

Trading Up: Ideas to improve Quebec's capand-trade system



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About Clean Prosperity

Clean Prosperity is a Canadian climate policy organization that advocates for pragmatic solutions to grow the low-carbon economy. We work on market-oriented policies that incentivize private enterprise to compete, innovate, and invest in low-carbon technologies. We believe that decarbonizing the Canadian economy is a significant opportunity to generate economic growth across the country, for the benefit of all Canadians.

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Table of contents

Abbreviations	3
Executive summary	4
Introduction	6
1. The Quebec carbon market	10
1.1 Background on the Western Climate Initiative	10
1.2 Basic features of the Quebec carbon market	11
2. Outcomes of the carbon market: Limited GHG emission reductions, rising but low carbon price	15
2.1 GHG emissions, caps, and emission allowances	15
2.2 Auction proceeds	19
2.3 Compliance obligations	20
2.4 Carbon market participation	21
3. Key issues with the Quebec carbon market	24
3.1 Not on track to meet GHG emissions target	24
3.2 Barriers to efficiency and effectiveness	29
3.3 Problematic distribution of costs and benefits	30
Conclusion	33
References	35

Abbreviations

CARB	California Air Resources Board
CBAM	Carbon border adjustment mechanism
CCCC	Comité consultatif sur les changements climatiques
EITE	Emissions-intensive trade-exposed
ETS	Emissions trading system
EU	European Union
GHG	Greenhouse gas
RGGI	Regional Greenhouse Gas Initiative
WCI	Western Climate Initiative

Executive summary

Quebec has a carbon pricing system that's distinct from the systems in other Canadian provinces. The Quebec system, a cap-and-trade market linked to California, remains obscure for many. This report aims to shed light on the key features of the Quebec cap-and-trade system.

Since 2013, Quebec's large industrial emitters need to match their declared greenhouse gas (GHG) emissions with tradable emission allowances. In 2015, fuel distributors were added to the coverage of the system and must buy allowances equivalent to the quantity of GHG emissions released into the atmosphere through the combustion of the fuels they sell. There is a cap on the number of emission allowances put into circulation each year, which is reduced over time. This cap-and-trade system is jointly operated with the state of California, which creates a larger market for these emission allowances and a single California-Quebec carbon price.

The broad coverage of emission sources (about 75% of emissions are subject to the cap-and-trade system in Quebec) and the notion of an absolute, declining cap on GHG emissions provide, in principle, a robust and efficient framework to price carbon emissions and achieve the province's 2030 GHG emissions reduction target of 37.5% below 1990 levels. However, despite a functioning market, increasing prices, and the growing participation of financial actors, Quebec is currently not on track to reach its 2030 target. Many issues are preventing the cap-and-trade system from achieving its objectives. The main ones are the overallocation of emission allowances and the fact that the cap is not really a cap, since the California government can release more allowances when a price ceiling is



reached, and could supply Quebec emitters with allowances beyond the provincially-legislated cap. Such a dynamic is likely to emerge, as California's 2030 GHG reduction target is more ambitious than Quebec's, thereby increasing the chance of prices hitting the ceiling. While there are restrictions on the sale of California price-ceiling allowances, we still think that the California price ceiling could affect the achievement of the Quebec target.

Another concern is whether allowances generated in California and purchased by Quebec emitters can be counted as valid reductions of Quebec's GHG inventory. If allowances from California are purchased by Quebec emitters at the price ceiling, or at the price floor, they are not eliminating the possibility of additional emissions in California — therefore undermining the validity of these allowances as reductions in Quebec. Some types of carbon leakage, linked to electricity trading between California and other U.S. states, could also weaken the validity of California allowances.

Nevertheless, coordinated cap-and-trade system reforms by the Quebec and California governments in 2025 offer opportunities for Quebec to address these issues. In support of the planned reform, we make the following main recommendations:

- Retire excess and unsold allowances.
- Reform the use of carbon offsets as a compliance mechanism.
- Plan for the system to cover nearly all GHG emissions.
- Account for the fact that imported allowances might not represent global emission reductions.

If the Government of Quebec successfully reforms the cap-and-trade system, then elements of its carbon market could provide lessons to other Canadian provinces. Other provinces could draw on these lessons to find ways of linking markets across Canada, in order to create a unified carbon pricing system and increase the efficiency of emissions reduction initiatives. Incorporating more emissions sources and more jurisdictions within a single carbon pricing system can lead to further prioritizing the cheapest abatement options.

Introduction

Since 2013, the Government of Quebec has required industrial greenhouse gas (GHG) emitters to have a permit — called an emission allowance — for every tonne of GHGs emitted. Fuel distributors in the province have also been subject to this requirement since 2015, to cover the GHGs embodied in these fuels and released when they are used.

Every year the government sets the maximum amount of GHGs that can be emitted, which declines over time. Emitters can buy allowances from the government at auctions and trade with each other. Businesses that are exposed to international competition receive free allowances, but their free allocations decline over time.

This cap-and-trade approach creates a unique carbon price that covers a larger share of emissions than the Canadian federal government's industrial carbon pricing system.

This cap-and-trade market is unique in Canada, though Ontario and Nova Scotia participated in the same cap-and-trade system in the past, to varying degrees. By putting a price on carbon emissions, this system promises optimal emission reductions as the number of available allowances declines every year. Despite its administrative success and higher than expected revenues, emissions in Quebec and in California (its market partner) are not on track to meet the 2030 targets, as visible in Figure 1. Since 2013, emissions in Quebec have even decreased by the smallest percentage among the eight provinces that have reduced their emissions,¹ which may explain why Quebec, along with California, plans to reform the cap-and-trade market.

This report explains the basics of the California-Quebec cap-and-trade market, documents its outcomes, and analyzes some of its key challenges.

¹ Between 2013 and 2022, emissions have decreased in all provinces except Manitoba (+1.9%) and British Columbia (+6.9%). The largest decrease was in Nova Scotia (-18.1%) while Quebec only decreased its GHG emissions by 0.3% (ECCC, 2024a). See also Figure 3.



Figure 1. Historical GHG emissions in Quebec, California, and combined, with 2020 and 2030 targets (MELCCFP, 2024k and CARB, 2024c).

An overview of carbon pricing options

Carbon pricing is an important market-based climate policy. It places an explicit price on GHG emissions. As illustrated in Figure 2, other financial incentives can be designed to induce some GHG emissions reductions. Alternatives to carbon pricing, such as regulations (a non-financial climate measure) and subsidies can promote specific technologies and behaviours that can reduce or avoid emissions, without directly affecting the cost of carbon. For instance, Quebec subsidizes several programs that reduce emissions through its Electrification and Climate Change Fund (formerly known as the "Fonds vert" or Green Fund), including clean electricity and public transportation.

Figure 2. Types of financial climate measures, including carbon pricing (based on World Bank, 2024, and Nomura, 2022).



The carbon pricing family includes voluntary measures adopted by companies. Firms can set an internal price of carbon to analyze current investments and assess their robustness against possible future carbon prices. Companies and individuals can also use voluntary carbon offsets to offset their emissions with reductions made by others. Carbon offsets are plagued with measurement challenges, making their credibility as emission reductions often doubtful (Calel et al., 2021; Trencher et al., 2024).

Countries around the world are increasingly implementing mandatory carbon prices (World Bank, 2024). While indirect (or implicit) pricing options have been used for a long time, especially through fuel taxes, direct (explicit) carbon prices are more and more common. Carbon taxes and emissions trading systems (ETSs) are the two main mechanisms used to price carbon directly. Cap-and-trade is a type of ETS that places an absolute cap on the number of emission allowances available in the market. Emitters either buy these emission allowances or receive an allocation for free from the government. If the cap is low enough, this creates scarcity, driving emission reductions. The other approach to ETSs is an intensity-based mechanism, such as the Alberta Technology Innovation and Emissions Reduction Regulation (see Alberta, 2024) or the Canadian Output-Based Pricing System (Canada, 2024). These systems set benchmark emissions levels per unit of output. Companies emitting above this level need to purchase emissions credits. Companies emitting below this level can generate credits and sell them.

When a cap-and-trade system has floor and ceiling prices, it becomes a hybrid system akin to other forms of direct carbon price when the price is at these boundaries. In this report, we discuss Quebec's approach to carbon pricing, which is a hybrid cap-and-trade mechanism.

1. The Quebec carbon market

Quebec and Alberta were the first Canadian provinces to implement a form of carbon pricing, in 2007 (Sawyer et al., 2021). The Quebec government applied a carbon levy (tax) to liquid fuels only, from 2007 to 2012. The levy was designed to generate \$200 million² per year to finance the Green Fund, the provincial climate change fund (Gouvernement du Québec, 2007). However, since the coverage of this carbon levy was limited, compared to the many different sources of GHG emissions, and since the Quebec government wanted to position itself as a "climate leader," the province joined the Western Climate Initiative in 2008 to develop a broader market-based solution (MELCCFP, 2024a). The current Quebec carbon market, born out of the Western Climate Initiative, started in 2013 and replaced the 2007 carbon levy.

The following subsections provide some background information on the Western Climate Initiative, the basic components of the carbon market, and some features of the political economy of climate policy in Quebec.

1.1 Background on the Western Climate Initiative

The Western Climate Initiative (WCI) was founded in 2007 by the governors of the U.S. states of Washington, Oregon, California, Arizona, and New Mexico (State of Washington, 2008). More than 15 other states and provinces from the United States, Mexico, and Canada joined as partners or observers.³ The ambition of the WCI was to (1) set a regional GHG reduction goal that is consistent with each partner's individual reduction goal; (2) create a multi-state registry to track, manage, and credit entities that report their GHG emissions and the reductions they make; and (3) develop a regional multi-sector market-based mechanism: the cap-and-trade program. WCI's implicit objective was to contribute to establishing a universal carbon price. It is well established that a universal price would be the It is well established that a universal price would be the most efficient option to reduce carbon emissions, from an economic perspective.

² All currency amounts are in Canadian dollars except where otherwise noted.

³ British Columbia and Manitoba and the states of Utah and Montana formally joined as partners in 2008. Kansas, Wyoming, Nevada, Colorado, Alaska, Idaho; the provinces of Quebec, Saskatchewan, and Ontario; and the Mexican states of Sonora, Tamaulipas, Baja, and Chihuahua were observers in 2008 (State of Washington, 2008).

most efficient option to reduce carbon emissions, from an economic perspective (see for instance D'Autume et al., 2016).

However, by 2012 only California and Quebec had the political will to implement the legislative changes required to create a cap-and-trade system. These two jurisdictions started their own respective cap-and-trade systems in 2013 and linked them in 2014 (CARB, 2015; MELCCFP, 2024a). Ontario created its own cap-and-trade program based on the WCI model in 2017 and linked it to the California-Quebec system in 2018, but cancelled it in the same year following a change in the provincial government (FAO, 2018). Nova Scotia also joined the WCI, created and ran a cap-and-trade system between 2019 and 2022, but cancelled it the following year (Nova Scotia, 2024). Unlike Ontario, Nova Scotia never linked its cap-and-trade program with California and Quebec. The state of Washington, an original signatory of the WCI in 2007, created its cap-and-trade system based on the WCI model in 2023 and is considering linking its market with California and Quebec (State of Washington, 2024).

While the WCI has had limited success in attracting new participating jurisdictions, other cap-and-trade programs are working well around the world, and their number is growing. Since 2005, when the European Union started the world's first cap-and-trade program, the global share of emissions covered by an emissions trading system has grown from 5% to 17% (World Bank, 2024). In North America, the Regional Greenhouse Gas Initiative (RGGI) has been a successful cap-and-trade market for the power sector since 2009 in the Northeastern U.S..⁴ The state of New York is considering its own cap-and-trade system (called "cap-and-invest") with rules similar to the WCI, possibly as soon as 2025 (Trimarchi and Castriz, 2024).

1.2 Basic features of the Quebec carbon market

A cap-and-trade approach is traditionally characterized as providing a high level of certainty about future emissions (if the cap is "hard", meaning that there is a strict and enforceable limit on total yearly GHG allowances)⁵, but not about the price of those emissions. Carbon taxes do the inverse: they create uncertainty about the level of emissions, but certainty on price (C2ES, 2024).

The Quebec-WCI cap-and-trade system is defined by the following core components:

• Wide coverage that excludes only a few sectors. GHG emissions from electricity generation, electricity imports, large industrial facilities, and fuels distribution need to comply with the cap-and-trade system. These emissions represent about 75% of the province's emissions (WCI, 2024; see also Figure 7). Complying with the cap-and-trade system entails that emitters obtain emission allowances to cover their emissions. They surrender these emission

⁴ States participating in the RGGI are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont (RGGI, 2024).

⁵ If the emission cap (i.e. the maximum number of emission allowances available in a given year) can change, then the certainty on quantity disappears. This can happen for example when the market features a price ceiling.

allowances to the government at the end of three-year compliance periods. Emissions from agriculture (except fuel emissions), waste, aviation, and marine shipping are exempt from the system (Sopher and Mansell, 2012).

- **Declining caps.** Over the period 2015-2030,⁶ caps in the Quebec market decline by an average of 2.6% per year. This translates to an average decrease of 1.4 million tonnes (Mt) of emission allowances every year, in a province that emits a total of about 80 Mt per year (ECCC, 2024a). Such a decrease in emission allowances every year corresponds to about 2% of the yearly emissions. With fewer and fewer emission allowances available every year, a relative scarcity is created, which creates an upward pressure on allowance prices.
- Regular auctions of emission allowances. Four times a year, emitters and market participants can bid on emission allowance auctions. About two-thirds of the yearly emission allowances available, as specified by the cap, are offered in these auctions. A minimum price of US\$10/tonne was set in 2012 and this minimum price increases by 5% plus inflation every year. This means that even if few participants bid on the auctions, the price of carbon at auctions never falls below the minimum price. Otherwise, the auction price is set by the lowest price at which the last allowance is sold. Offers are ranked from the highest offered price to the lowest, and all bidders get their desired amount of emission allowances until the available quantity is exhausted.
- Revenue recycling in GHG emission reduction. All auction revenues are directed towards the Electrification and Climate Change Fund, financing a wide array of residential, commercial, industrial, and transportation programs aiming at reducing GHG emissions (MELCCFP, 2024d).
- Free allocation to emissions-intensive trade-exposed (EITE) companies. About 20 Mt of emission allowances are freely allocated by the government to EITE companies. Companies are assessed based on two measures: a trade exposure ratio and their emission intensity (MELCCFO, 2024h). The

amount they receive is determined by



⁶ While the cap-and-trade system started in 2013, it only included industrial and electricity emissions in its first two years (2013 and 2014). The full coverage of the market only started in 2015, with fuel distributors (petroleum products and natural gas) having to purchase emission allowances to cover GHG emissions resulting from the use of their products.

an intensity-based formula defined in the law and decreases every year. These free allocations are justified to maintain competitiveness against companies producing in markets without a carbon price. The top five sectors receiving free allocations are aluminum (29% of free allocations), cement (17%), refining (12%), steel (10%), and mining (9%) – see Vié (2022) for more information.

- Limited access to carbon offsets. Emitters in Quebec can use carbon offsets to cover up to 8% of their carbon market obligations, instead of emissions allowances purchased at auctions or freely allocated. Carbon offsets are created through GHG emission reduction projects developed by private companies, under carbon offset protocols approved by the Quebec or California governments. In Quebec, the main carbon offset projects approved by the government are in landfill methane reclamation and destruction, and halocarbon destruction (MELCCFP, 2024b). While offset credits are recognized by both the Quebec and California governments, protocols are developed and approved separately.
- Linkage with California. As the Quebec and California cap-and-trade markets are linked, emission allowances from both jurisdictions are equally valid in either market.⁷ Some market rules are different, however. For instance, California has an allowance price ceiling (at US\$88.22 in 2024, rising every year by 5% plus inflation), over which California can sell new emission allowances, to ensure that price increases do not create damaging economic impacts (CARB, 2024a). This price ceiling however may compromise the notion of an absolute cap, since it allows more credits to be issued, as we discuss further below. It is interesting to note that not all carbon markets have price ceilings. New England's RGGI and the EU ETS have price stability reserves without price ceilings.

This carbon pricing framework is central to Quebec's climate goals: reducing its GHG emissions by 37.5% below 1990 levels by 2030, and achieving net-zero emissions by 2050. Despite shortcomings and concerns discussed in section 3, Quebec's carbon pricing system has two notable strengths relative to the Canadian federal carbon pricing backstop approach: (1) it is a single system with a single carbon price, as opposed to the federal carbon tax on fuel distributors (fuel charge) combined with a separate output-based pricing system for large industrial emitters, for which two separate sets of regulations are needed, resulting in two different carbon price signals; (2) it sets a clear cap on emissions, in principle creating an absolute limit. Revenues from auctions are reinvested in climate programs, potentially creating a virtuous circle of lower emissions through the carbon price and more accessible emission-reduction solutions through these programs.

The annual cap on emissions can be interpreted as a yearly carbon budget. The concept of a carbon budget is advocated notably by Canada's Net-Zero Advisory Body (2024) to clarify "the total GHG emissions that Canada should not exceed" to meet its climate targets.

⁷ Total net Quebec imports of allowances and offsets in 2023 had a market value of \$370 million in 2023, and have been gradually rising in value from the start of the cross-border trade, totalling \$1.3 billion over the period of 2019-2023. This is approximately 10 percent of the overall offsets and allowance market over this period.

Finally, this Quebec approach is characterized by a high level of public support. A consensus exists around carbon pricing among provincial political parties. Houle et al. (2015) discuss in more detail the favorable context for a cap-and-trade market in Quebec, where no political party has ever proposed to abolish the system, despite a very limited understanding of the system among the general population, in the government, and even in industry. The dedication of Quebec Premier Jean Charest, in office from 2003 to 2012, played an important part in building support for carbon pricing. He was able to implement the system in a political environment where climate action was popular and in which there was, and still is, a desire to stand out among other provinces on climate policy. In addition, several other factors helped ease the creation of the cap-and-trade market: the high initial cap did not impose significant constraints on industry, the free allocation of allowances made it possible for firms to comply at little cost, and firms had access to lower-cost California allowances.

2. Outcomes of the carbon market: Limited GHG emission reductions, rising but low carbon price

2.1 GHG emissions, caps, and emission allowances

While Quebec introduced its cap-and-trade market in 2013 to price GHG emissions and support its GHG emission reduction targets, GHG emissions in Quebec in 2022 were almost unchanged: they only declined by 0.3% compared to the 2013 level (ECCC, 2024a). This is the slowest decline among the eight provinces that reduced emissions during this period, as illustrated in Figure 3, and is partly explained by the access of Quebec emitters to low-cost California allowances. Nova Scotia experienced the largest decrease (-18.1%), followed by Newfoundland and Labrador, New Brunswick, Saskatchewan, Alberta, Ontario, and Prince Edward Island. In two provinces, Manitoba and British Columbia, emissions have increased between 2013 and 2022, with BC leading (+6.9%) despite having a carbon tax since 2008.

The apparently limited impact of carbon pricing on Quebec's emissions is primarily the result of low carbon prices, in the context of many other variables influencing GHG emissions: regulation, economic activity, shifts in industrial activity, consumer behaviour, etc.



Figure 3. Provincial GHG emissions in 2022 and percentage change with respect to 2013 (ECCC, 2024a).

Figure 4 illustrates the GHG emissions trajectory in Quebec between 1990 and 2022, with the introduction of cap-and-trade in 2013. Caps are shown from 2013 to 2030, declining after 2015 by a total greater than 21 Mt, or about 25% of Quebec's annual emissions (close to 80 Mt per year since 1990). While the introduction of these caps does not have a visible impact on emissions, the carbon price, per tonne of CO_2 equivalent, is clearly on the rise. From its initial level of \$10.75 in 2013 (average auction price), it has increased every year to reach \$48.31 in 2024 (average price of the four auctions that year). The carbon price increase is driven by declining caps and an increasing participation of non-emitting (financial) market participants. Quebec's carbon price is lower than the federal carbon price, which stood at \$80 per tonne in 2024 (ECCC, 2021); see also Figure 4. Quebec's carbon price fluctuates according to the dynamics of the carbon market. However, adjustments to the cap-and-trade regulations have been announced in California and Quebec for 2025, with the intention to tighten the market, and with the likely consequence of raising prices.

In Figure 4, the space between the upper line (total GHG emissions in Quebec from all sources) and the yearly caps (short black horizontal lines) largely correspond to emissions from uncovered sectors (agriculture and waste), which are emissions targeted by carbon offset protocols.

Figure 4. Quebec GHG emissions, caps, emission allowances freely allocated and sold at auctions and yearly average auction price (ECCC, 2024a; MELCCFP, 2024c and 2024d; Gouvernement du Québec, 2012 and 2017).



Just under 20 Mt per year of free allowances have been issued to industrial emitters since 2013. But even though these allowances are free, the price signal is still working to incentivize emissions reductions — emitters can sell the allowances if they no longer need them, as a result of cutting their emissions. The sale of allowances at auction increased significantly in 2015, when fuel distributors (natural gas and most petroleum products) were added to the cap-and-trade system. The number of allowances sold in auctions varies from year to year due to two reasons: (1) fewer allowances are available every year, due to the decreasing caps; (2) unsold allowances are re-offered in later auctions. This happened for instance in 2016 and 2020, when specific circumstances (legal challenges in California around the validity of the cap-and-trade system, and the COVID pandemic) reduced the demand for allowances at auctions.

Price levels in the Quebec carbon market are bounded by minimum and maximum prices, as illustrated in Figure 5. The price floor sets a minimum auction price. The maximum price is set by the California government. Before reaching this price ceiling, units held by the government in a reserve are sold at a fixed price, to postpone the time at which the price ceiling is reached. Allowances have been

set aside in a reserve, and therefore not auctioned nor allocated for free, since 2013. Since 2021, the government has placed 4% of the allowances created under the cap in the reserve (MELCCFP, 2024f). While no reserve sale has been held so far, these allowances could temporarily limit price increases. In California, an official price ceiling limits the possibility of having higher prices. Before creating new allowances ("price ceiling units"), the California government uses unsold reserve allowances.

Auction prices were at or very close to the price floor until 2021, but have risen significantly since then. It's notable that prices have risen even though allowance demand has remained below the cap. This is likely due to speculators buying credits in anticipation of higher allowance prices in future, as the cap and the supply of allowances decline.

Figure 5. Carbon prices: floor, average auction price, reserve prices, California ceiling price and Canadian carbon price, 2012-2030 (MELCCFP, 2024d; CARB, 2024a; ECCC, 2021).



Note: The floor price is the real auction floor price from 2012 to 2024. After 2024, it is an estimate based on the floor price of the previous year, increased by 5% plus inflation (assumed to be 2%). Prices of units in reserve categories A, B, and C are set by decree (Gouvernement du Québec, 2011 and 2020) but are also aligned with the California Allowance Price Containment Reserve and Price Ceiling. This explains the higher prices in 2024. Reserve prices increase by 5% plus inflation (assumed to be 2% for the period 2024-2030). California ceiling prices are shown in Canadian dollars, based on a 1.25 USD to CAD exchange rate, and rising yearly by 5% plus an assumed 2% inflation rate (CARB, 2024a).

2.2 Auction proceeds

While revenues from the federal fuel charge (commonly called the "carbon tax") were returned to households in the provinces where the charge is collected, through the Canada Carbon Rebate (ECCC, 2024b), proceeds from the Quebec cap-and-trade auctions are not returned directly to citizens. They are transferred to the Electrification and Climate Change Fund (MELCCFP, 2024d), which in turn finances climate programs — such as electric vehicle (EV) subsidies, home retrofit incentives, etc. Figure 6 illustrates how much money was generated each year from the auctions, for a cumulative total of \$9.86 billion by the end of 2024.



Figure 6. Quebec yearly auction proceeds (MELCCFP, 2024d).

These amounts are dedicated to the fight against climate change and to decrease GHG emissions. As previously mentioned, few emissions reductions have been observed in Quebec during the 2013-2022 period (see Figures 1, 3, and 4), possibly because of the limited effectiveness of the funded programs and the low carbon price. The cap-and-trade system has been criticized for a long time in the media for its lack of effectiveness (Shields and Crête, 2019) and the Quebec Sustainable Development Commissioner finds its performance evaluation framework problematic (as reported in Commissaire au développement durable, 2024). The fundamental problem with the current approach to revenue recycling is that it only subsidizes technologies that are more efficient, without preventing emissions

growth. For instance, EVs are subsidized in Quebec with cap-and-trade auction revenues, and this results in growing EV sales: more than 40,000 EVs were sold in 2023 (Statistics Canada, 2024a). However, in the same year, the fleet of gasoline and diesel light-duty vehicles continued to grow, resulting in record sales of gasoline in 2023 (Statistics Canada, 2024b).

2.3 Compliance obligations

The cap-and-trade system obliges emitters to surrender GHG emission allowances to cover all their emissions during each compliance period. Since the system was introduced, four compliance periods have been fully documented: 2013-2014, 2015-2017, 2018-2020 and 2021-2023. Figure 7 illustrates how many emitters surrendered emission allowances in each of these compliance periods, and which types of allowances: regular allowances (given by the government, purchased at auctions or traded in the secondary market) or carbon offsets (generated through private GHG reduction projects authorized by the government). Figure 7 also shows Quebec's total GHG emissions during these periods and the caps.





Figure 7 shows that the number of emitters covered by the cap-and-trade system has grown over time – from only 55 large industrial emitters in the first compliance period, to 118 emitters in the second period, 126 in the third and 135 in the fourth. The use of offset credits is also growing, from only 0.81% of allowances surrendered in the first compliance period to 7.73% in the fourth. This is still below the maximum of 8% allowed for each emitter.

All emitters have fully complied with their obligations in these three periods. Penalties would be applied if emitters do not have enough emission allowances to cover their declared (and independently verified) emissions. The penalty is to find and surrender four emission allowances for every missing one (MELCCFP, 2024d).

2.4 Carbon market participation

Two interesting indicators document the level of participation in the cap-and-trade market. Such participation is a testimony to the confidence of economic actors in the system and of its credibility. Participation can be measured by the bid-to-offer ratio, which measures how much more demand for allowances there is in a specific auction, compared to the offered quantity. Figure 8 shows that this ratio is trending upward, especially for "future date" allowances. At each auction, the California and Quebec governments offer not only current-year allowances, but also allowances that can only be used three years later. If there is a strong demand for future year allowances, it suggests strong confidence in the system from economic actors.



Figure 8. Bid-to-offer ratio in the 40 first joint California-Quebec auctions (MELCCFP, 2024e).

Some auctions in 2016, 2017, and 2020 have experienced bid-to-offer ratios lower than one. This means that fewer allowances were demanded than the number offered. The auction price, in such cases, is set at the floor price. Unsold allowances are auctioned again later. In 2016-2017, legal challenges against the cap-and-trade system in California created enough uncertainty to discourage many buyers (Charles and Norin, 2017). In 2020, the COVID pandemic, and the resulting decrease in GHG emissions, explain the drop in demand.

The other indicator of participation, illustrated in Figure 9, is the percentage of buyers that are direct GHG emitters, as opposed to speculators. This percentage is trending downward because an increasing number of speculators are participating in the market, based on the belief that allowances will be more valuable in the future. These participants are valuable because they increase market liquidity.



Figure 9. Share of allowances sold to emitters in the 40 first joint California-Quebec auctions (MELCCFP, 2024e).

3. Key issues with the Quebec carbon market

The previous sections highlighted important features of Quebec's carbon market today. In this section, we look at problems with the design of the Quebec cap-and-trade system, grouped into three themes: the environmental integrity of the market, cost containment, and cost allocation.

3.1 Not on track to meet GHG emissions target

One of the main goals of Quebec's carbon market is to help the province achieve its 2030 emissions-reduction target and its 2050 net-zero target. According to the government's latest Green Economy Plan, the price signal from the market will contribute 25% of the reductions required to achieve the province's 2030 target (MELCCFP, 2024e). The market is poised to play an increasingly important role in reaching the 2050 target as the aggregate cap is further reduced.

In terms of the environmental integrity of the market, meaning its ability to deliver aggregate GHG emission reductions for the province, we explore the implications of how aggregate emissions interact with the market's floor and ceiling prices, the overallocation of emission allowances, the use of California allowances and carbon offsets for compliance, and whether the province should rely on the federal carbon pricing policy.

The cap is not really a cap

In a pure cap-and-trade market, the aggregate emission cap, or aggregate supply of emission allowances, is fixed. Depending on the shape of the allowance demand curve of covered facilities, the price of allowances will reflect the cost of the last tonne of emissions abated to achieve the cap. Depending on the demand for emission allowances, the allowance price can fluctuate. For example, if the economy faces stronger economic growth than expected, increased demand for carbon-emitting fuels will shift allowance demand up and increase the allowance price such that the aggregate cap is still met. Conversely, if there is an economic recession, demand for carbon-emitting fuels will decrease, and so will the allowance price. In theory the price in a pure cap-and-trade market could go to zero if demand for allowances reduced such that the aggregate cap was no longer binding.

However, the possibility of large swings in allowance prices is contained in Quebec's market by the price floor, and by the price ceiling in California. The price floor sets a minimum auction price when demand is low, and the price ceiling injects more allowances into the market when the demand is high. The aggregate cap responds to economic conditions.

Research by Borenstein et al. (2019) shows that unpredictable economic and technological factors affecting cap-and-trade markets are the dominant forces for predicting allowance prices. As such, more often than not, in the long run markets like Quebec and California's will either be at the floor price or the ceiling price. The market is less likely to settle at a price in between.

Since the allowance price is more likely going to be at the floor or ceiling, the emissions covered by the system can end up above or below the stated aggregate target. This is not necessarily a bad thing. The floor and ceiling price collars allow for price stability, which is important for political acceptability and incentivizing long-term investment (Bushnell, 2023). While prices have historically been near or at the floor and recently in between the floor and ceiling, impending reforms to the market are likely to push prices towards the ceiling price. Indeed, since 2023, policymakers from California and Quebec have held meetings to discuss ratcheting down the cap to meet more ambitious GHG targets (CARB and MELCCFP, 2023). Details of the reforms are planned to be released in 2025 (MELCCFP, 2024g). Recent price increases are consistent with market expectations that the cap will be tightened (IMEAC, 2023).

Recognizing the hybrid nature of the California-Quebec cap-and-trade market is important in understanding the potential implications of tightening the cap on aggregate emissions. For instance, adjusting the cap downward increases the chances of the market settling at California's price ceiling, thereby increasing the likelihood of aggregate emissions exceeding the new cap.

Specifically, if Californian covered entities do not hold sufficient allowances to meet their annual compliance obligation, the California Air Resources Board (CARB) will sell price ceiling units at the ceiling price until all entities are in compliance (CARB, 2025). Once the CARB price ceiling account is empty and there is still compliance demand from covered entities, CARB will issue new allowances, thereby increasing the aggregate emission cap. While Quebec's own cap-and-trade legislation does not allow for a price ceiling and therefore for the release of additional allowances, its link to the California market could counteract the integrity of Quebec's cap. It is important to note that these price ceiling units are placed in facility compliance accounts and cannot be transferred out to be sold.⁸ This safeguard partially protects Quebec's cap, but its integrity could still be affected by sales of allowances in secondary markets or from previous auctions, from California to Quebec entities. Indeed, California emitters could sell regular allowances to Quebec emitters knowing that they have access to extra allowances from the California government.

Overallocation of allowances

A recurring theme since the launch of the California-Quebec carbon market is the overallocation of allowances relative to the cap (Cullenward and Coghlan, 2016; Bush, 2017; Borenstein and Bushnell, 2018; Vert Martin and Pineau, 2024). Market participants could comply with future obligations yet their collective emissions could be higher than the cap – resulting in a failure to meet the 2030 emission target. Lower than anticipated demand for allowances, relatively high use of carbon offsets, and lower

⁸ In the event of the sale of price ceiling units, CARB plans to use the proceeds to achieve equivalent emission reductions through the purchase of emission offsets (CARB, 2025).

actual coverage of emissions during the initial compliance periods have led to prices often settling at the price floor, unsold allowances at auctions, and a large bank of allowances. Of all unsold allowances at auctions, only one percent have been retired by CARB (CARB, 2021). Incoming market reforms could increase the share of retired allowances in the future (MELCCFP, 2024g; CARB, 2024b). All other allowances have either been sold at subsequent auctions or placed in price stabilization reserve accounts.

In order to address the overallocation of allowances and the need for more aggressive emission reductions, the Quebec and California governments are exploring different strategies to meet their 2030 targets. California is expected to retire allowances from its free allocation and auction pools, and to increase the price of its cost containment reserves (CARB and MELCCFP, 2023; CARB, 2024b). Quebec is considering retiring allowances from its auction pool or its price stability reserves, as opposed to drawing from its freely allocated allowances, and also increasing the trigger level of its price reserve (MELCCFP, 2024g).

If the Quebec government prioritizes retirement of allowances in its auction or price stability pools, it will increase the share of allowance value going to emitters in the form of free allowances, as opposed to government coffers. More equitably, the Quebec government could instead consider retiring allowances based on the existing share of freely allocated allowances, auctioned allowances or allowances dedicated to the price reserve.



In addition to retiring excess allowances, there are other reforms that can help address the overallocation problem. An overallocation of allowances is typically consistent with prices at the floor. In this case, market reforms such as the mechanism adopted by the New England RGGI carbon market can alleviate overallocation. The mechanism retires a share of unsold allowances once a trigger price is reached. Currently, unsold allowances in the California-Quebec market are transferred to the reserves or can be sold at future auctions, thereby not affecting the cumulative cap (CARB, 2021). Adopting such a mechanism could help shelter the market from future overallocation problems as economic conditions change.

Even while prices are above the floor and all auctioned allowances are being purchased, there is evidence that entities are buying more allowances than needed for current compliance and that the private bank is growing. Since the 2030 target is at risk of being exceeded by the banked allowances, the Independent Emissions Market Advisory Committee (IEMAC) advised the California government to increase the transparency of allowance banking data, and retiring allowances based on the size of the privately-held allowance bank (IEMAC, 2022). These recommendations should also be considered by the Quebec government. However, it is important to note that changes to the private bank of allowances could have impacts on the carbon price. Indeed, if emitters anticipate that their private bank will be shrunk in the future, this could reduce carbon prices in the near term due to lower short-term demand.

In addition to retiring allowances, a complementary way to address the over-allocation of allowances is to increase the number of covered facilities under the cap-and-trade market without changing the aggregate emission cap. Currently, only facilities that produce more than 25,000 tonnes of GHG emissions per year are covered by the policy. The market also excludes direct emissions from certain sectors, such as emissions resulting from land-use changes, agriculture, and emissions from landfills. Following recommendations by Quebec's independent expert committee on climate change, the Comité consultatif sur les changements climatiques (CCCC), the government should incorporate smaller emitters into the cap-and-trade system — those emitting between 10,000 and 25,000 tonnes per year — as well as emissions from landfills (CCCC, 2024). Currently, emitters below the mandatory threshold can voluntarily opt in to the program. Furthermore, the Quebec government should also consider including emissions arising from agriculture and land-use changes. Recent advances in carbon measurement from land-use changes could enable the inclusion of these sources under the market cap and provide the potential for low-cost abatement (emLab, 2024).

Carbon offsets

Under current rules, Quebec emitters covered by the carbon market can cover up to 8% of their obligations using offsets. During the third compliance period, Quebec emitters nearly maximized their offset use. By allowing covered emitters to meet their obligations with emission reductions from outside of the market, instead of using government-created allowances, excessive use of offsets can further exacerbate overallocation problems. To alleviate the effect of offset use on the oversupply of allowances, California reduced the allowable level of carbon offset use under its system from 8% to 4% from 2021 to 2025. It will then increase allowable offset use to 6% from 2026 to 2030 as the cap reduces further. While regulatory details are unclear, Quebec is planning to follow the regulatory leadership of California on limiting carbon offset use to reduce allowance overallocation (MELCCFP, 2024e). The CCCC goes further and recommends that the Quebec government ban the use of offsets starting in 2027 (CCCC, 2024).

Net imports of California allowances

Quebec is a net importer of California allowances and is counting those allowances towards its province-wide GHG target. In line with an agreement between both governments, California cannot count exported allowances towards its state-wide emission target (CARB and MELCCFP, 2022). However, given the hybrid nature of the cap-and-trade market this situation raises the questions: To what extent do these California allowances represent "true" emission reductions? Are Quebec emitters simply sending money to California emitters and government coffers? Even while California's

emissions have decreased by 15% between 2012 and 2022, whereas Quebec's reductions were nearly null (see Figure 3), imported California allowances need not represent emission reductions.

Notably, California's cap-and-trade system may be particularly contributing to carbon leakage in the electricity generation sector. As opposed to Quebec, California imports significant amounts of electricity, and power importers are subject to the cap-and-trade system. As a result, low-carbon electricity is more likely to be dispatched to California, while carbon-intensive power will be preferentially used out of state, where it does not attract a carbon price (Fowlie et al., 2021). While generally the U.S. electricity system is decarbonizing, there is empirical evidence of this carbon leakage arising from out-of-state electricity imports in California (Lo Prete et al., 2024). If emitting entities in Quebec have been buying these problematic emission reductions from California electricity importers, then we might question their environmental integrity. Greater transparency about which industries are trading allowances across jurisdictions could shed light on this issue.

It is also important to recognize that California and Quebec's cap-and-trade market is not a pure cap-and-trade system. It has a flexible cap regulated by floor and ceiling prices. If it was a pure cap-and-trade market, then it would be sensible for Quebec emitters to reduce emissions at least cost by buying cheaper California allowances. Under the current flexible cap, whether allowances that Quebec facilities buy from California reflect emission reductions depends on whether current market-wide prices are at the floor or ceiling.

Following Borenstein et al. (2019), let's consider the more likely cases of prices being at the floor or the ceiling as opposed to a price in between. In the linked world, if prices are at the ceiling, then Quebec emitters are no longer buying emission reductions, since the California government is injecting more allowances in the market. If instead linked prices are at the floor, then perhaps surprisingly, imported allowances from California also do not represent global emission reductions (Bushnell, 2021). Quebec emitters are buying allowances that would have been withheld for future auctions otherwise. It is only in the more unlikely world where prices are always in between the floor and the ceiling that Quebec can more credibly claim the California imported allowances as reductions.

With past auction prices near or at the floor, instead of buying cheaper emission reductions, Quebec was buying lower emission prices for its emitters. In a world where Quebec's cap-and-trade system operated independently, it is likely that the price of allowances would be higher, given that Quebec's electricity generation is already decarbonized. Initial auctions in Washington state's unlinked cap-and-trade market triggered price containment reserves, which offers anecdotal supporting evidence for such an outcome, given the state's similarly decarbonized electricity grid. Following upcoming reforms of the California and Quebec emission markets, prices are more likely to approach the price ceiling (CARB and MELCCFP, 2023). Without an absolute price ceiling like California's, Quebec might still be obtaining a lower carbon price with imported California allowances.

Historically, a relatively less ambitious reduction in the aggregate cap and potentially cheaper abatement options in California have arguably allowed Quebec emitters to access cheaper emission allowances than in an unlinked system. These gains from trade might be shrinking, as California's 2030 emissions reduction target becomes increasingly ambitious. Compared to Quebec's 37.5% reduction goal, California is currently targeting a 40% reduction below 1990 levels, and there are discussions about increasing this to between 48% and 55% (Morgan Lewis, 2023; Newsom, 2022).

Federal carbon pricing policy

Would Quebec be better able to achieve its emission target if it instead relied on Canadian federal carbon pricing policy? A 2022 joint analysis by the Quebec Ministry of Finance and Ministry of Environment modelled the effects of replacing Quebec's carbon market with the federal carbon pricing policy (Ministère des Finances and MELCC, 2022). Their analysis found that federal policy would lead to half as many emission reductions through 2030 compared to the current carbon market. These emission reductions would also come at a higher cost, since the federal carbon price was scheduled to reach \$170/tonne in 2030, compared to current predictions that allowance prices will be closer to \$100/tonne in 2030. While the report doesn't explain this discrepancy, these greater reductions at lower cost could be due to access to cheaper abatement opportunities in California — or because of the oversupply of allowances — relative to a federal policy where those lower cost allowances would no longer be available to Quebec emitters.

3.2 Barriers to efficiency and effectiveness

The presence of overlapping policies could negatively affect the efficiency and effectiveness of the cap-and-trade system in achieving the province's GHG target.



Overlapping policies

The Government of Quebec predicts that 75% of GHG reductions to meet its 2030 target will be achieved by climate policies other than its carbon market. In its 2024-2029 implementation plan, it identifies 7 to 8.4 Mt of GHG emissions which need to be reduced by undefined policies yet to be adopted. This implicitly acknowledges that the "cap" is not really a cap, since these emissions would be otherwise constrained by the declining cap. The plan also states that its carbon market is a cost-effective way to cut GHG emissions, while at the same time stating that the main goal of the policy is to fund climate mitigation actions

in Quebec. It is important for existing climate policies implemented by the province to be complementary to its carbon market. Furthermore, it matters how new federal policies and subsidies will interact with Quebec's carbon market.

A main concern with overlapping climate policies is that by mandating low-carbon technology adoption, or lowering fuel demand, these policies reduce demand for GHG allowances and lower allowance prices. This in turn reduces the incentive for GHG reductions by all sources covered in the market. When implementing additional climate policies, governments should ensure that these policies are addressing separate market failures or covering emissions gaps not covered by the carbon market. If overlapping climate policies are simply substituting emission reductions that would have otherwise been achieved by the carbon market, these climate policies are increasing the cost of mitigation in the province.

Some policies can address market failures that carbon pricing doesn't, helping carbon pricing work better. Examples include subsidizing electric vehicle charging stations to overcome financing gaps and achieve network economies of scale, public transit investments to counter traffic congestion, and research and development subsidies, recognizing that knowledge produced through innovation is a public good.

3.3 Problematic distribution of costs and benefits

The stringency of the market, the share of freely allocated and auctioned allowances, and revenue use impact the distribution of costs and benefits of the policy.

Free allocation and carbon leakage

By increasing emitters' operating costs, the carbon market can put certain emitters at a competitive disadvantage relative to competing producers located in jurisdictions without equivalent carbon prices. In order to avoid the costly displacement of GHG emissions arising from reduced domestic production and increased foreign production, also known as carbon leakage, the Quebec government provides free allowances to certain emitters that are both emission intensive and trade exposed.

In 2024, Quebec revised its free allocation rules after analysis showed that by 2040 the government would allocate more free allowances than its aggregate cap (Ministère des Finances and MELCC, 2022). The revised rules will update emission intensity benchmarks such that free allowances are proportionally reduced in better alignment with the aggregate cap. In 2022 the Ministry of Finance and the Ministry of Environment modeled the effects of these changes in free allocation. They found limited impacts on the competitiveness of covered industries in terms of changes in trade flows.

Fowlie and Reguant (2022) show that targeting free allocations based on measures of trade and emission intensity, as Quebec is doing, can create problems, because these measures are a poor proxy for true leakage risk. Their measure of leakage risk is instead based on the response of foreign emissions to domestic carbon prices and foreign emission intensities. Standard leakage risk measures fail to capture these features. For example, if an emitter is emission intensive and trade exposed but the production of their unregulated competitors is not responsive to domestic carbon prices, then there is no need to allocate free allowances to the domestic emitter since the foreign

competitor will not increase its production. Fowlie and Reguant find that carbon leakage can be substantially mitigated by allocating free allowances based on their measure of leakage risk, as opposed to current standard metrics such as the ones used in Quebec's market. To ensure the applicability of their approach, they show how to estimate their theoretically-derived leakage risk measure using publicly available data from the U.S. manufacturing sector. The Quebec government should look into further refining its targeting rules for free allocations to avoid this issue.

By providing too many free allowances, the government is missing out on auction revenue and providing "free lunches" to emitters, and if they provide too few allowances, then they face unnecessary carbon leakage. It is also important to note that if in the short term foreign competitors do not respond strongly to domestic carbon prices, changes to free allowance allocation can change the profitability of domestic emitters, thereby changing their probability of exit and therefore the probability of leakage if substitute goods are then imported.

An alternative to using free allowance allocation to combat carbon leakage is to price the carbon content of traded goods. Currently, the California-Quebec cap-and-trade system includes carbon border adjustments for electricity, but not for other traded goods. The European Union (EU) will implement a carbon border adjustment mechanism (CBAM) to price the carbon content of imports starting in 2026. If Canada implements a CBAM or a similar mechanism with stringency that is equal or greater to Quebec's cap-and-trade system, then the province should further review its need to provide free allowances to covered emitters.

Revenue use and equity

Currently most of the revenue raised in the auctions for the Quebec carbon market goes towards the Electrification and Climate Change Fund (formerly the Green Fund), which finances further emission reduction projects, such as EV purchase subsidies, EV charging subsidies, low-carbon technology adoption for firms, and energy efficiency subsidies. This use is at odds with the use of carbon pricing revenue in California and the rest of Canada, which is targeted at alleviating affordability and equity issues. Since EVs and energy efficiency technologies are disproportionately purchased by higher-income households, current revenue use in Quebec is likely to exacerbate equity issues.

Indeed, the carbon market can affect households by changing the relative price of goods and services based on their carbon intensity, and through changes in production and abatement at covered facilities. Since lower-income households generally spend a greater share of their budget on energy, carbon markets can exacerbate pre-existing financial inequalities across households. In Quebec, this would be particularly the case with respect to the consumption of transportation fuels, since electricity supply is already decarbonized.

More income-targeted mobility measures and programs can offer alternative options for consumers, increasing their ability to react to carbon price-induced price increases. An example includes British Columbia's income threshold for buyers to qualify for the full EV subsidy (cleanBC, 2024). Such measures can both decrease emissions and increase equity. Other progressive revenue recycling

measures include returning the revenue directly to households in the form of rebates or other tax cuts as is done in other Canadian provinces.

The carbon market coordinates GHG abatement efforts for large emitters in the province that also emit other local air pollutants that harm human health. In California and British Columbia, researchers have studied how carbon pricing has affected the distribution of local air pollutants in disadvantaged communities (Fowlie, 2023; Sileci, 2023). To our knowledge, such analysis has not been conducted for the Quebec carbon market. Especially given the location of large air pollution emitters near population centers — such as the Montreal refinery, the Levis refinery or the Horne Smelting plant in Rouyn-Noranda — it would be warranted to conduct an empirical examination of the impacts of the carbon market on the health of communities that are downwind of covered facilities.

Conclusion

Quebec was a North American climate leader in 2013, when it introduced a broad cap-and-trade system within the Western Climate Initiative, designed to link many jurisdictions. The initial hard and constantly declining cap, and the system's large coverage of emission sources, had the potential to set a clear framework to help emitters efficiently coordinate their abatement decisions and help the province to achieve its GHG targets.

However, while the Quebec market's link to California functions well, the current provincial GHG emissions trajectory sheds doubt on the ability of the cap-and-trade system to fully support Quebec's 2030 GHG emission goals. Significant problems with the system include too many emission allowances and a softer cap than initially planned.

These problems need to be solved for the Quebec cap-and-trade system to support Quebec climate's ambition. A process is already in place to tighten the market, by removing some allowances and limiting the use of carbon offsets (MELCCFP, 2024i).

In order to let the cap-and-trade system fully play its role, we make the following main recommendations:

Retire excess and unsold allowances.

A history of overallocation of allowances in the Quebec cap-and-trade market could result in the failure of the cap and trade system to meaningfully contribute to meeting the province's 2030 emission target. The Quebec government is currently studying retiring allowances from its auction pool or its price stability reserves. To ensure equity in the cost of mitigation, the government should also consider retiring excess allowances from its free allocation pool. This could be done through revising free allocation rules following principled analysis of leakage risk.

To retire unsold allowances during auction, Quebec could implement a stricter price trigger mechanism. Currently, if allowances are unsold during an auction, they are reserved for future auctions. A tested solution implemented in the New England RGGI market involves instead retiring unsold allowances once a price trigger is attained.

Reform and reduce the use of carbon offsets as a compliance mechanism.

To alleviate the exacerbating effect of carbon offset use on the oversupply of allowances, the Government of Quebec should plan to reduce the use of offsets other than carbon removal technologies.

Plan for the system to cover nearly all GHG emissions.

By including additional emission sources in the province besides large stationary sources — such as smaller emitters, and emissions from agriculture and landfills — the province could both enable lower-cost abatement opportunities and address the excess allowance issue.

Account for the fact that imported allowance might not represent global emission reductions

Because of the hybrid nature of the California-Quebec cap-and-trade market, when allowances prices are at the floor or the ceiling, allowances imported from California may not represent true emission reductions. Since, historically, prices have been at the floor and are predicted to be closer to the ceiling in future, and because Quebec is a net importer, the government should account for the true additionality of imported permits when calculating its province-wide emissions. This is also relevant because California's 2030 emission target is more ambitious than Quebec's, which could shrink the gains from trade arising from lower emission prices.

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