a facility's benchmark is 90% in 2020, its 2021 benchmark is 89%. Assuming it does not deliver on the 1% reduction it would pay tax on the 1% difference. If it achieves its benchmark the facility pays no tax.

New facilities are exempt from the regulation for three years after operational start but must report emissions.

A facility has several compliance options:

- On-site emission reductions.
- Use of emissions performance credits (produced and traded by facilities that exceed their emission reduction obligations). Credits have various expiry dates.
- Use of Alberta-based emissions offsets.
- Payment into a TIER fund (for the 2020 compliance year, a price of$30/tonne of CO_2ehas been set).

Quebec

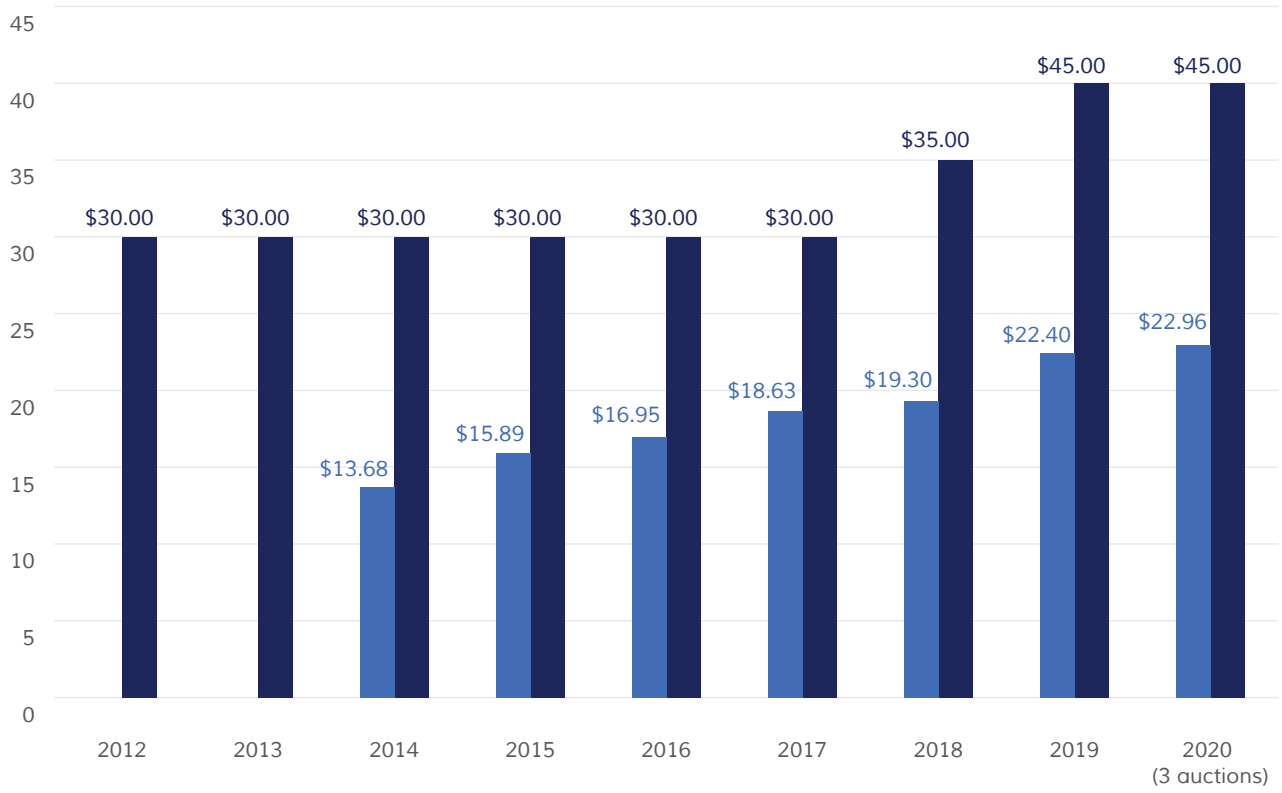
Quebec is linked to the California emissions trading system. This means there is mutual acceptance of compliance instruments and a shared allowance auction market.

The Quebec government distributes allowances to the companies, either for free or through an auction. Companies reducing emissions can sell allowances or bank them for future use.

62 https://www.alberta.ca/assets/documents/ep-fact-sheet-tier-regulation.pdf and https://www.osler.com/en/resources/regulations/2019/the-more-things-change-the-more-they-stay-the-same-alberta-revamps-carbon-pricing-regime-for-large.

Pricing for non-free allowances is determined via auction. Quebec joined the California ETS in 2014. The first join auction was held in November 2014. The figure below shows the Canadian dollar per tonne of CO_2e auction results. The 2013 number is for one auction only the next years are averaged. The BC Carbon Tax is presented for comparison. At present, Quebec industries participating in the ETS pay approximately 60% of the BC rate on a per tonne basis and may pay even less based on free allowance allocations.

BC versus Quebec Carbon Price CAD/tCO_2e
Source: CARB, Province of BC



California

The California emissions trading system began operation in 2013 (five years after the BC carbon tax). The first auction set a price that was 70% lower than the BC Carbon Tax level at the time. Since then the price has been rising slowly and is currently at about 40% lower than the BC Carbon Tax (as with Quebec, the current price in Canadian dollars is at $22.96/tCO_2e$). As with Quebec this price does not apply to all emissions, only the amount above that protected by free allowances. In effect, the California and Quebec ETS is simply a bridge toll (on top of regulations) that makes out-of-state/out-of-province suppliers pay "access" fees that are revenues distributed to in-state/in-province producers.

Nova Scotia

The Nova Scotia cap and trade program[63] is modelled after the Quebec/California system except that it is a closed market, meaning only in-province emitters can participate. The first allowance auction was held in June 2020. There were 15 qualified bidders and a $24 settlement price, still only 60% of the BC Carbon Tax and $6 less than the federal OBPS in 2020.

European Emissions Trading Systems

Many countries in the European Union have two carbon pricing systems. One for individuals and small and medium sized businesses and another for large industry. All EITE European industrial sectors participate in the EU ETS.

The EU ETS began in 2005. Sectors covered include power and heat generation, energy-intensive industry sectors including oil refineries, steel works and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids, and bulk organic chemicals. A certain number of allowances are set aside for new market entrances and it has a Market Stability Reserve to help manage both surplus allowances and swings in allowance numbers.[64]

The EU ETS operates in all EU countries and is much like the California/Quebec ETS. For many years, the allowance price was as low as US$5/t$CO_2$e. In 2019 is rose to US$28/tCO_2e. While this is getting closer to the level of the BC Carbon Tax on a per tonne level, it is applied to only a small portion of emissions – a result of free allowances used to support EITE industries. Up until 2020, the EU distributed 80% free allowances to certain industries. Going forward (2021 to 2030) the EU plans to transition to a benchmark process for determining the amount of free allowances issued. Industries considered at-risk are listed and include mining industries. Industries considered most at-risk are slated to receive 100% free allocations.[65]

Australia

A carbon pricing scheme in Australia was introduced in 2011 as the Clean Energy Act 2011. The act came into effect in July 2012 and was repealed in July 2014. It has not been replaced and the Australian government is in the process of developing a long-term strategy.[66] The Australian government has developed some initiatives including renewable energy development and a $2 billion Climate Solutions Fund.[67]

63 https://climatechange.novascotia.ca/nova-scotias-cap-trade-program.

64 https://ec.europa.eu/clima/policies/ets_en.

65 https://ec.europa.eu/clima/policies/ets/allowances/industrial_en.

66 https://www.pmc.gov.au/sites/default/files/publications/Summary%20Report%20Australias%202030%20Emission%20Reduction%20Target.pdf.

67 https://www.industry.gov.au/strategies-for-the-future/australias-climate-change-strategies.

Chile

The carbon tax in Chile is US$5/$tCO_2e$ and was implemented in 2017. It applies to thermal electricity generation facilities with capacity of 50MW or more, and other industries if they emit 25,000 tCO_2e and/or 100 tonnes of particulate matter from combustion of fossil fuels processes per year. Electricity generation and industry represent about 39% of country emissions. The carbon tax and related monitoring, reporting and verification system is designed to fit with an emission trading system, including the use of offsets, which could be an outcome of the 2017 Carbon Pricing in the Americas Declaration (Canada and British Columbia are also signatories to the Declaration).[68]

68 https://www.carbonpricingleadership.org/news/2017/12/14/leaders-commit-to-regional-cooperation-on-carbon-pricing-in-the-americas.

Appendix D – About the Study

Mansfield Consulting Inc. (www.mansfieldconsulting.ca) provides specialized consulting services on economic and statistical issues. Mansfield Consulting Inc. was founded by Ed Mansfield Ph.D., who has more than thirty years of experience providing consulting services to public and private companies, professional associations, industry organizations, and government agencies.

During his career Ed has been a partner or principal with four major accounting and business consulting firms, including the last 10 years with MNP LLP, where he was the national leader for the firm's Economics & Research practice. Prior to joining MNP LLP Ed held similar positions with PwC LLP, Grant Thornton LLP, and Arthur Andersen LLP. Ed has Ph.D. and M.S. degrees in Applied Mathematics from the University of Washington, and a B.Sc. in Mathematics and Statistics from the University of BC.

Working with Mansfield Consulting on this study was Denise Mullen, MPA, BA, CCR, CPL. Denise is the President of DMD Management Ltd and has worked in the energy, environmental and natural resources for over thirty years.

Study Limitations and Restrictions

This report is provided for information purposes and is intended for general guidance only. It should not be regarded as comprehensive or a substitute for personalized business or investment advice.

Mansfield Consulting Inc. has relied upon the completeness, accuracy, and fair presentation of all information and data obtained from industry representatives and public sources believed to be accurate. The accuracy and reliability of the findings and opinions expressed in the presentation are conditional upon the completeness, accuracy, and fair presentation of the information underlying them. As a result, we caution readers not to rely upon any findings or opinions for business or investment purposes and disclaim any liability to any party that relies upon them as such.

Our analysis is based upon projections, founded on past events giving an expectation of certain future events. Future events are not guaranteed to follow past patterns and results may vary, even significantly. Accordingly, we express no assurance as to whether the projections underlying the economic and financial analysis will be achieved.

Additionally, the findings and opinions expressed in the presentation constitute judgments as of the date of the presentation and are subject to change without notice. We are under no obligation to advise of any change brought to its attention which would alter those findings or opinions.

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