**Carbon Pricing Ratio**

TECHNICAL MANUAL

# Preliminary Document Pertaining to the Consultation of the Industrial Sector Concerning the 2024-2030 Free Allocation Rules

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# SUMMARY

Since 2013, Québec has priced its greenhouse gas (GHG) emissions by means of a GHG emission cap-and-trade system (C&T system).

— Under this system, reporting emitters must obtain an emission allowance to cover each tonne of GHG emitted.

— The total quantity of emission units made available to businesses is declining each year, consistent with Québec's GHG emission reduction targets.

Under the C&T system, large industrial enterprises can benefit from a free allocation to mitigate the cost of carbon pricing.

— The free allocation thus limits the risk of offshoring industrial activities carried out in Québec to countries with lower carbon pricing.

— To ensure that the C&T system remains coherent with Québec climate targets, the free allocation must, however, decline in the coming years.

In conjunction with the elaboration of the free allocation approach for the period 2024-2030, the government wants the free allocation to decrease gradually and adapt to the context in which emitters are operating.

One way to do so is to adjust the free allocation according to changing global carbon pricing practices.

## ❑ The carbon pricing ratio: taking into account global carbon pricing trends

Starting from 2024, the Québec government is contemplating a more or less rapid reduction in the free allocation according to changes in international carbon pricing practices. The **carbon pricing ratio** will measure such changes.[1]

Overall, the ratio will reflect the relationship between average carbon pricing in Québec and such pricing elsewhere in the world. It will consider both the explicit price of one tonne of GHG, and the proportion of emissions covered in all jurisdictions.

— In this way, the level of free allocation could dwindle more rapidly if global carbon pricing increases relatively faster than that in Québec.

— Conversely, the level of free allocation could dwindle less rapidly if global carbon pricing changes less rapidly than that in Québec.

For 2019, the estimated value of the ratio is 7.1, which means that carbon pricing is, on average, seven times more present in Québec than in the rest of the world.

[1] This document seeks solely to define the carbon pricing ratio and explain the calculation method adopted. The ratio's impact on the free allocation granted to large industrial enterprises will be explained in detail when the industrial sector is consulted with respect to the 2024-2030 free allocation, and eventually in the *Regulation respecting a cap-and-trade system for greenhouse gas emission allowances.*

# 1. A RATIO TO MEASURE QUÉBEC'S LEAD IN THE REALM OF CARBON PRICING

## 1.1 Québec is a leader in carbon pricing

Like other jurisdictions at the international level, Québec has made carbon pricing a key facet of its strategy to tackle climate change.

Indeed, in 2013 Québec established the GHG emission cap-and-trade system (C&T system).

— Under the system, the level of greenhouse gas (GHG) emissions cannot exceed a quantity that the government determines (emission cap).

— The quantity of authorized emissions is decreasing each year, especially in light of Québec's GHG emission reduction targets.[2]

— The price is changing according to interaction between supply (the emission cap set by the government) and demand (emitters' needs).

The C&T system covers GHG emissions from large industrial enterprises[3] and those attributable to fuel consumption and fossil fuels.

— Establishments subject to the C&T system must obtain an emission allowance for each tonne of GHG emissions for which they are responsible.

### ❑ A system that allows for the attainment of the desired reductions at lower cost

From an economic standpoint, the C&T system is the most efficient way to reduce GHG emissions since its market mechanism ensures that the least costly reductions are achieved first.

What is more, the C&T system is linked to California's system, which pools the two governments' reduction targets and enables all businesses present on the market to trade emission units.

— The establishment of a joint market thus promotes the attainment of Québec's and California's climate targets at lower cost.

— Indeed, a common carbon price fosters the initial attainment of the least costly reductions, thereby limiting the economic impact of the fight against climate change.

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2 Québec has set as its target a 37.5% reduction in its GHG emissions by 2030, in relation to 1990. It is also targeting carbon neutrality by the year 2050.

3 In this document, the expression "large industrial enterprises" refers to industrial reporting emitters pursuant to subparagraph 1 of section 2 or section 2.1 of the *Regulation respecting a cap-and-trade system for greenhouse gas emission allowances* that are eligible for the free allocation of emission units pursuant to section 39 of the same regulation.

## ❑ The free allocation of emission units serves global targets in the fight against climate change

Carbon pricing can help accelerate the decarbonization of the economy by generating an effective price signal, which promotes behaviour that reduces the carbon footprint.

In open economies such as Québec's, industrial enterprises can, however, enjoy limited leeway to recover the cost of carbon pricing by increasing the price of their products.

— For example, Québec firms are competing with establishments that are sometimes situated in jurisdictions where carbon is barely priced or not priced at all.

— Moreover, the prices of several industrial products are set on international markets.

Substantial carbon pricing can thus harm the competitiveness of certain industrial enterprises and lead to the offshoring of their GHG-emitting operations to jurisdictions with lower or non-existent carbon pricing (carbon leakage).

— This can result in plant closures, the partial relocation of operations, or a loss of market share to foreign firms that are not subject to the same constraints.

Carbon leakage can lead to higher global GHG emissions, especially when production is shifted to jurisdictions where the technologies used are less efficient and where the energy used is more emissive.

— Given the Québec context, where hydroelectricity significantly sustains industrial production, a shift in such production from Québec abroad could increase global GHG emissions.

For this reason, businesses subject to GHG emission cap-and-trade systems in the world can usually benefit from a free allocation of emission units when the risk of carbon leakage warrants doing so.

The gradual reduction in the free allocation of emission units allows for the integration of an increasingly significant carbon cost, while taking into account the capacity of businesses to contend with the cost. This measure thus directly serves global targets respecting the fight against climate change by limiting the movement of emissive activities.

## 1.2 Why consider global carbon pricing trends in the free allocation?

### ❑ Differences around the world in carbon pricing practices

As is true of most carbon pricing systems in the world, the relative risk of carbon leakage among businesses subject to the C&T system is mainly determined by:

— their exposure to world trade, which affects the capacity of businesses to adjust their prices to reflect carbon pricing;

— the importance of GHG emissions in their production processes since carbon pricing more broadly affects firms that produce goods with a high carbon footprint.

Were all countries to adopt equally rigorous policies to fight climate change, businesses subject to carbon pricing would not need support like the free allocation of emission units.

— Indeed, in such a context, businesses exposed to international trade would not be put at a disadvantage compared to their competitors, since the latter would be subject to similar environmental constraints and could adjust their prices accordingly.

— Besides, the carbon footprint would become a key point of competitiveness for businesses and countries.

As long as global carbon pricing practices are not more uniform, it will therefore be warranted to offer free of charge a portion of the emission units to the Québec industrial sector.

— However, such assistance should be adjusted according to changing climate policies outside Québec.

## ❑ A growing number of jurisdictions are establishing carbon pricing initiatives

Significant progress has been achieved in recent years in the realm of carbon pricing.

— Indeed, between 2010 and 2020, the proportion of global GHG emissions covered by carbon pricing tripled, from 5% to 16%.

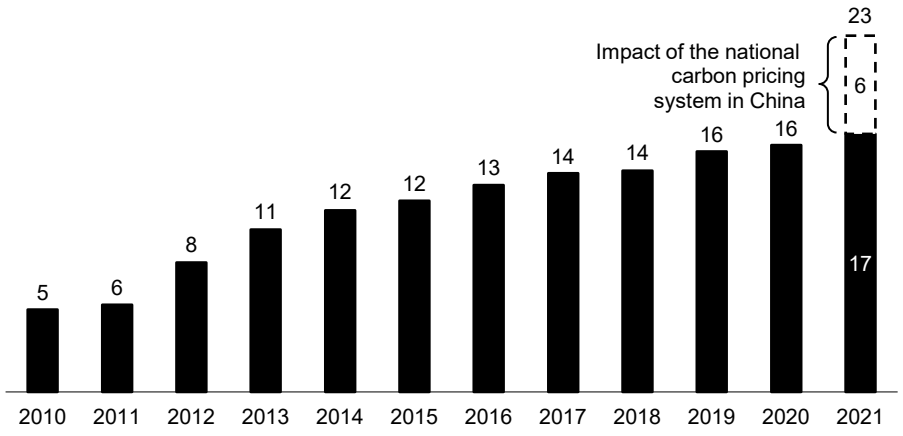
— The establishment in 2021 of a national carbon market in China could raise this proportion to 23%.

Despite this progress, significant differences remain in carbon pricing practices at the international level.

As Québec's main trading partners adopt carbon pricing systems, the risk of carbon leakage among Québec businesses will subside, as will the need for allowances free of charge.

CHART 1

**Global GHG emissions covered by carbon pricing**
(as a percentage of total GHG emissions)




Source: World Bank.

## ❑ A free allocation better adapted to the needs of businesses

For the period 2024-2030, the level of the free allocation for industrial businesses could decline more or less rapidly according to changes in carbon pricing in the world.

— Hence, the level of free allocation granted to industrial businesses would partly depend on the risk of carbon leakage linked to differences in climate policies at the international level.

Thereby, a quicker increase in global carbon pricing than that in Québec would more rapidly reduce the free allocation offered to businesses.

— Indeed, such a change could enhance the relative capacity of Québec businesses to adjust their prices to take into consideration carbon pricing since their competitors on international markets would contend with more similar environmental requirements.

— Such a situation would warrant a more sustained reduction in the free allocation.

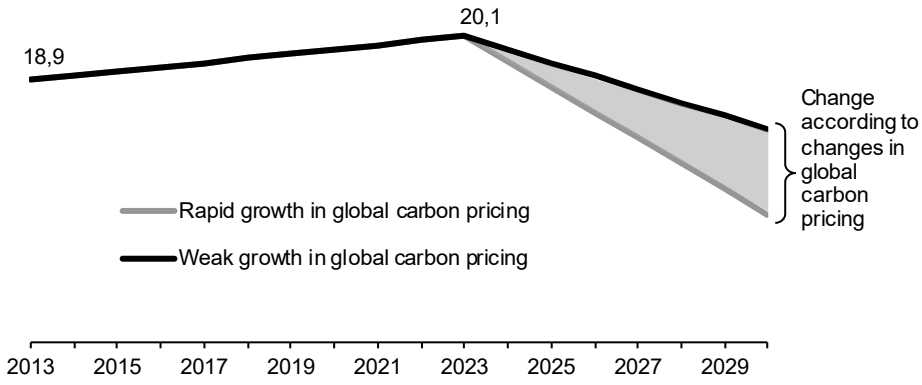
On the contrary, a slower increase in global carbon pricing in relation to that in Québec could increase the risk of carbon leakage.

— This would limit the possibility for Québec businesses to adjust their prices to take into consideration carbon pricing, which would justify a slower reduction in the free allocation.

To measure changes in global carbon pricing in relation to that in Québec, a **carbon pricing ratio** has been elaborated.[4]

CHART 2

**Level of the free allocation according to changes in global carbon pricing**




Note: Illustration based on projected and real volumes of the free allocation.
Sources: Ministère de l'Environnement et de la Lutte contre les changements climatiques and Ministère des Finances du Québec.

[4] The measure stems from an interdepartmental approach launched by the Ministère des Finances du Québec and the Ministère de l'Environnement et de la Lutte contre les changements climatiques, in collaboration with government partners and international agencies.

## 2024-2030 free allocation rules

The carbon pricing ratio falls within the scope of the renewal of Québec's approach to the free allocation of emission units for the period 2024-2030. The approach seeks, in particular, to:

- ensure a reduction of the total level of free allocation in keeping with the government's climate targets;
- foster the maintenance of the industrial sector's competitiveness by supporting its climate transition;
- accelerate business investments in the climate transition;
- adapt the free allocation to emitters' new realities, especially the risks of carbon leakage.

The carbon pricing ratio is one part of the approach and seeks to consider changing carbon leakage risks on international markets by reflecting global carbon pricing trends.

**The free allocation rules proposed for the period 2024-2030**

The ratio would apply uniformly to all businesses that benefit from the free allocation and would not vary from one sector or business to another.

However, other components of the 2024-2030 approach could be used to adjust the support offered to businesses according to the context in which they are operating and to differentiate risks related to carbon leakage.

Accordingly, starting from 2024, the government is contemplating:

- considering the real intensity of GHG emissions from the production of businesses;
- more accurately differentiating the reduction of the free allocation according to the risk of prejudice to competitiveness specific to the businesses;
- reserving on behalf of the emitters part of the value of the reduction in the free allocation to facilitate their climate transition, whether in the case of greenhouse gas emission reduction projects or research and development projects in this field.

# 2. CALCULATION OF THE CARBON PRICING RATIO

The carbon pricing ratio expresses the average level of carbon pricing in Québec in relation to that in the rest of the world and is obtained by means of the following equation:

$$\text{Ratio} = \frac{\text{Average carbon pricing in Québec}}{\text{Average carbon pricing in the rest of the world}}$$

Average carbon pricing considers both the price of carbon and the proportion of emissions covered by carbon pricing (or the coverage rate).

$$\text{Average carbon pricing} = \text{carbon price x coverage rate}^{5}$$

Hence, the ratio will decrease when global average carbon pricing increases more rapidly than that in Québec.

— In the context of Québec's 2024-2030 approach to free allocation, a lower ratio could accelerate a reduction in the free allocation of large industrial companies.

Conversely, the ratio will increase when global average carbon pricing increases less rapidly than that in Québec.

— A high ratio could slow the reduction in the free allocation.

[5] For example, in a jurisdiction where the price of carbon stands at $10 and the proportion of GHG emissions covered is 50%, average carbon pricing would thus be $5 according to the formula.

## 2.1 Components of the ratio

The carbon pricing ratio relies essentially on data pertaining to:

— the price of carbon in Québec and in different carbon pricing systems on international markets;

— the coverage rate of GHG emissions in Québec and in the rest of the world.

### 2.1.1 Carbon price

The ratio incorporates the full available data focusing on explicit carbon pricing initiatives.

Explicit carbon pricing is a mechanism that calls for a price for each tonne of GHG emitted and covered so as to encourage economic agents to adopt practices that reduce their carbon footprint. The price can be set by the government or determined by a market mechanism.

The initiatives included in the calculation encompass direct carbon pricing mechanisms such as carbon taxes and fuel charges.

— To be considered in the calculation of the ratio, a fuel charge must focus specifically on the carbon content of the fuels.

— The taxes on gasoline applied to the volume of fuel, even though they indirectly target a source of GHG emissions, do not take into consideration the real carbon content of the fuels consumed. They are, therefore, excluded from the calculation.

GHG emission cap-and-trade systems such as the Québec's C&T system, under which the quantity of emissions is set or the price is determined according to supply and demand, are also included.

Lastly, hybrid systems such as output-based pricing systems are also considered. Under these systems, businesses pay an amount per tonne of carbon emitted but only on the emissions that exceed a benchmark set by the government.

Other forms of carbon pricing could be included in the future, such as carbon border adjustment mechanisms, some of which could emerge in the coming years.

— Such mechanisms seek to apply a cost to the carbon content of goods imported from jurisdictions in which carbon pricing is limited or non-existent.

— The possible consideration of such mechanisms will depend on the form that they take and their ability to transmit an explicit price signal.

## The price of carbon as a price signal measure

The carbon pricing ratio is measured based on carbon prices and coverage rates in Québec and elsewhere in the world. It therefore associates a price on carbon with overall GHG emissions subject to pricing systems, regardless of mitigation measures.

- Indeed, depending on the system adopted, mechanisms can reduce the cost for emitters of carbon pricing.

The measures can take the form of a free allocation of emission units, benchmarks for output-based pricing systems, carbon tax exemptions, or even changes to the tax system.

**Reliance on the price of carbon better reflects the impact on businesses of carbon pricing**

Overall, the measures used at the global level to mitigate the cost of carbon pricing reduce the amount that an emitter must pay to ensure its environmental compliance, in a context of international competition.

However, the direct cost of carbon pricing does not measure the investments that an emitter has made beforehand to reduce its “carbon bill.”

- Consequently, a business may invest substantially in its decarbonization because of a rising carbon price, even though it receives enough allowances free of charge in the short-term to obtain a low or even zero carbon bill.

The price of carbon is interpreted as the marginal cost for businesses to emit one tonne of GHG and thus represents a measurement of the marginal cost of carbon pricing. It represents the best price signal measure to estimate the carbon pricing ratio.

- Indeed, whether or not a business has a carbon bill, it can nonetheless be strongly encouraged to invest in clean technologies if it perceives a clear price signal.

### 2.1.2 **Coverage rate**

The consideration of the coverage rate, i.e., the percentage of emissions covered by carbon pricing, is an essential factor to ensure that the economic impacts of carbon pricing are fully recognized.

— In this way, the ratio measures the presence of carbon pricing in the economy as a whole.

For example, without considering the coverage rate, a jurisdiction that prices 100% of its emissions at $10/tonne of carbon and a jurisdiction that prices 10% of its emissions at the same price would contribute in a similar way to global carbon pricing.

— However, the carbon price signal is much more present in the first jurisdiction.

The consideration of the coverage rate also avoids double counting of priced emissions in jurisdictions where several pricing systems overlap, for example, in certain European countries.

| **Carbon pricing affects the overall value chain** |
| --- |
| While the carbon pricing ratio seeks first to adjust the pace at which the level of the free allocation for industrial businesses decreases, it does not solely consider the price signal to which they are directly subject.<br><br>Since the ratio is established according to the coverage rates of different initiatives, it considers the impact of carbon pricing on the economy as a whole, including the transportation and energy sectors.<br><br>The consideration of all sectors allows the ratio to reflect the impact of carbon pricing in the entire value chain of businesses.<br><br>– For example, when the transportation sector is targeted by a fuel tax, all the industries that use fuels in their chain of production pay a cost associated with carbon pricing, even if the cost is recorded outside their economic sector.<br><br>– In response to carbon pricing applied to fossil fuels, households could demand higher wages to protect their purchasing power, thereby transferring part of the cost of carbon pricing to their employers, including businesses in the industrial sector. |

## 2.2 Ratio calculation method

To calculate the carbon pricing ratio, it is necessary to determine average carbon pricing both in Québec and in the rest of the world.

### 2.2.1 Calculation of average carbon pricing in Québec

The notion of an average carbon price requires the measurement of the price of carbon for the emissions covered and a measurement of the proportion of emissions covered by such initiatives.

In Québec, the carbon price signal is generated through the C&T system.

— For each year, an emission cap is determined and, according to such a cap, a number of emission units is auctioned. The market determines the price of such units.

However, carbon pricing doesn't target the economy as a whole. Indeed, the C&T system mainly targets large industrial enterprises and fuel distributors (transportation and buildings) and excludes, for example, the residual materials sector.

According to the definition adopted, average carbon pricing in Québec is obtained by multiplying the price of carbon of Québec's C&T system by the coverage rate of carbon pricing in Québec, i.e., the proportion of GHG emissions subject to the system:

$$\begin{matrix}\text{Average carbon pricing} \\ \text{in Québec}\end{matrix} = \begin{matrix}\text{Carbon price} \\ \text{in Québec}\end{matrix} \times \begin{matrix}\text{Coverage rate of carbon} \\ \text{pricing in Québec}\end{matrix}$$

## Compliance by businesses subject to the C&T system

To ensure their compliance with the C&T system, businesses whose operations are likely to be delocalized because of carbon pricing (carbon leakage) can receive a free allocation of emission units.

The compliance of businesses subject to the C&T system is supplemented through the purchase of emission units auctioned by Québec and California.

- The auctions constitute the primary market and are held four times a year. They are open both to emitters subject to the C&T system and to investors.
- Most of the emission units sold there are current vintage.
- The participants also have the possibility of obtaining future vintage units, which can be used to ensure compliance by covered entities during future compliance periods.

Beyond the primary market and free allocation, other possibilities enable businesses to comply with the obligations under the C&T system:

- the purchase of units on the secondary market;
- the acquisition of offset credits.

**The secondary market**

The secondary market encompasses transactions that can be conducted using emission units initially sold on the primary market or distributed free of charge to large industrial enterprises.

Such transactions can be conducted by mutual agreement or on the derivatives market, comprising futures contracts or options negotiated on transactional platforms.(1)

**Offset credits**

An offset credit is a compliance unit stemming from an activity not covered by the C&T system that can be sold to subject emitters.

- Projects that lead to the issuance of offset credits must focus on permanent emissions reductions that would not otherwise have occurred.

The purchase of offset credits can reduce the carbon bill of subject emitters if the price of such credits is lower than that of the emission units on the primary and secondary markets.

- However, the regulation stipulates that a maximum of 8% of compliance by businesses can be ensured through offset credits.

To date, Québec offset credit protocols exist for the destruction of methane in landfill sites, in mines, or from manure storage, and for the destruction of ozone-depleting substances (ODS).

- Deliberations are under way to determine other activities in respect of which offset credit protocols could be established, for example in the forest sector.
- Subject emitters can also use offset credits from California.

(1) The most widely used transactional platforms for this type of trading include the Intercontinental Exchange (ICE) and the Nodal Exchange.

## ❑ Carbon price in Québec

In Québec, most of the C&T system price signal is generated through sales of emission units during joint Québec-California auctions.

— Consequently, it is these prices that are used to determine the price of carbon.[6]

— The price of the offset credits and the units traded on the secondary market is not, therefore, considered in the calculation.

Joint auctions are held four times a year. Prices and quantities can vary from one auction to the next.

To obtain a price that is representative of carbon pricing for a given year overall, an average final price for each auction weighted by the quantity of units sold is used. Only current vintage units are considered.

— For example, using this method, the price of carbon in Québec stood at US$16.78 in 2019.

The information used to perform this calculation is found in the summary auction reports published by the Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC)[7] and the California Air Resources Board (CARB).[8]

TABLE 1

**Carbon price in Québec in 2019 – Weighted average for current vintage units**
(in US dollars, unless otherwise indicated)

| | February | May | August | November | Total |
|---|---|---|---|---|---|
| Current vintage units sold(1) | 80 847 404 | 66 321 122 | 66 289 515 | 67 435 661 | 280 893 702 |
| *As a % of the total (A)* | *28.8%* | *23.6%* | *23.6%* | *24.0%* | *100.0%* |
| Final selling price (B) | 15.73 | 17.45 | 17.16 | 17.00 | — |
| **Weighted price (A x B)** | **4.53** | **4.12** | **4.05** | **4.08** | **16.78** |

(1) Since Québec and California jointly conduct the auctions, all the current vintage units sold to emitters in both jurisdictions are considered.
Sources: Ministère de l'Environnement et de la Lutte contre les changements climatiques and Ministère des Finances du Québec.

6 Selling price of current vintage units.

7 **http://www.environnement.gouv.qc.ca/changements/carbone/ventes-encheres/avis-resultats-en.htm**

8 https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/auction-information/auction-notices-and-reports

## ❑ Coverage rate of carbon pricing in Québec

Once the price of carbon in Québec has been determined, it must be multiplied by the proportion of the emissions covered, to obtain average carbon pricing in the Québec economy overall according to the definition adopted.

To determine the coverage rate, data from the latest Québec GHG emissions inventory are used, from which the following emissions are excluded, from sources not subject to the C&T system:

— all emissions from the agriculture and waste sectors that are not the result of fuel combustion;

— emissions from air transport and maritime transport;

— halocarbons leakage from small industrial emitters not subject to the C&T system;

— fugitive emissions[9] from emitters not subject to the C&T system;

— emissions from residential fuelwood.

The coverage rate of the C&T system is then obtained by measuring the ratio between the emissions covered and total emissions in the inventory.

— In 2018, the coverage rate was evaluated at 79.3%.

TABLE 2

**GHG emissions and coverage rate by sector – 2018**
(in thousands of tonnes of $CO_2$ equivalent, unless otherwise indicated)

| | GHG emissions according to the Québec inventory | GHG emissions covered | Coverage (%) |
|---|---|---|---|
| Transportation | 36 094 | 34 336 | 95.1 |
| Industry | 24 195 | 22 121 | 91.4 |
| Residential, commercial, and institutional sector | 8 169 | 7 254 | 88.8 |
| Agriculture | 7 774 | — | — |
| Waste | 4 128 | — | — |
| Electricity | 246 | 246 | 100.0 |
| **TOTAL** | **80 607** | **63 958** | **79.3** |

Source: Ministère de l'Environnement et de la Lutte contre les changements climatiques.

[9] Fugitive emissions usually stem from leaks that occur during the transportation and distribution of natural gas.

## ❑ Average carbon pricing in Québec

Average carbon pricing in Québec for a given year is obtained by multiplying the carbon price under the C&T system by the most recent GHG emissions coverage rate available.

It is interpreted as an average price signal measure in all economic sectors.

— In 2019, the carbon price stood at US$16.78 (CA$22.31) in Québec, while the most recent coverage rate available stood at 79.3%.

— Consequently, average carbon pricing would be evaluated at US$13.31 if a ratio were announced in 2020 and applied to determine the 2022 free allocation.

  — Indeed, the ratio announced during a given year, for example, 2020, will rely on data for the preceding year (2019) but will apply to the free allocation two years later (2022).

## ■ A discrepancy observed between data on prices and on emissions

Unlike the selling price of emission units, it takes a long time to collect and process information to evaluate GHG emissions in Québec.

— At the end of a given year, businesses must calculate and report their emissions. The government departments concerned must then process the reports. More than a year can elapse before emission data for a given year are published.

— Data pertaining to the results of an auction are obtained only one week after the auction.

Consequently, the coverage rates used must usually be based on those for the most recent year for which data are available.

The coverage rate of emissions in Québec is nevertheless fairly stable from one year to the next. The use of a previous coverage rate does not, therefore, affect the reliability of the average carbon price estimated for the ratio.

### 2.2.2 Calculation of global average carbon pricing

To assess the importance of carbon pricing in Québec in relation to the rest of the world, the measure considers jurisdictions that have established carbon pricing systems but also those that do not have such a system.

— Implicitly, carbon pricing is deemed to be null for the jurisdictions that do not price carbon in their territory.

Consequently, the average carbon price in the rest of the world is calculated as follows:

$$\begin{matrix}\text{Global average carbon}\\ \text{pricing (excl. Québec)}\end{matrix} = \sum \left[ \begin{matrix}\text{Carbon price for}\\ \text{each initiative}\end{matrix} \times \begin{matrix}\text{Proportion of emissions covered}\\ \text{in relation to global emissions}\end{matrix} \right]$$

This represents a weighted average of the carbon prices of each explicit carbon pricing initiative, excluding Québec.

The proportion of emissions covered by each initiative is obtained by dividing the GHG emissions covered under the initiative by total global emissions, excluding Québec.

$$\begin{matrix}\text{Proportion of emissions covered}\\ \text{in relation to global emissions}\end{matrix} = \frac{\text{Emissions covered by the initiative}}{\text{Total global emissions (excl. Québec)}}$$

The measurement thus obtained expresses the presence of carbon pricing in all jurisdictions outside Québec while taking into account the jurisdictions that do not price carbon.

— Hence, a jurisdiction that does not price carbon will lower global average carbon pricing.

#### ❑ Calculation of the price of carbon by initiative in the rest of the world

For most of the carbon pricing initiatives included in the calculation of the ratio for a given year, the price of carbon used will be that observed on July 1 of that year, expressed in US dollars.

However, the method used to determine the price of carbon differs according to the carbon pricing mechanism.

— Certain prices will be estimated based on revenue collected through a jurisdiction's carbon pricing or by means of averages, especially in jurisdictions with several levels of carbon prices.

— The calculation methods specific to each initiative will be described in greater detail in the databases that the Ministère des Finances du Québec will publish annually.

The conversion of carbon prices into US dollars will be based on the average annual exchange rate published by the International Monetary Fund (IMF).

— The use of an annual average helps to limit the possible impact of short-term variations on the ratio, such as a sudden, temporary increase in the exchange rate for a currency.

## ❑ Emissions covered by carbon pricing initiatives in the rest of the world

Information concerning emissions is usually obtained by means of national GHG emission inventories and other information that the governments in question make available.

— As is true of the price of carbon, the method of determining the emissions covered could differ from one pricing mechanism to another and certain exceptions might be noted.

— For example, in the case of carbon tax initiatives, the emissions covered will usually be obtained by dividing the revenue that governments collect by the explicit price of carbon.

— As for carbon market initiatives, it will usually be possible to obtain the emissions reported by the subject entities, made available by public authorities. However, in the absence of such data, emission caps could be used.

As a precaution, when it is impossible to evaluate the emissions covered or the emission caps, the emissions covered can be temporarily set at zero, especially when the systems are too recent.

## ❑ Global greenhouse gas emissions

The calculation of global carbon pricing requires that the price of carbon of each initiative be weighted by the share of the emissions covered over total global emissions, excluding Québec.

The collection of emissions data from all countries, including those that do not price carbon, can be complex and difficult to carry out annually.

In this respect, an annual evaluation of global GHG emissions, based on the latest literature, will be used to calculate the ratio.

## ❑ Global average carbon pricing

By multiplying, for each initiative, the price of carbon by the proportion of emissions covered over global emissions and by adding the results for all initiatives, a measurement of global average carbon pricing is obtained.

— According to the most up-to-date information available at the time of publication of this document, global average carbon pricing stood at US$1.88/tonne of $CO_2$ equivalent in 2019.

## ■ The contribution of different initiatives to global carbon pricing

A total of 65 carbon pricing initiatives were listed for 2019. The initiatives vary considerably from one place to the next as regards the carbon price and the proportion of emissions covered.

— For example, average carbon pricing was evaluated at US$14.78/tonne of $CO_2$ equivalent in 2019 in the countries participating in the Community Emissions Trading Scheme, a carbon market established by the European Union.

— In the United States and China, average carbon pricing is evaluated at US$0.91 and US$0.40/tonne of $CO_2$ equivalent, respectively.

— In the rest of the world, average carbon pricing stood at US$0.80/tonne of $CO_2$ equivalent in 2019.

Weighting the average pricing of each country or each block of countries by its relative importance in global GHG emissions produces the latters' contribution to global carbon pricing, which stands at US$1.88/tonne of $CO_2$ equivalent.

TABLE 3

**Contribution of different initiatives to global average carbon pricing – 2019**
(in US dollars per tonne of $CO_2$ equivalent, unless otherwise indicated)

| | Europe[1] | United States | China | Rest of the world[2] | Total[2] |
|---|---|---|---|---|---|
| Initiatives listed (number) | 16 | 3 | 8 | 38 | 65 |
| Average carbon price[3] (A) | 31.14 | 15.71 | 3.90 | 6.95 | 13.94 |
| Coverage[4] (%) (B) | 47.5 | 5.8 | 10.2 | 11.6 | 13.5 |
| **Subtotal – Global average carbon pricing (C = A x B)** | **14.78** | **0.91** | **0.40** | **0.80** | **1.88** |
| Proportion of global GHG emissions (%) (D) | 8.4 | 12.6 | 26.8 | 52.3 | 100.0 |
| **Total – Contribution to global average carbon pricing (C x D)** | **1.24** | **0.11** | **0.11** | **0.42** | **1.88** |

Note: The results presented must be interpreted with caution. For certain initiatives, the coverage rate is not available, but carbon pricing revenues are. For such initiatives, the price of carbon is obtained by dividing the revenues collected by the jurisdiction's total emissions.
(1) This group includes all the European Union (EU) countries and the countries outside the EU that are participating in the Community Emissions Trading Scheme, the carbon market established by the EU. The non-EU countries included in the calculation are the United Kingdom, Norway, Iceland, and Liechtenstein.
(2) This category excludes Québec. Moreover, several initiatives listed in Canada are too recent for data on the emissions covered to be available. Consequently, these initiatives have no impact on the estimates presented.
(3) Average carbon price applied to each tonne of $CO_2$ equivalent covered by carbon pricing.
(4) Proportion of the emissions covered in the countries where the initiatives were established.
Sources: International Carbon Action Partnership, Ministère de l'Environnement et de la Lutte contre les changements climatiques, and Ministère des Finances du Québec.

## ❑ Calculation of the carbon pricing ratio

Once average carbon pricing has been calculated for Québec and for the rest of the world, the carbon pricing ratio can be obtained simply by dividing the two levels of average pricing.

— This operation produces a measurement of the relative difference between average pricing in Québec and in the rest of the world.

According to the information presented in this document, the carbon pricing ratio stood at 7.1 in 2019.

— Indeed, average pricing in Québec stood at US$13.31 in 2019 whereas it stood at US$1.88 in the rest of the world.

In 2019, explicit carbon pricing was thus on average seven times more present in Québec than in all other jurisdictions in the world.

## 2.3 Accessibility of the data used to calculate the ratio

### ❑ Data collection

The full data set used to calculate the carbon pricing ratio will be compiled both by the Québec government and by an independent data supplier.

The Québec government provides data focusing on prices under the C&T system and emissions in Québec.

— Since this data significantly affects the result of the calculation, it is important that they be as accurate and complete as possible.

Most of the data will, however, be supplied to the Québec government by the data supplier and updated annually. In particular, such data will include for each explicit carbon pricing initiative listed:

— the type of carbon pricing, whether a carbon tax, a cap-and-trade system, or an output-based pricing system;

— the price of one tonne of carbon;

— the exchange rates used to convert the carbon prices into US dollars;

— the GHG emissions covered;

— the total GHG emissions of the jurisdiction in which the initiative was established.

### ❑ Source and accessibility of the data

All data used to calculate the ratio will come from official sources such as:

— the GHG emission inventories of the jurisdictions studied;

— other sources, such as summaries of auctions in the case of carbon markets;

— international organizations such as the IMF.

The ratio will be published in December of each year and the full data set used for the calculation will be made public.

| **The International Carbon Action Partnership: data collected objectively and transparently** |
| --- |
| Québec is a member of the International Carbon Action Partnership (ICAP), an organization specializing in cap-and-trade systems that serves, in particular, as a knowledge sharing platform.<br><br>In collaboration with Québec, the ICAP has created a data bank that lists existing carbon pricing initiatives, which was used to calculate the carbon pricing ratio for 2019.<br><br>Participation by an independent organization recognized in its field also ensures that the approach leading to the elaboration of the ratio is objective and transparent. |

## ❑ An annual update toward the end of each year

The most up-to-date ratio will be published in December of each year and will be used to determine the free allocation to be applied just over one year later.

— For example, the ratio published in December 2022 will be used to calculate the free allocation for 2024.

Given the availability of the information, the ratio published in a given year will be based on the carbon pricing for the preceding year and on certain information from previous years.

— For example, the ratio published in December 2022 will be based primarily on price information for 2021.

— However, the information used concerning emissions could focus on previous years because of the generally observed lags in its availability.

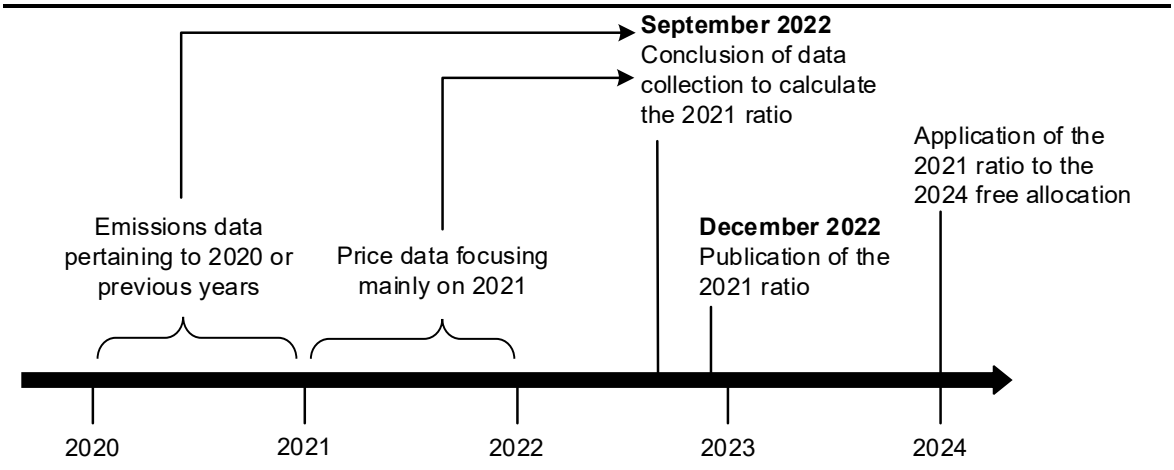
Even if the data used to calculate the ratio are updated later, the revision will have no retroactive impact on the free allocation.

— For example, if the ratio applied to the 2024 free allocation is updated after it has been announced, the free allocation for 2024 will not be modified.

— Such updates could arise for several reasons, including the availability of more recent GHG emissions data.

CHART 3

**Illustration of the steps leading to the application of the 2021 carbon pricing ratio**




Sources: Ministère des Finances du Québec and Ministère de l'Environnement et de la Lutte contre les changements climatiques.

# 3. CHANGE IN THE CARBON PRICING RATIO

## 3.1 The ratio has decreased in recent years

Over the past five years, the carbon pricing ratio has changed significantly because of the combined impact of:

— moderate growth in average carbon pricing in Québec;

— relatively rapid change in global average carbon pricing.

Since annual growth in global average carbon pricing (roughly 20%) exceeded that of Québec (roughly 8%) between 2015 and 2019, the carbon pricing ratio has dwindled.

— During this period, the ratio fell from 10.7 to 7.1.

The most significant reduction in the ratio in recent years occurred between 2017 and 2018, when it decreased from 10.5 to 7.4.

— The drop is attributable to a rapid increase in global carbon pricing (45%), combined with a modest rise in the price of the emission units auctioned under the C&T system in Québec (3%).

TABLE 4

**Carbon pricing ratio**
(relationship between average carbon pricing in Québec and such pricing elsewhere in the world)

| | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| Average carbon pricing in Québec (in US dollars) | 9.85 | 10.02 | 11.54 | 11.81 | 13.31 |
| Global average carbon pricing (in US dollars) | 0.92 | 0.86 | 1.10 | 1.59 | 1.88 |
| **Carbon pricing ratio** | **10.7** | **11.6** | **10.5** | **7.4** | **7.1** |

Note: Totals may not add due to rounding.
Sources: International Carbon Action Partnership, Ministère de l'Environnement et de la Lutte contre les changements climatiques, and Ministère des Finances du Québec.

## ❑ Recent changes in average carbon pricing in Québec

According to the information compiled when this document was elaborated, average carbon pricing in Québec rose from US$9.85 (or CA$12.53) to US$13.31 (or CA$17.70) between 2015 and 2019.

— Since 2015, average carbon pricing in Québec has thus risen on average by 8% annually.

Since the coverage rate is fairly stable from year to year, the increase is attributable mainly to the increase in the price of the emission units auctioned jointly by Québec and California in the context of the C&T system.

TABLE 5

**Average carbon pricing in Québec**
(in US dollars, unless otherwise indicated)

| | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| Carbon price in Québec | 12.44 | 12.73 | 14.49 | 14.88 | 16.78 |
| Coverage (%)[(1)] | 79.2 | 78.7 | 79.7 | 79.3 | 79.3 |
| **TOTAL** | **9.85** | **10.02** | **11.54** | **11.81** | **13.31** |

Note: Totals may not add due to rounding.
(1) The 2018 coverage was used for 2019 since the 2019 Québec greenhouse gas emissions inventory data were unavailable when this document was elaborated.
Sources: Ministère de l'Environnement et de la Lutte contre les changements climatiques and Ministère des Finances du Québec.

## ❑ Recent changes in average carbon pricing in the world

Between 2015 and 2019, global average carbon pricing doubled, from US$0.92 to US$1.88.

— Average carbon pricing in the world has thus increased annually by roughly 20% since 2015.

The most significant increase in the ratio occurred between 2017 and 2018, when global average pricing rose from US$1.10 to US$1.59/ tonne of $CO_2$ equivalent, up more than 40%.

— This variation is mainly attributable to the rapidly rising price of emission units on carbon markets in the European Union and in South Korea.

Changes in global average carbon pricing over the past five years stem, by and large, from the higher carbon price in the countries that have already established carbon pricing systems.

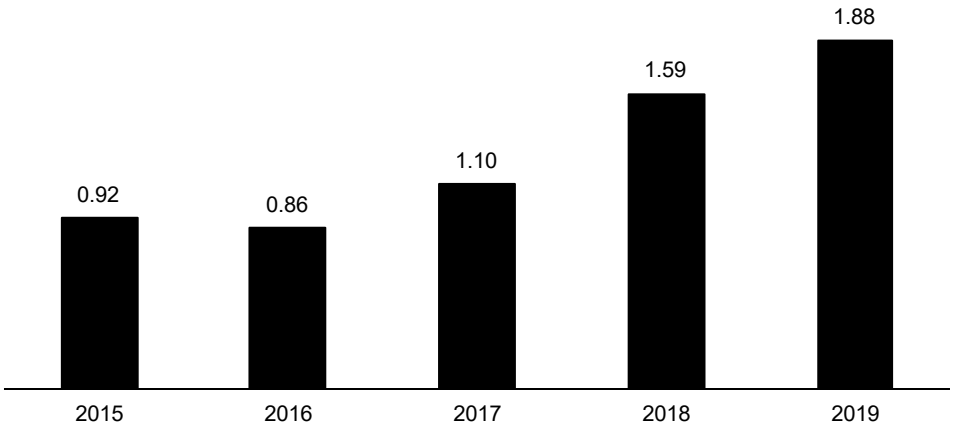
— In particular, average carbon pricing in the European countries that participate in the Community Emissions Trading Scheme increased from US$6.28 to US$14.78 between 2015 and 2019.

The proportion of emissions covered in the world appears to have stalled during the same period, rising from 13.3% to 13.5%.[10]

— Going forward, the inclusion of the Chinese national carbon market and the Canadian carbon pricing systems should increase the global coverage.

CHART 4

**Change in global average carbon pricing**
(in US dollars)




Sources: International Carbon Action Partnership, Ministère de l'Environnement et de la Lutte contre les changements climatiques, and Ministère des Finances du Québec.

[10] The data that allow for the evaluation of the coverage rates for 2018 and 2019 are, however, mainly drawn from previous years.

## 3.2 Illustrations of potential changes in carbon pricing

### ❑ Future changes in the ratio will depend on changes in the price in Québec and progress achieved in the world

Changes in the carbon pricing ratio in the coming years will depend on many factors that cannot be predicted with certainty.

- The price of carbon in Québec will increase minimally by 5% plus inflation.
- At the same time, carbon prices in the rest of the world could follow differentiated paths.
  - New systems will emerge and contribute to increasing the global proportion of emissions covered.
  - Existing initiatives are likely to intensify, especially in the context of the Paris Agreement and the revision of the reduction targets that several countries are adopting by the year 2050.

Three key examples can enable us to better grasp the potential impact of progress achieved in the world concerning the value of the ratio.

- First, more rapid changes in carbon prices in the existing systems than under the C&T system in Québec could exert downward pressure on the ratio.
- Next, it is possible that carbon pricing will change more rapidly in Québec than in the rest of the world, which would increase the value of the ratio.
- Lastly, the establishment of new carbon pricing systems could increase both the proportion of global emissions covered and the global average carbon price.

Such impacts could ultimately result in a more or less rapid reduction in the free allocation granted to businesses.

## ❑ Illustration 1: The price of carbon increases more rapidly in the rest of the world than in Québec

The carbon pricing ratio measures the difference between carbon pricing in Québec and that in other countries. It is expected that it will decrease when global average pricing grows more rapidly than that in Québec.

If the coverage rates of carbon pricing do not change, the change in the ratio will reflect the difference between the growth rate of prices under the C&T system and those in systems elsewhere in the world.

Let us imagine, for example, that between 2019 and 2020, the price of emission units increases by 15% in Québec but that carbon prices elsewhere in the world rise, on average, by 30%.

— Average carbon pricing in Québec would thus increase from US$13.31 to US$15.31/tonne of $CO_2$ equivalent.

— Global average carbon pricing would increase from US$1.88 to US$2.44/tonne of $CO_2$ equivalent.

— The ratio would thus decrease by roughly 11%, from 7.1 to 6.3.

TABLE 6

**Illustration of a more rapid increase in global carbon pricing in relation to that in Québec**

| | **2019** | **2020** |
|---|---|---|
| Average carbon pricing in Québec (in US dollars) | 13.31 | 15.31 |
| Global average carbon pricing (in US dollars) | 1.88 | 2.44 |
| **Carbon pricing ratio** | **7.1** | **6.3** |

Sources: International Carbon Action Partnership, Ministère de l'Environnement et de la Lutte contre les changements climatiques, and Ministère des Finances du Québec.

## ❑ Illustration 2: The price of carbon increases more rapidly in Québec than in the rest of the world

Let us imagine, instead, that the price of emission units under the C&T system increased by 30% between 2019 and 2020, while global average carbon pricing only rose by 15%.

— Average carbon pricing in Québec would thus increase from US$13.31 to US$17.31/tonne of $CO_2$ equivalent.

— Global average carbon pricing would increase from US$1.88 to US$2.16/tonne of $CO_2$ equivalent.

— The ratio would thus have increased by roughly 13%, from 7.1 to 8.0.

TABLE 7

**Illustration of a less rapid increase in global carbon pricing in relation to that in Québec**

| | **2019** | **2020** |
|---|---|---|
| Average carbon pricing in Québec (in US dollars) | 13.31 | 17.31 |
| Global average carbon pricing (in US dollars) | 1.88 | 2.16 |
| **Carbon pricing ratio** | **7.1** | **8.0** |

Sources: International Carbon Action Partnership, Ministère de l'Environnement et de la Lutte contre les changements climatiques, and Ministère des Finances du Québec.

## ❑ Illustration 3: A carbon pricing initiative is established

In the coming decade, new carbon pricing systems may emerge, or existing systems may cover more economic sectors.

— China recently established its own carbon market, which for the time being only covers the energy sector. However, it is anticipated that it will include other sectors, such as the industrial sector, by 2030.

— The European Union is examining the possibility of introducing in the coming years customs tariffs linked to the carbon content of its imports.

The addition of an explicit carbon pricing initiative and broadening an existing initiative to other sectors raise global average carbon pricing. The increase corresponds to the following product:

$$\begin{matrix}\text{The jurisdiction's share of emissions} \\ \text{in global emissions}\end{matrix} \times \begin{matrix}\text{The jurisdiction's share of emissions} \\ \text{covered by the initiative}\end{matrix} \times \begin{matrix}\text{Carbon price} \\ \text{of the initiative}\end{matrix}$$

Accordingly, if a carbon pricing initiative emerges in a jurisdiction that accounts for 10% of global emissions and the initiative covers 50% of the jurisdiction's GHG emissions at a price of US$10/tonne of $CO_2$ equivalent, global average pricing will increase by:

$$10\% \times 50\% \times \text{US\$}10 = \text{US\$}0.50$$

For example, according to the values estimated previously for average carbon pricing in Québec and in the rest of the world for 2019, the addition of such an initiative would reduce the ratio from 7.1 to 5.6.

TABLE 8

**Illustration of the impact of a new initiative on the carbon pricing ratio**

| | Without a new initiative | With a new initiative[1] |
|---|---|---|
| Average carbon pricing in Québec (in US dollars) | 13.31 | 13.31 |
| Global average carbon pricing (in US dollars) | 1.88 | 2.38 |
| **Carbon pricing ratio** | **7.1** | **5.6** |

(1) It is assumed that the new initiative is implemented in a jurisdiction whose GHG emissions account for 10% of global emissions (excluding Québec), that the initiative covers 50% of the jurisdiction's GHG emissions, and that the price of carbon is US$10.

Sources: International Carbon Action Partnership, Ministère de l'Environnement et de la Lutte contre les changements climatiques, and Ministère des Finances du Québec.