

IMPACT ANALYSIS
ON GHG EMISSIONS AND
THE ECONOMY

2030 Plan for a
Green
Economy 

2024-2029
IMPLEMENTATION
PLAN



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June 2024

The Ministère des Finances and the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs produced this publication.

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Impact Analysis on GHG Emissions and the Economy

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HIGHLIGHTS

Québec has set a 37.5% greenhouse gas (GHG) emission reduction target by 2030 in relation to the 1990 level.

Every year, the government implements initiatives to further reduce Québec’s GHG emissions and make progress toward achieving this target.

To monitor the progress made and pinpoint the least costly reductions that allow it to attain its climate targets, the Québec government updates its projections annually in light of the latest information available.

❑ Initiatives defined and funded in 2024-2025: 67% of the 2030 target

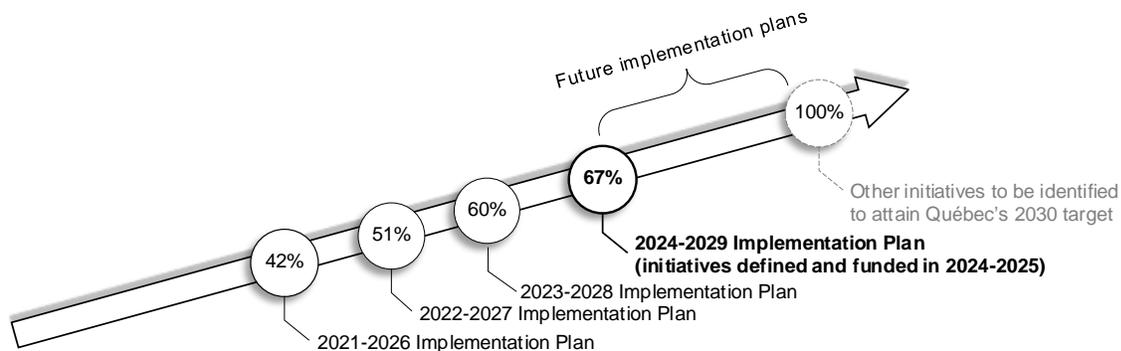
According to the modelling carried out under the *2024-2029 Implementation Plan* of the *2030 Plan for a Green Economy* (PGE), the entire array of initiatives defined and funded in 2024-2025¹ in Québec to fight climate change will engender reductions corresponding to 67% of the necessary effort to achieve the target in Québec by 2030.

— This marks an improvement in relation to the proportion of 60% estimated in the *2023-2028 Implementation Plan* of the PGE.

Québec will continue in the coming years to gradually enhance initiatives to combat climate change by assessing the best ways to effectively reduce GHG emissions in the long term, maximize reductions in Québec to attain the 2030 target, and adjust the initiatives in light of technological development and the economic and social context.

ILLUSTRATION 1

Effort required to attain the 2030 target in Québec (as a percentage of the requisite reductions to meet the target)



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

¹ The initiatives defined and funded in 2024-2025 include those implemented on April 1, 2024, and other measures to be added by March 31, 2025, in particular the optimization of the GHG emission cap-and-trade (CAT) system and new regulations. Specific details concerning the optimization of the CAT system must be confirmed in Québec and in California through the tabling of a draft regulation.

INTRODUCTION

Québec is at the forefront in the global fight against climate change and is determined to maintain its leadership with all of its partners to achieve its GHG emission reduction objectives.

In this respect, Québec has set a greenhouse gas (GHG) emissions reduction target of 37.5% by 2030 compared to 1990 levels, which corresponds to an emission level of 53.2 Mt CO₂ eq.

To meet its climate objectives, Québec has implemented the *2030 Plan for a Green Economy* (PGE), which relies on:

- the GHG emission cap-and-trade (CAT) system, which puts a price on carbon and covers 80% of Québec's GHG emissions;
- the reinvestment of revenues from the CAT system in the Electrification and Climate Change Fund (ECCF) to fund the measures in the PGE implementation plans;
- other legislation, regulations, and Québec government policies and initiatives, especially in the transportation, building, and industrial sectors.

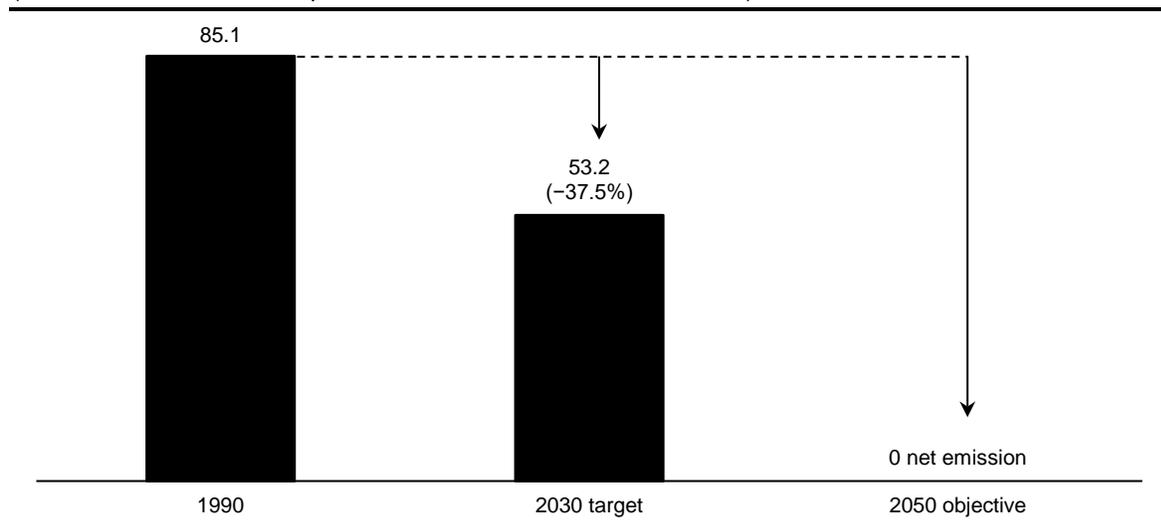
These initiatives round out those announced by the federal government, the municipalities, the private sector, and the general population.

The government is also targeting carbon neutrality (zero net emissions) by not later than 2050.

To monitor the progress made and pinpoint the least costly reductions that allow it to attain its climate targets, the Québec government produces annual updates of its GHG emission projections and the impact of the reduction measures in light of the latest information available.

CHART 1

Québec's GHG emissions in 1990 and reduction targets
(millions of tonnes of CO₂ equivalent and reduction in relation to 1990)



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

GHG emissions projections scenarios

Three separate simulations have been produced to support the Québec government's decision-making in the realm of the fight against climate change.¹

The Ministère des Finances du Québec and the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs² have elaborated the scenarios.

The reference scenario

The reference scenario considers the initiatives defined and funded in 2024-2025 to combat climate change. The projection illustrates the impact in Québec of:

- the current GHG emission cap-and-trade (CAT) system price signal;³
- changes in the operating rules of the CAT system currently being elaborated that will be implemented by the end of 2024;
- budget measures in respect of which funding is planned under the implementation plans of the *2030 Plan for a Green Economy (PGE)*;⁴
- new regulations that have come into force since the implementation in 2021 of the PGE or that will come into force in 2024-2025, and federal government and municipal initiatives.

The models used consider the interplay between the CAT system and the other initiatives implemented, thereby avoiding double counting in GHG emission reductions.

The choice of technologies illustrates the outcome projected by the modeling following optimization according to the entire array of economic and financial assumptions formulated, anticipated behaviour changes, and the solutions available, e.g., energy efficiency, additional electrical capacity, and reduced output.

The reduction potential scenario

The reduction potential scenario illustrates, according to current knowledge, the least costly emissions reductions that allow for the attainment of Québec's 2030 target (optimization).

This theoretical scenario suggests the best way to reduce GHG emissions in Québec according to parameters such as the cost of current and future technologies, changes in household behaviour, and the possible adaptation of the structure of the economy in a future low-carbon Québec. It also considers constraints linked to growth by 2030 in electricity supply.

The disengagement scenario

The disengagement scenario presents the GHG emissions level in the absence of government initiatives to combat climate change such as the CAT system, measures, and regulations starting in 2021, and according to technological improvement trends.

This theoretical scenario reveals the potential effort to be made to attain the reduction targets that considers the economic growth forecast by the Ministère des Finances du Québec and the underlying technological improvements. The scenario includes the emission reductions that would have occurred without government intervention.

- ¹ Estimates throughout this document are based on the information available on April 1, 2024, and on the Québec government's *Budget 2024-2025* economic and financial forecasts. Appendix 2 indicates the main risks linked to the projection scenarios.
- ² The Ministère de l'Économie, de l'Innovation et de l'Énergie, the Ministère des Ressources naturelles et des Forêts, the Société du Plan Nord, and Hydro-Québec were consulted in the context of these deliberations.
- ³ It is assumed that the price of the CAT system GHG emission unit will reach \$101 by 2030, in keeping with private-sector estimates. The price excludes changes in the operating rules of the CAT system currently being elaborated that will be implemented by the end of 2024.
- ⁴ It is assumed that investments to fight climate change will continue until 2030.

1. WHERE DO WE STAND WITH THE 2030 TARGET?

Québec is ahead of a number of jurisdictions with regard to decarbonization, mainly because of its electricity generated using renewable sources and the implementation of significant initiatives to reduce GHG emissions.

1.1 Considerable progress was achieved in 2022 toward attaining the target

As indicated in the *Bilan 2022-2023 de l'action climatique du gouvernement du Québec*, the GHG emissions level in Québec was estimated at 79.1 Mt in 2022.²

— This represents a 3.1 MT reduction in relation to the level prior to the COVID-19 pandemic in 2019 (82.2 Mt).³

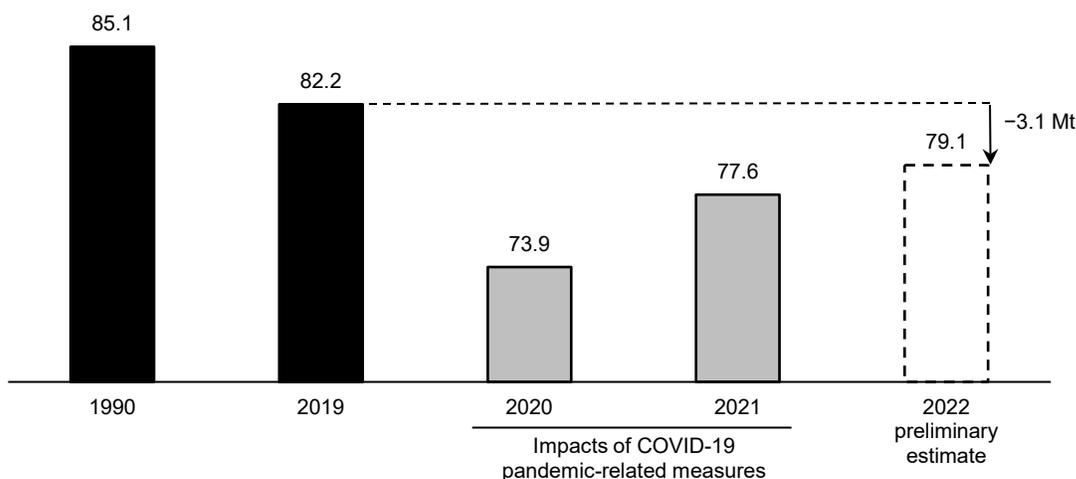
The increase observed in relation to 2021 stems principally from the gradual ending of the containment measures adopted in 2020 and 2021 in the wake of the COVID-19 pandemic, an exceptional event that significantly curtailed economic activity.

According to the latest information available, the GHG emissions level should fall slightly in 2023 (-0.1 Mt) and decrease gradually by 2030 under the cumulative effect of ongoing GHG emission reduction initiatives in Québec, in keeping with the projections produced.

— Accordingly, despite the increase observed between 2021 and 2022, emissions should not return to their pre-COVID-19 pandemic level.

CHART 2

Estimated GHG emission level anticipated for 2022
(millions of tonnes of CO₂ equivalent)



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

² Estimates for 2022 and 2023 are preliminary and were produced using information available on April 1, 2024. The Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs will publish in late 2024 the Québec inventory of greenhouse gas emissions for 2022.

³ The year 2019 has been used as a benchmark throughout this document since data for 2020 and 2021 include the adverse effects on GHG emission levels of the COVID-19 pandemic.

1.2 Initiatives to achieve the 2030 reduction target

Economic and population growth is usually accompanied by increased household consumption and business production, which can lead to higher GHG emissions.

- However, enhanced energy efficiency and economic processes and the replacement of equipment are mitigating the increase's impact.

According to the anticipated economic growth and technological change trends (disengagement scenario),⁴ it is estimated that in the absence of government initiatives to combat climate change Québec's GHG emissions could reach 84.0 Mt by 2030.

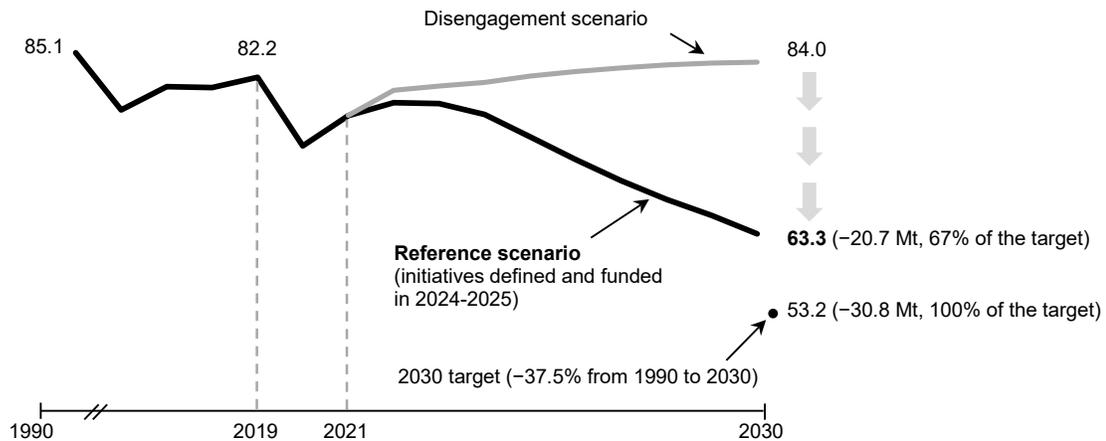
The attainment in Québec of the 2030 target would require a GHG emissions level of 53.2 Mt, which would require a 30.8 MT emissions reduction by 2030.

The modeling carried out reveals that the initiatives defined and funded in 2024-2025 (the reference scenario) will lead to reductions of 20.7 Mt by 2030, i.e., 67% of the effort required.

- This marks an improvement in relation to the proportion of 60% estimated in the *2023-2028 Implementation Plan* of the PGE.

CHART 3

GHG emissions trajectory according to the initiatives defined and funded in 2024-2025
(millions of tonnes of CO₂ equivalent)



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

⁴ The box on page 4 describes the scenarios. Appendix 3 provides details of the disengagement scenario and the tables of the detailed results of the simulations are available on [the publications page of the Ministère des Finances du Québec](#).

1.3 Initiatives defined and funded in 2024-2025: 67% of the target

It is estimated that the entire array of initiatives defined and funded in 2024-2025 will raise the target achievement rate to 67% by 2030.⁵ The reductions would stem overall from:

- the impact of the CAT system price signal on household and business behaviour change in Québec (7.7 Mt);
- budget, regulatory, and other initiatives already defined and funded or that will be implemented in 2024-2025 in Québec (13.0 Mt).

The new initiatives in the *2024-2029 Implementation Plan* defined and funded in 2024-2025 are:

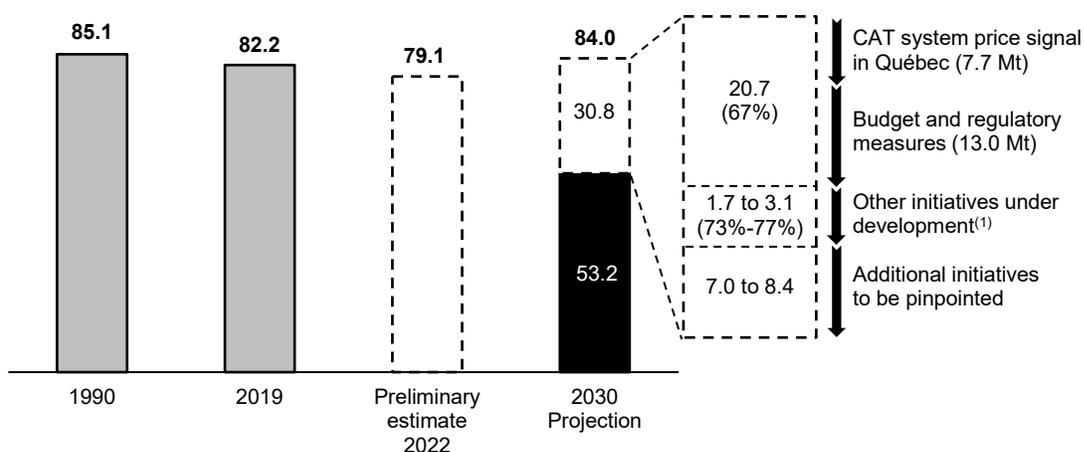
- the optimization of the CAT system in partnership with California;
- a new regulation concerning the mandatory reporting of thermal discharges for regulated industries and an enhanced incentive to encourage industries to implement energy management systems;
- the adoption of additional regulatory requirements to regulate fossil fuel use in buildings.

The remaining reductions to achieve the 2030 target could stem from other initiatives under development or to be pinpointed.

- For example, according to the estimates of the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs, the forward-looking measures could, subject to certain assumptions, account for 73% and 77% of the effort required by 2030.

CHART 4

Changes in GHG emissions and reductions necessary to attain the 2030 target
(millions of tonnes of CO₂ equivalent and as a percentage of the reductions required to reach the target)



(1) Estimate produced by the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs.
Sources: Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs and Ministère des Finances du Québec.

⁵ Appendix 4 lists the initiatives defined and funded as of April 1, 2024, and the new initiatives that will be defined and funded in 2024-2025.

1.3.1 Reduced GHG emissions by sector

It is estimated that the initiatives defined and funded in 2024-2025 will engender a 20.7 MT reduction in Québec's total GHG emissions by 2030.

The breakdown of such reductions can vary from one sector to the next, depending on the weight of their emissions in the total emissions and the available possibilities for reductions.

Q **Transportation: 53% of the estimated reductions for 2030**

Emissions in the transportation sector should reach 26.4 Mt by 2030, 11.0 Mt below the disengagement scenario (53% of the reductions of 20.7 Mt projected by 2030).

Aside from the incentive effect of the CAT system price signal, the anticipated fall in GHG emissions in this sector appears to stem from:

- the target of 2 million electric vehicles on Québec roads by 2030 (the zero-emission vehicles [ZEV] standard);
- the *Regulation respecting the integration of low-carbon-intensity fuel content into gasoline and diesel fuel*, which sets a 15% minimum share of renewable fuel for gasoline and 10% for diesel by 2030;
- the eco-trucking program and the gradual electrification of Québec government vehicle fleets, taxis, and school and urban buses.

Q **Industry: 26% of the estimated reductions for 2030**

Emissions in the industrial sector should fall by 5.4 Mt in relation to the disengagement scenario (26% of the reductions of 20.7 Mt anticipated) to reach 21.5 Mt by 2030.

Such reductions would result primarily from:

- ongoing measures that target the industrial sector, including the Défi GES, ÉcoPerformance, and Bioénergies programs;
- regulations, in particular the regulation governing the increase in the share of renewable natural gas (RNG) in Québec natural gas supplies and the regulation governing halocarbons;
- the gradual reduction in the allocation of emission rights free of charge for large industrial enterprises under the CAT system for the period 2024-2030.

Q **Other sectors would account for 21% of the estimated reductions for 2030**

In the buildings, residual materials, and agriculture sectors emissions should decline by 4.4 Mt by 2030 in relation to the disengagement scenario.

The initiatives targeting the residential, commercial and institutional **buildings** sector should lead to a 2.9 MT emissions reduction by 2030. Such reductions would stem primarily from:

- the ongoing ÉcoPerformance (the section devoted to commercial and institutional buildings), Heating with Green Power, and waste heat recovery programs, and the support measure to convert natural gas to electricity and dual energy for peak demand management;
- the regulation that prohibits the use of fuel oil for residential heating and the regulation on existing GSRs and the anticipated rollout in the coming years of reporting, rating, and energy performance system in commercial, institutional, and multi-residential buildings;
- the gradual decarbonization of the government's building inventory, in particular through electrification.

It is also estimated that the measures planned will lead to a 0.7 MT reduction in GHG emissions in the **residual materials** sector by 2030 in relation to their anticipated level in the disengagement scenario.

- This result is attributable to the measures stemming from the *Organic Matter Development Strategy*, including the organic matter treatment program by biomethanization and composting.

Lastly, 0.7 MT reductions should be observed in the **agriculture** sector, in particular through the enhanced management of nitrogenous fertilizers and the implementation of agricultural biomethanization projects.

TABLE 1

GHG emissions projection – Reference scenario
(millions of tonnes of CO₂ equivalent, unless otherwise indicated)

	Level					Anticipated reductions by 2030 ⁽¹⁾	
	2019	2021	2022 ^P	2025 ^P	2030 ^P	(Mt)	(%)
Transportation							
Light-duty vehicles	17.6	15.2	15.6	15.0	10.4	6.2	29.8
Heavy-duty vehicles	8.4	7.7	8.4	7.2	6.3	2.5	12.2
Other transportation ⁽²⁾	9.8	10.2	10.5	10.2	9.7	2.3	11.1
Subtotal – Transportation	35.9	33.0	34.6	32.3	26.4	11.0	53.1
Industry							
Pulp and paper	1.4	1.5	1.6	1.5	0.8	0.8	3.8
Chemicals and refineries	3.4	3.4	3.5	3.3	2.6	1.4	6.8
Mines, pelletization, metallurgy, and aluminum	9.0	9.7	9.5	9.6	8.7	1.3	6.5
Cement and lime	3.9	3.9	3.3	3.9	3.6	0.6	2.9
Other industries ⁽³⁾	8.0	7.0	7.2	6.6	5.8	1.2	5.8
Subtotal – Industry	25.7	25.4	25.1	24.8	21.5	5.4	25.9
Buildings	8.3	7.0	7.5	6.1	4.8	2.9	14.2
Residual materials	4.3	4.0	4.0	3.8	3.4	0.7	3.4
Agriculture	8.0	8.1	8.0	8.0	7.3	0.7	3.5
TOTAL	82.2	77.6	79.1	75.0	63.3	20.7	100.0

P: Projections.

Note: Since figures are rounded, they may not add up to the total shown.

(1) These are reductions in millions of tonnes in relation to the disengagement scenario by 2030 and the percentage breakdown of the reductions in relation to the total estimated reductions in the reference scenario. The emissions reductions that would have been achieved without government intervention (the disengagement scenario) are thus not included in the reductions presented.

(2) Other transportation includes off-road vehicles and rail, maritime, and air transportation.

(3) Other industries include the electricity, construction, forestry, non-ferrous metals (except aluminum) production and processing sectors, and other manufacturing sectors such as electronics, glass, plastic, and rubber manufacturing.

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

2. REDUCTION POTENTIAL

The initiatives defined and funded in 2024-2025 in Québec include budget and regulatory measures that cover the economic sectors overall to reduce GHG emissions. Such initiatives are one more step toward the complete achievement of Québec's 2030 target.

They will be further enhanced in the coming years in the context of the annual update of the PGE implementation plans in order to maximize Québec's GHG emission reductions.

Q **Reduction potential: a tool to guide government initiatives**

The reduction potential illustrates, in light of current knowledge, the least costly GHG emission reductions that allow Québec to attain its 2030 target.⁶

Such potential constitutes a theoretical representation of the mechanisms to which households, businesses, and governments can resort to optimally reduce their GHG emissions and at the lowest cost for the economy.

For example, it can include:

- the adoption of innovative technologies such as electric vehicles and new, more efficient equipment, or the conversion of equipment to less emissive energy sources;
- behaviour change and the adaptation of the economy to a new low-carbon reality.

Consequently, it reveals the best path to follow to achieve the reduction targets and facilitate the identification of decarbonization-related obstacles and constraints.

Reduction potential is a decision-support tool. However, the government is also considering other factors in the decision-making process, such as:

- social acceptability, the carbon dioxide footprint, and the maturity of technologies;
- the impact on the most vulnerable populations and benefits for health, society, and the economy, e.g., climate change adaptation measures;
- the economic, legal, and political context in Québec and abroad.

The governments can subsequently establish initiatives to promote the attainment of such potential.

- In the context of the updates of the PGE implementation plans, such initiatives can, for example, take the form of reduced purchase prices for household technologies such as the Heating with Green Power program, investments in recharging infrastructure, or regulations such as the ZEV standard.

⁶ The reduction potential scenario is a theoretical estimate subject to high variability. Indeed, despite recent technological advances, considerable uncertainty remains concerning their future development, especially as regards their accessibility. The reduction potential presented in this section is updated regularly to reflect changes in the level of maturity of such technologies. Such potential can vary between sectors over time, depending on the cost of the reduction technologies available and the capacity of businesses and households to adopt them.

2.1 The path toward the attainment of the 2030 target

Q The transportation sector accounts for more than half of the reduction potential

In a scenario in which the 2030 target is achieved at the lowest cost in Québec, the transportation sector would account for 54% of the total reduction effort, i.e., a reduction by 2030 of 16.7 Mt in relation to the disengagement scenario.

The reductions in this sector would chiefly stem from:

- the presence of 2 million electric vehicles;
- the use of biofuels (ethanol and bio-based diesel);
- reduced automobile travel because of broader recourse to sustainable mobility.

Q The industrial sector accounts for one-third of the potential reductions

It is estimated that the technological potential in the industrial sector overall represents an 8.2 MT GHG emission reduction by 2030, i.e., 27% of the total effort necessary in relation to the disengagement scenario.

According to the estimates produced, the reductions would stem from:

- energy efficiency gains;
- the use of bioenergy, including GRS, and the conversion to renewable energies of equipment;
- changes in manufacturing processes and reliance on disruptive technologies such as the gradual introduction of inert anodes in the aluminum sector;
- the use of carbon reclamation, capture, and sequestration technologies.

Q Other sectors account for 19% of the potential

The reduction potential of the buildings, residual materials, and agriculture sectors would represent 5.9 Mt, i.e., 19% of the total effort necessary in Québec by 2030.

In the case of **buildings**, the technological reduction potential would be on the order of 2.7 Mt as a result of energy efficiency gains and the additional conversion of fossil energy heating systems to electricity and dual energy.

The 1.6 MT reduction potential by 2030 in the **residual materials** sector would stem from more extensive disposal of organic material from landfill sites through composting and biomethanization and improved methane capture in landfill sites.

The 1.6 MT reduction potential by 2030 in the **agriculture** sector would result principally from the destruction or the recovery and conversion of methane from manure and the adoption of agricultural practices that reduce the use of nitrogenous fertilizer and enteric fermentation emissions.

TABLE 2

GHG emissions projection – Reduction potential scenario
(millions of tonnes of CO₂ equivalent, unless otherwise indicated)

	Level					Potential reductions by 2030 ⁽¹⁾	
	2019	2021	2022 ^P	2025 ^P	2030 ^P	(Mt)	(%)
Transportation	35.9	33.0	34.6	31.6	20.6	16.7	54.2
Industry ⁽²⁾	25.7	25.4	25.1	23.5	18.6	8.2	26.6
Buildings	8.3	7.0	7.5	6.8	5.0	2.7	8.8
Residual materials	4.3	4.0	4.0	3.4	2.5	1.6	5.1
Agriculture	8.0	8.1	8.0	7.1	6.3	1.6	5.3
TOTAL	82.2	77.6	79.1	72.5	53.2	30.8	100.0

P: Projections.

Note: Since figures are rounded, they may not add up to the total shown.

(1) These are reductions in millions of tonnes in relation to the 2030 disengagement scenario and the percentage breakdown of the potential reductions in relation to the total estimated reductions. The emissions reductions that would have been achieved without government intervention (the disengagement scenario) are thus not included in the reductions presented.

(2) This sector includes emissions related to electricity generation and distribution.

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

Q A gradual approach to better harness technological development

The Québec government is gradually improving its approach in the context of the annual update of the PGE implementation plans.

Indeed, the initiatives announced to reduce GHG emissions reflect uncertainty surrounding future technological changes and economic conditions.

Most of the initiatives defined and funded in 2024-2025 rely on technologies whose estimated costs by 2030 for society will be less than \$440/tonne of reduced emissions. Such costs include:

- all public and private investments and operating expenses to adopt technologies and use them for their useful life;
- other costs, such as increased electricity supply, and benefits, such as behaviour change, reduced running costs, and the improved efficiency of production processes.

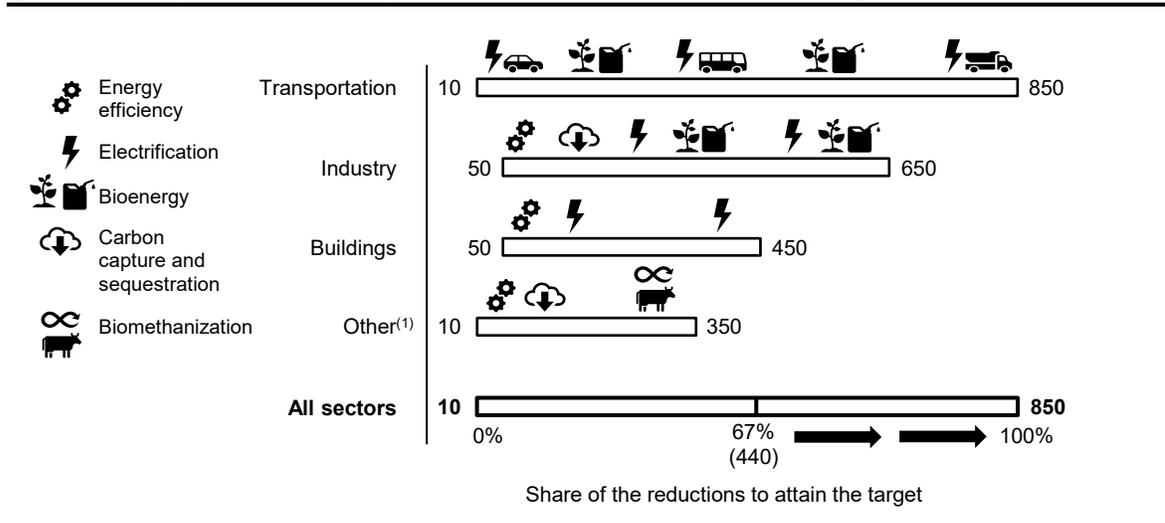
However, the impending stages in the realm of GHG emission reduction will require the adoption of higher-cost technologies.

Indeed, it is estimated that the attainment in Québec of the 2030 target will require technologies whose cost could reach up to \$850/tonne by 2030.

The gradual enhancement of the initiatives to combat climate change thus facilitates the evaluation of the best ways to effectively reduce GHG emissions in the long term, achieve all the reductions necessary to meet the 2030 target, and adjust the initiatives announced in light of technological development and the context.

ILLUSTRATION 2

GHG emission reduction costs and examples of technologies for the year 2030 (in 2022 dollars per tonne of CO₂ equivalent reduced, unless otherwise indicated)



Note: Reduction costs are presented in relation to the disengagement scenario for the year 2030.

(1) Includes the residual materials and agriculture sectors.

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

2.2 An approach aligned with reduction potential

In the context of the PGE implementation plans, the Québec government has adopted a gradual approach that allows for the attainment of 67% of the reductions necessary to meet the 2030 target in keeping with the evaluation of reduction potential.

Indeed, it is estimated that the entire array of initiatives defined and funded in 2024-2025 in Québec to combat climate change will generate reductions in the sectors with the most significant technological potential:

- the transportation sector, which accounts for 53% of the anticipated reductions in the reference scenario, while the reduction potential in this sector represents 54% of the total;
- the industrial sector, which accounts for 26% of the estimated reductions, compared with 27% in the reduction potential scenario.

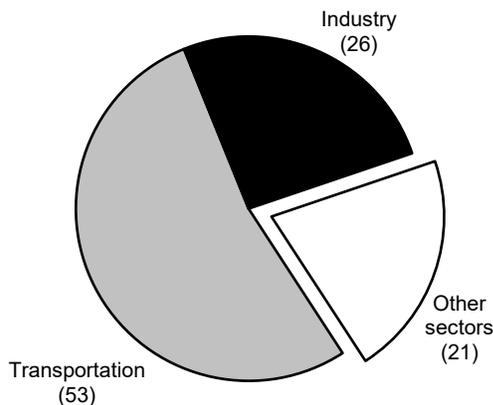
Overall, the reductions in the other sectors account for 21% of the total, compared with 19% in the reduction potential scenario. However, variability exists within this category. For example:

- the reductions concerning the buildings sector are bigger in the reference scenario, especially because of the adoption of additional regulatory requirements;
- the reductions pertaining to the residual materials and agriculture sectors are smaller in the reference scenario than in the technological potential scenario, whereas the initiatives in these sectors require significant coordination, which may make the reductions harder to attain in the short term.

This approach maximizes the impact of measures to tackle climate change on GHG emission reduction in Québec, bearing in mind decarbonization-related obstacles and other factors.

CHART 5

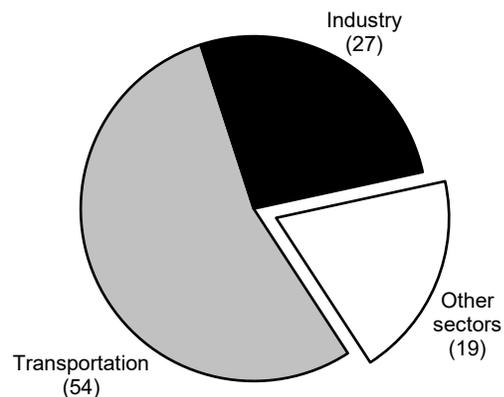
Breakdown of the reductions in the reference scenario
(as a percentage of the reductions in the reference scenario in relation to the disengagement scenario)



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

CHART 6

Breakdown of the reductions in the reduction potential scenario
(as a percentage of the reductions in the reduction potential scenario in relation to the disengagement scenario)



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

3. DEFINED, FUNDED INITIATIVES THAT ARE CONTRIBUTING TO ECONOMIC DEVELOPMENT

In addition to reducing Québec's GHG emissions, the initiatives already defined and funded to combat climate change will have a generally positive impact on the economy stemming from two separate mechanisms.

- The CAT system engenders a price signal on carbon, which reduces real GDP but also hydrocarbon imports.
- Revenues from the CAT system are reinvested in the Québec economy through the measures stipulated in the PGE implementation plans.

Accordingly, it is estimated that such initiatives will by 2030 bolster Québec's real GDP by \$2.0 billion. This impact will stem from:

- a \$0.4 billion increase in consumption, attributable to the positive impact of the investments carried out in Québec in the context of the PGE;
- a \$1.7 billion increase in investments, attributable to the anticipated public investments under the PGE implementation plans and purchases by businesses of emission-reducing technologies;
- a \$0.1 billion decrease in net exports.
 - The decrease would be chiefly attributable to increased imports accompanying rising consumption and investments.
 - What is more, the long-term impact on net exports should be positive when investments related to GHG emission reduction have been made and hydrocarbon imports are lower.

TABLE 3

Economic impact by 2030 of the implementation plans of the 2030 Plan for a Green Economy (billions of 2022 dollars)

	Initiatives defined and funded in Québec	CAT system price signal	Total
Consumption	1.4	-1.1	0.4
Investment	2.7	-1.0	1.7
Net exports	0.1	-0.2	-0.1
Government spending	—	—	—
TOTAL – GDP	4.2	-2.2	2.0
<i>Household disposable income</i>	1.9	-1.5	0.4

Note: Impacts in relation to the disengagement scenario.

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

Impact of climate change on the economy

Climate change is exerting growing pressure on the global economy and society because of the attendant biophysical impacts such as rising temperatures and precipitation and more frequent freeze-thaw cycles.

Estimates produced by the Ministère des Finances du Québec¹ reveal that the impact of climate change on labour productivity and the depreciation of physical assets² could have a negative impact ranging from 3% to 4% on Québec's real GDP by 2050 depending on the emissions levels and in the absence of initiatives implemented by governments to curtail such impacts.

Such impacts would stem from:

- lower labour productivity, which would engender a reduction in the number of hours worked, household disposable income, and consumption;
- more significant deterioration of infrastructure but also reduced business investment as a result of weaker domestic demand.

Such changes would also engender a sharper increase in the general level of prices in the economy of up to 4%.

Accordingly, to adapt the economy to this new reality, the government is investing overall \$1.8 billion over five years with respect to adaptation to climate change to further bolster the Québec economy's resilience to such risks.

Such strategies seek to minimize the direct and indirect impacts of climate change and their costs on security, the health of the population, and economic activity.

Interval of climate change impacts on certain economic variables in Québec by 2050 according to the emissions scenario (as a percentage)

	Moderate emissions scenario	High emissions scenario
Real GDP	-3	-4
Consumption	-1	-2
Investments	-7	-9
Consumer prices	3	4

Note: The Intergovernmental Panel on Climate Change (IPCC) is developing emissions scenarios called Representative Concentration Pathways (RCP) that consider the impacts of rising temperatures and water levels (flooding and coastal erosion), heavier precipitation, and more frequent freeze-thaw cycles on labour productivity and infrastructure depreciation. Two scenarios are used for the simulations, i.e., RCP 4.5 (moderate emissions scenario) and RCP 8.5 (high emissions scenario).

Source: Ministère des Finances du Québec.

1 The Ministère des Finances du Québec has developed a calculable general equilibrium model to simulate the impact of different climate change scenarios on Québec's economy and public finances.

2 Data pertaining to the depreciation of physical assets from the Canadian Climate Institute have been used.

3.1 Impacts on energy productivity

The investments made under the PGE will enable businesses to bolster their productivity by replacing their equipment with more efficient systems and by relying on renewable energy sources such as electricity and bioenergy.

The entire array of initiatives defined and funded to combat climate change will enhance the Québec economy's productive capacity, which will have a positive effect on energy productivity, i.e., the level of economic growth created per energy unit in the coming years.

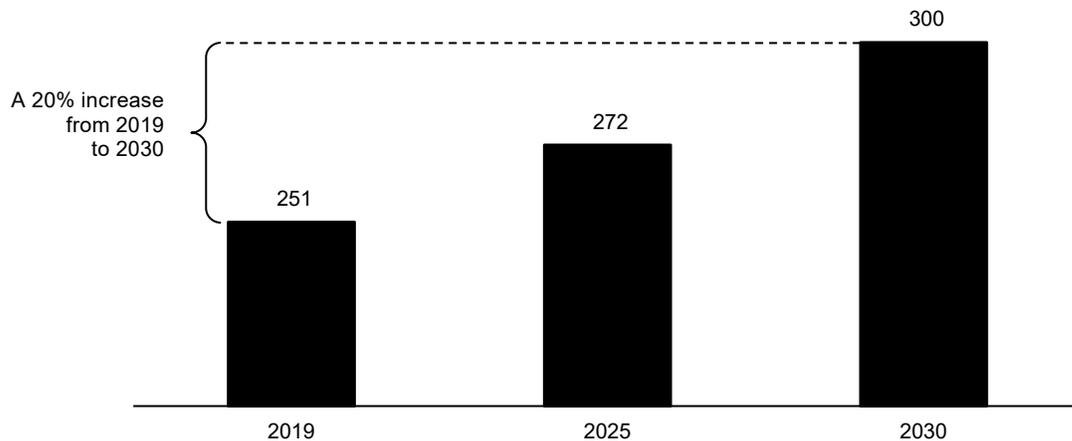
Indeed, it is estimated that Québec produced \$251 per gigajoule of energy consumed in 2019, compared with the Canadian average of \$241.

This level should rise gradually in the coming years to reach \$300 per gigajoule by 2030.

This improvement will stem from the combined impact of the PGE on growing business productivity and reduced reliance on fossil fuels.

CHART 7

Energy productivity in Québec
(in 2019 dollars per gigajoule of energy consumed)



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

CONCLUSION

The Québec government wishes to attain the GHG emission reduction target of 37.5% by 2030 in relation to the 1990 level by maximizing the reductions achieved in its territory.

The initiatives defined and funded in 2024-2025 in Québec to combat climate change will attain 67% of this target.

The initiatives will be further enhanced in the coming years in the context of the annual update of the PGE implementation plans in order to maximize Québec's emissions reductions to meet the 2030 target.

The Québec government is a leader in the realm of tackling climate change and is committed to reducing GHG emissions.

— It will continue to affirm its leadership and display exemplariness by reducing its carbon dioxide footprint.

Growing efforts must be made in the coming years to meet Québec's targets.

What is more, Québec cannot achieve decarbonization without the full participation of society as a whole.

— Indeed, the Québec government is implementing initiatives to foster low-carbon practices, but it is the behaviour change of households, businesses, and the municipalities that will make Québec's climate transition possible.

APPENDIX 1: KEY MODELS

The Ministère des Finances du Québec and the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs rely on a combination of models to estimate changes in GHG emissions, reduction potential, and the economic impacts of the fight against climate change.

- The general equilibrium model of the Ministère des Finances du Québec for the environment (MEGFQ-E) provides a macroeconomic perspective of the fight against climate change and considers the impact of the CAT system, the investments made, and regulations on Québec's economy and GHG emissions.
- The energy system for Québec, the environment, climate and electricity model (SEQUENCE) provides a technical perspective of the various technological and energy choices that can be made to reduce GHG emissions.

The MEGFQ-E and SEQUENCE models are linked to thoroughly study interplay between the economy and the fight against climate change.

Lastly, a simulation model based on the Low Emissions Analysis Platform (LEAP) is also used in the simulations conducted.

Q **The MEGFQ-E provides a macroeconomic perspective of the fight against climate change**

The MEGFQ-E represents the key interrelationships in Québec's economy through a fine-tuned system of equations.

- The model describes in detail the entire structure of the economy and the CAT system and therefore takes into account interactions between economic agents such as households, businesses, and governments, as well as feedback effects between markets.
- Prices and quantities adjust to balance all markets simultaneously, in particular the labour and goods and services markets. Households and businesses adjust their habits to changes in the economy.

Q **The SEQUENCE model considers technologies and their long-term costs**

The SEQUENCE model is a highly detailed energy optimization tool that projects long-term GHG emissions and measures technological reduction potential to meet the 2030 target.

- It considers anticipated technological change, efficiency in manufacturing processes, the anticipated level of economic activity in different sectors, and the prices of different forms of energy.

The model is based on The Integrated MARKAL-EFOM System (TIMES), sponsored by the International Energy Agency.

❑ A combination of models to capture the interplay between the economy and GHG emission reduction

The link between the SEQUENCE and the MEGFQ-E models allows the tools to communicate to better capture the interplay between the economy and GHG emissions.

This methodology enables the Québec government to conduct thorough, complete analyses of scenarios to combat climate change by simultaneously providing economic, climatic, and energy-related perspectives.

The exercise, conducted between a TIMES type model and a calculable general equilibrium model, represents a methodological innovation that has few equivalents worldwide.

The models are enhanced regularly to carefully consider changes in the structure of the economy and continue to improve their projection capacity.

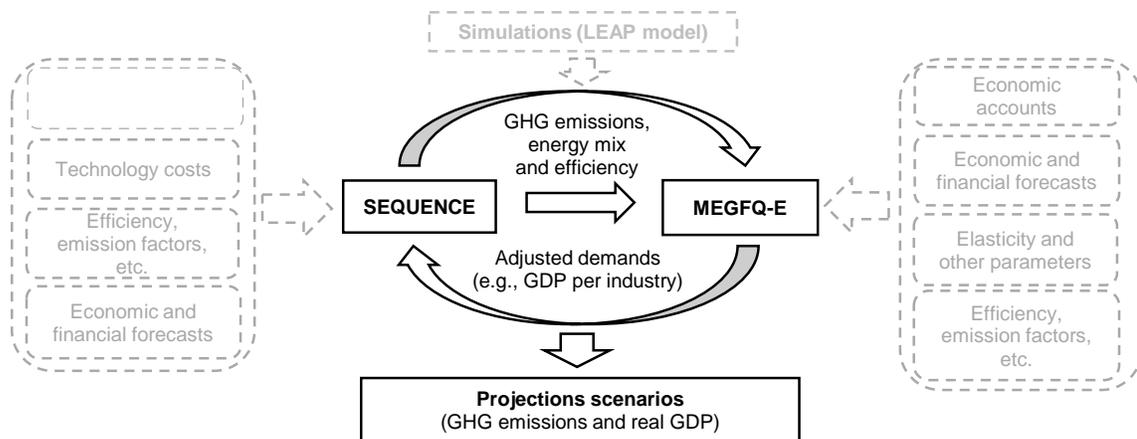
❑ The key sources of data that sustain the models

The models are updated annually in light of information such as:

- the economic and financial forecasts produced by the Ministère des Finances du Québec;
- the Québec inventory of greenhouse gas emissions and the mandatory reporting by businesses of contaminants in the atmosphere;
- the scientific literature pertaining, in particular, to innovative technologies and their costs;
- other information sources such as Statistics Canada, Environment and Climate Change Canada, Natural Resources Canada, and the Société de l'assurance automobile du Québec.

ILLUSTRATION 3

Representation of the models used



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

APPENDIX 2: KEY RISKS THAT CAN AFFECT ACTUAL EMISSION TRENDS

The models used to produce the GHG emission projection scenarios and the economic impact analyses hinge on several assumptions, which are associated with risks that could influence actual GHG emission trends.

Q **A different economic growth trend**

The simulations are based on the Québec government's most recent economic and financial projections concerning various sectors of the economy as of April 1, 2024, and the initiatives defined and funded in 2024-2025.

A different trend in economic growth or the anticipated financial variables could affect economic impacts and Québec's GHG emission levels.

The simulations are based on a GHG emission allowance price scenario that is consistent with private-sector projections.

The price trend will depend, in particular, on technological innovations, the possible addition of new partners to the carbon market, and the measures adopted by the participating governments.

— Indeed, the pace of the development and adoption of new GHG emission reduction technologies will affect the cost of meeting the targets.

— What is more, the addition of new partners to the carbon market could affect the price depending on how readily they are able to reduce their GHG emissions to meet their climate targets.

Accordingly, a higher or lower price would amplify or mitigate the impacts of the measures to tackle climate change in Québec.

Following the example of the price of emission allowances in the context of the carbon market, the projections presented in this document also hinge on assumptions concerning trends in other prices in the economy by the year 2030.

Changes in these prices will depend on the relationship between supply and demand on each market. Accordingly, such changes could be affected by:

- sustained high inflation or higher-than-anticipated population growth;
- more substantial acceleration or downturn than anticipated in economic growth and business investment;
- excess demand or limited supply of raw materials;
- ongoing disruptions in supply chains;
- the global geopolitical context, including ongoing tensions in the Middle East.

Q **Updates of statistical data**

The analyses hinge on the best statistical data available when the projection scenarios are produced.

The historic data used to estimate the GHG emissions are based on information from statistics agencies and other organizations.

- An elevated level of uncertainty surrounds such information despite significant advances in the accuracy of the data published in recent years.

- Accordingly, the data are revised frequently, which can affect the estimates produced.

Moreover, data pertaining to technologies and their costs come from various sources of information such as specialized agencies and scientific articles.

- Knowledge respecting future technologies is changing very quickly, which demands the regular adjustment of GHG emissions projections and the evaluation of the anticipated reductions.

Q **Technological breakthroughs**

The GHG emissions projections and the economic impacts presented hinge on assumptions concerning technological advances by the year 2030.

For example, in the reference scenario, the adoption of less emissive technologies occurs when they become economically advantageous considering the decreasing cost of the technologies, higher carbon pricing, and government financial support.

However, a high degree of uncertainty can be linked to them.

- Accordingly, innovative technologies could emerge and engender more pronounced emissions reductions by 2030.

- Conversely, delays in the development of certain technologies could engender lower-than-anticipated emissions reductions.

Furthermore, in the models, electricity generation is adjusted to optimize the entire array of technological choices in the economy, in particular according to their cost.

- However, a lower level of electricity generation in Québec could also impact the scenarios carried out.

Q **Public and business support for the fight against climate change**

The models used hinge on assumptions respecting the structure of the economy and household and business behaviour.

The fight against climate change requires all economic sectors and the public to contribute.

Accordingly, support to a greater or lesser degree for the fight against climate change from households and businesses could affect emission levels.

Q **The external environment**

Changes in the external environment can significantly impact GHG emissions and economic spin-off in Québec.

For example, the adoption of policies to combat climate change in several regions could promote:

- broader global demand for lower-carbon products, which could increase the price of such products on international markets;
- the accelerated development of certain technologies, which could increase their availability and adoption.

Moreover, higher global carbon pricing or the adoption of carbon adjustment mechanisms at the border would impact the economy and the level of GHG emissions.

Q **The full use of the budgets allocated to the fight against climate change**

The projections presented hinge on the assumption that all the budgets earmarked for combating climate change are used.

- GHG emissions could thus be higher if certain programs implemented are not used to their full potential.

What is more, some degree of uncertainty persists concerning the measures that the federal government and the municipalities will define and fund to fight climate change.

APPENDIX 3: DISENGAGEMENT SCENARIO

According to the anticipated economic growth and technological change trends, it is estimated that in the absence of government initiatives to combat climate change (the disengagement scenario) Québec's GHG emissions could increase by 1.9 Mt between 2019 and 2030 to reach 84.0 Mt.

This increase would stem, in particular, from:

- increased emissions in the transportation sector (1.5 Mt) at a time when the impact of an increase in the number of motor vehicles appears to be mitigated by greater reliance on increasingly affordable, accessible electric vehicles;
- increased GHG emissions in the industrial sector (1.1 Mt) due to growth in output in several sectors;
- reduced emissions in other sectors, primarily the buildings sector (-0.6 Mt), where ongoing conversion to electric residential heating is anticipated.

TABLE 4

GHG emissions projection – Disengagement scenario (millions of tonnes of CO₂ equivalent)

	Level					Change 2019-2030
	1990	2019	2021	2025 ^P	2030 ^P	
Transportation	27.4	35.9	33.0	36.1	37.4	1.5
Industry ⁽¹⁾	33.5	25.7	25.4	26.4	26.8	1.1
Buildings	11.2	8.3	7.0	7.7	7.7	-0.6
Residual materials	6.1	4.3	4.0	4.1	4.1	-0.2
Agriculture	6.8	8.0	8.1	8.0	8.0	-0.0
TOTAL	85.1	82.2	77.6	82.3	84.0	1.9

P: Projections.

Note: Since figures are rounded, they may not add up to the total shown. The disengagement scenario illustrates potential changes in GHG emissions without government intervention starting in 2021, bearing in mind economic growth and trends in technological advances.

(1) This sector includes emissions related to electricity generation and distribution.

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

APPENDIX 4: INITIATIVES MODELED IN THE REFERENCE SCENARIO

TABLE 5

Key initiatives modeled in the reference scenario defined and funded as of April 1, 2024

Global	GHG emission cap-and-trade (CAT) system
Transportation	<p>Program</p> <ul style="list-style-type: none"> - Drive Electric - Transportez vert - Écocamionnage - Programme d'aide gouvernementale à l'amélioration de l'efficacité du transport maritime, aérien et ferroviaire (PETMAF) <p>Regulations</p> <ul style="list-style-type: none"> - Zero-emission vehicles (ZEV) standard: 2 million vehicles by 2030 - Regulation respecting the integration of low-carbon-intensity fuel content into gasoline and diesel fuel <p>Other initiatives</p> <ul style="list-style-type: none"> - Electrification by 2030 of 65% of the school bus fleet and 55% of urban buses - Electrification of the government vehicle fleet - Improved transit services
Industry	<p>Program</p> <ul style="list-style-type: none"> - ÉcoPerformance - ÉcoPerformance – Large emitters - Bioénergies - Bioénergies – Large emitters - Défi GES - Québec industrial sector decarbonization assistance measure (MADI) - Federal Strategic Innovation Fund <p>Regulations</p> <ul style="list-style-type: none"> - Regulation respecting the quantity of gas from renewable sources to be delivered by a distributor (10% by 2030) - Regulation respecting halocarbons - The 2024-2030 free allowance rules for large industrial enterprises under the CAT system, including the consignment of emission allowance units <p>Other initiatives</p> <ul style="list-style-type: none"> - Renewable energy supply of 80% for Hydro-Québec's off-grid systems by 2025

TABLE 5

Key initiatives modeled in the reference scenario defined and funded as of April 1, 2024 (cont.)

Buildings	<u>Program</u>
	– Chauffez vert
	– ÉcoPerformance (commercial and institutional sections)
	– Programme en efficacité énergétique d'Energir
	– Waste heat recovery
	<u>Regulations</u>
	– <i>Regulation respecting oil-fired heating appliances</i>
	– Reporting, rating, and energy efficiency system in commercial, institutional, and multi-residential buildings
	<u>Other initiatives</u>
	– Carbon-neutral government buildings by 2040
– Support to convert from natural gas to electricity and dual energy to manage peak demand	
– Commitment by Energir respecting entirely renewable new connections in buildings	
Other	<u>Agriculture</u>
	– <i>Plan d'agriculture durable</i>
	– Develop, make operational, and broaden the use of practices and technologies that reduce methane emissions from cattle breeding operations
	– Renewable Natural Gas Production Support Program (impact of agricultural biomethanization)
	<u>Residual materials</u>
	– <i>Organic Matter Development Strategy</i>
– Programme de traitement des matières organiques par biométhanisation et compostage	

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

TABLE 6

New initiatives modeled in the reference scenario introduced in the 2024-2029 Implementation Plan that will be defined and funded in 2024-2025

Global	Optimization of the GHG emission cap-and-trade (CAT) system
Industry	<u>Regulations</u>
	– <i>Règlement sur la déclaration obligatoire des rejets thermiques</i>
	– Incentives in the programs to promote the adoption of energy management systems
Buildings	<u>Regulations</u>
	– Gradual conversion to electricity of natural gas residential heating equipment and fuel oil-fired commercial and institutional heating equipment

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

