Environment and Climate Change Canada
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GREENHOUSE GAS EMISSIONS PROJECTIONS

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

Canada

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Greenhouse gas emissions projections

Climate change is caused by the increase in concentrations of greenhouse gases (GHGs) which trap heat in the Earth's atmosphere. These increases are primarily due to GHG emissions from human activities.

Canada's actions to address climate change at home and abroad are guided by the 2015 Paris Agreement goal of holding the increase in the global average temperature to well below 2 degrees Celsius above pre-industrial levels, and pursuing efforts to limit the global temperature increase to 1.5 degrees Celsius. In 2021, Canada announced a commitment to cut its GHG emissions by 40% to 45% below 2005 levels by 2030. In the 2030 Emissions Reductions Plan, released in March 2022, Canada announced an interim objective to reduce GHG emissions by 20% below 2005 levels by 2026. In December 2024, Canada presented a 2035 GHG emission reduction target of 45% to 50% below 2005 levels.

To estimate future GHG emissions, Canada develops GHG projections on an annual basis, using the most up-to-date assumptions of the key drivers that influence Canada's emissions. This indicator uses the latest GHG emissions projections to present the forecasted progress toward Canada's 2030 and 2035 targets.

Greenhouse gas emissions projections

Environment and Climate Change Canada publishes updated GHG emissions projection scenarios annually, reflecting the latest historical data and updated future economic and energy market assumptions. As such, projections fluctuate over time.

The latest GHG emissions projection report included 2 scenarios developed using a bottom-up approach:

- the "With measures" scenario which includes all policies and measures funded, legislated, and implemented by federal, provincial, and territorial governments up to August 2024 and contributions from the Land Use, Land-Use Change and Forestry (LULUCF) sector
- the "With additional measures" scenario which adds in policies and measures that are under development but have not yet been fully implemented, including contributions from nature-based-climate solutions (NBCS), agriculture measures and credits purchased under the Western Climate Initiative (WCI)[1]

Detailed results are available in Annex 4 of Canada's First Biennial Transparency Report under the Paris Agreement (PDF; 11.8 MB).

Key results

- 2026 emissions are projected to be 652 Mt CO_2 eq (14% below 2005 levels[2]) under the "With measures" scenario and 628 Mt CO_2 eq (18% below 2005 levels) under the "With additional measures (without NBCS and agricultural measures)" scenario[3]
- 2030 emissions are projected to be 597 Mt CO_2 eq[4] (22% below 2005 levels) under the "With measures" scenario and 502 Mt CO_2 eq (34% below 2005 levels) under the "With additional measures" scenario

[1] Nature-based climate solutions and agriculture measures represent avoided conversion and restoration of ecosystems such as wetlands, grasslands, and forest land, as well as the use of best management practices on agricultural land. The Western Climate Initiative supports greenhouse gas emissions trading programs and permits the purchase of GHG emissions credits from other participating jurisdictions.

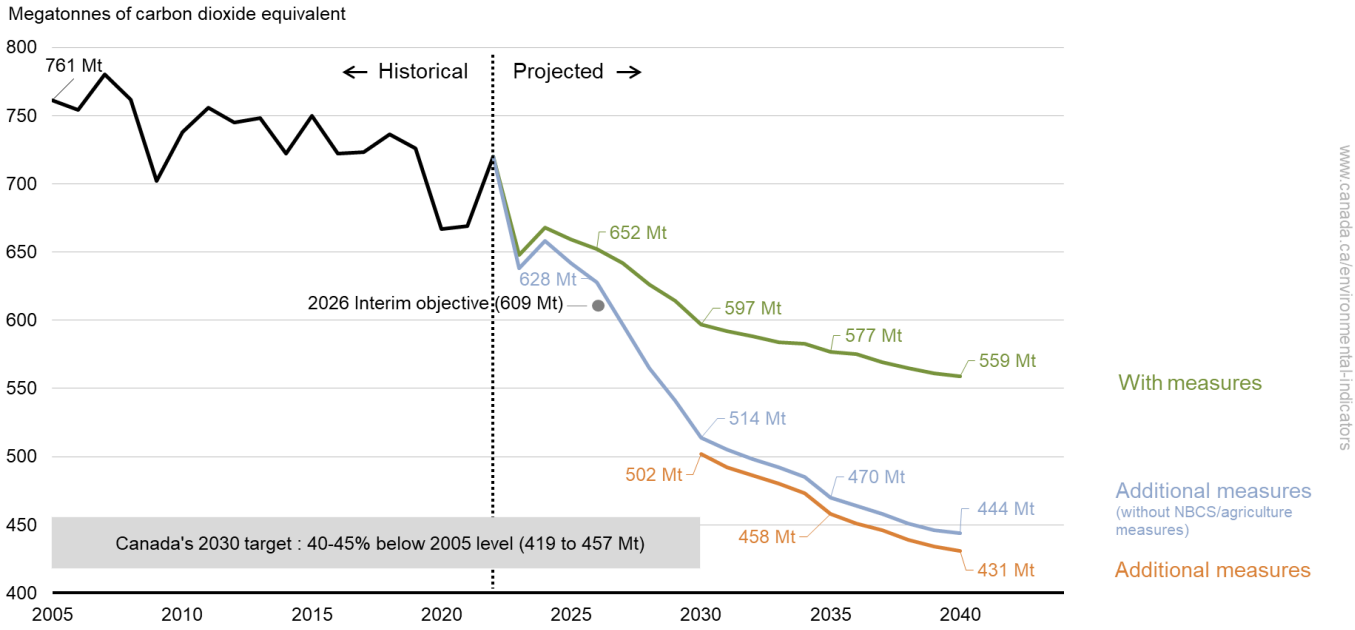
[2] Based on Canada's 2024 National Inventory Report, Canada's GHG emissions were 761 megatonnes of carbon dioxide equivalent in 2005. Note that the 2005 emission level is subject to change as recalculations are performed annually to reflect updates to source data and estimation methodology.

[3] The GHG impact of NBCS and agriculture measures was estimated for the year 2030 only and couldn't be included in the projected emissions for 2026.

[4] Through the sensitivity analysis of the "With Measures" scenario, GHG emissions in 2030 are projected to range between 601 and 650 Mt CO_2 eq, excluding LULUCF. The LULUCF accounting contribution is projected to reduce Canada's emissions by 28 Mt CO_2 eq in 2030.

- 2035 emissions are projected to reach 577 Mt CO_2 eq[5] (24% below 2005 levels) under the "With measures" scenario and 458 Mt CO_2 eq (40% below 2005 levels) under the "With additional measures" scenario
- 2040 emissions are projected to decline further, reaching 559 Mt CO_2 eq[6] (27% below 2005 levels) under the "With measures" scenario and 431 Mt CO_2 eq (43% below 2005 levels) under the "With additional measures" scenario

Figure 1. Historical greenhouse gas emissions and projections, Canada, 2005 to 2040



Data for Figure 1

Note: NBCS = nature-based climate solutions. Historical emissions data from 2005 to 2022 correspond to the emissions presented in the National Inventory Report 1990-2022: Greenhouse gas sources and sinks in Canada (excluding net GHG flux from Land Use, Land-Use Change and Forestry [LULUCF]) to which were added the accounting contribution from the LULUCF. The GHG impact of NBCS and agriculture measures was estimated for the year 2030 only. Since the reductions from NBCS and agriculture measures are considered permanent, it is assumed that the 2030 estimate (a reduction of 11 to 13 megatonnes of carbon dioxide equivalent, with a central estimate of 12) is constant out to 2040. For more information on the projection scenarios, refer to the Data sources and methods.
Source: Environment and Climate Change Canada (2024) Canada's First Biennial Transparency Report under the Paris Agreement. Environment and Climate Change Canada (2024) National Inventory Report 1990-2022: Greenhouse Gas Sources and Sinks in Canada.

One way to address the uncertainty inherent in projections is via modelling and analysis of alternate cases that focus on variability in: future economic growth, population projections, and oil and natural gas production and prices. The sensitivity analyses generated through these alternate cases are used to identify a range of possible emissions projections. Through the sensitivity analysis of the "With measures" scenario, GHG emissions in 2030 are projected to range between 601 and 650 Mt CO_2 eq, excluding LULUCF. The LULUCF accounting contribution is projected to reduce Canada's emissions by 28 Mt CO_2 eq in 2030. In 2035, the same range is expected to be between 552 and 654 Mt CO_2 eq, and between 515 and 647 Mt CO_2 eq in 2040, still when excluding LULUCF.

[5] Through the sensitivity analysis of the "With Measures" scenario, GHG emissions in 2035 are projected to range between 552 and 654 Mt CO_2 eq, excluding LULUCF. The LULUCF accounting contribution is projected to reduce Canada's emissions by 31 Mt CO_2 eq in 2035.

[6] Through the sensitivity analysis of the "With Measures" scenario, GHG emissions in 2040 are projected to range between 515 and 647 Mt CO_2 eq, excluding LULUCF. The LULUCF accounting contribution is projected to reduce Canada's emissions by 30 Mt CO_2 eq in 2040.

About the indicator

What the indicator measures

The indicator provides an overview of Canada's projected GHG emissions. These modelled projections are based on:

- historical data from Canada's National Inventory Report
- expectations about future energy markets, population and economic growth from authoritative sources including the Canada Energy Regulator, Statistics Canada, and Finance Canada
- policies and measures that were in place as of August 2024
- policies and measures that were announced but not yet fully implemented, as of August 2024
- the impact of the purchase of credits under the Western Climate Initiative, nature-based climate solutions, and agriculture measures

Why this indicator is important

GHG emissions and climate change have important human health, environmental and economic impacts. The indicator allows the public and policymakers to see Canada's modelled GHG emissions projections relative to upcoming targets and beyond.

In 2015, Canada and 194 other countries reached the Paris Agreement. This agreement aims to limit the global average temperature rise to well below 2 degrees Celsius and pursue efforts to limit the increase to 1.5 degrees Celsius. To achieve this long-term goal, the Paris Agreement requires countries to increase their ambition every 5 years. In July 2021, Canada committed to a GHG emissions reduction target of 40% to 45% below 2005 levels by 2030 and to achieve net-zero emissions by 2050. In March 2022, Canada announced an interim objective to reduce GHG emissions to 20% below 2005 levels by 2026. In December 2024, Canada presented a 2035 GHG emission reduction target of 45% to 50% below 2005 levels.

The *Canadian Net-Zero Emissions Accountability Act* enshrines in legislation Canada's commitment to achieve net-zero greenhouse gas emissions by 2050. The Act establishes a legally-binding process to set 5-year national emissions-reduction targets and develop emissions reduction plans to achieve each target. In March 2022, the Government of Canada introduced the 2030 Emissions Reduction Plan, the first plan issued under the Act. The plan provides a roadmap for the Canadian economy to achieve its 2030 emissions reduction target. Additional targets will be developed in 5-year intervals for 2040 through to 2045, as well as associated plans through to 2050.

The 2030 Emissions Reduction Plan builds upon the actions outlined in Canada's previous climate plans. Canada’s first-ever national climate plan was released in 2016 – the Pan-Canadian Framework on Clean Growth and Climate Change – jointly developed by the federal, provincial and territorial governments and in consultation with Indigenous Peoples. In 2020, the Government of Canada announced its strengthened climate plan, A Healthy Environment and a Healthy Economy.

Related initiatives

This indicator supports the measurement of progress towards the following 2022 to 2026 Federal Sustainable Development Strategy Goal 13: Take action on climate change and its impacts.

In addition, the indicator contributes to the Sustainable Development Goals of the 2030 Agenda for Sustainable Development. They are linked to Goal 13, Take urgent action to combat climate change and its impacts and Target 13.2, "Integrate climate change measures into national policies, strategies and planning."

Related indicators

The Greenhouse gas emissions indicators report trends in total anthropogenic (human-made) GHG emissions at the national level, per person and per unit gross domestic product, by province and territory and by economic sector.

The Greenhouse gas emissions from large facilities indicator reports GHG emissions from the largest GHG emitters in Canada (industrial and other types of facilities).

The Global greenhouse gas emissions indicator provides a global perspective on Canada's share of global GHG emissions.

The Greenhouse gas concentrations indicators present atmospheric concentrations as measured from sites in Canada and at a global scale for 2 greenhouse gases: carbon dioxide and methane.

The Carbon dioxide emissions from a consumption perspective indicator shows the impact of Canada's consumption of goods and services, regardless of where they are produced, on the levels of carbon dioxide released into the atmosphere.

The Land-based greenhouse gas emissions and removals indicator tracks exchanges of greenhouse gas emissions and removals between the atmosphere and Canada's managed lands.

Data sources and methods

Data sources

The data for this indicator come from Environment and Climate Change Canada's GHG emissions projections as reported in Canada's First Biennial Transparency Report under the Paris Agreement. The indicator reflects the latest GHG emissions projections modelling published by the department at the time of production.

The latest projections (December 2024) use historical GHG emissions data from the 2024 National Inventory Report for the years 2005 to 2022 to which were added the accounting contribution from the Land Use, Land-Use Change and Forestry sector. The projections cover the period from 2023 to 2040.

Methods

No changes or additional calculations are performed on the data.

More information

The indicator is based on analysis that incorporates the most up-to-date information on GHG emissions, economic and population growth and energy price and production projections available at the time the technical modelling was completed. Data and information on policies and measures modelled under each scenario were included in Annex 4 of Canada's First Biennial Transparency Report under the Paris Agreement (PDF; 11.8 MB).

Emissions projections

The emissions projections have been developed in line with generally recognized best practices. This includes:

- incorporating Intergovernmental Panel on Climate Change standards for estimating GHG emissions across different fuels and processes
- relying on outside expert views and the most up-to-date assumptions of the key drivers that influence Canada's overall GHG emissions, such as economic and population growth, energy prices, and energy demand and supply
- applying an internationally recognized energy and macroeconomic modelling framework for estimating emissions and economic interactions
- using a methodology to develop the projections and underlying assumptions that has been subject to peer review by leading external experts on economic modelling and GHG emissions projections, and reviewed by key stakeholders

The approach to developing Canada's GHG emissions projections involves:

- using the most up-to-date statistics on GHG emissions and energy use, and sourcing key assumptions from the best available public and private expert sources
- developing emissions projection scenarios using the detailed and proven Energy, Emissions and Economy Model for Canada, which combines a detailed bottom-up simulation with a top-down macroeconomic model

The methodology for developing the emissions scenarios is described in Annex 4 of Canada's First Biennial Transparency Report under the Paris Agreement (PDF; 11.8 MB).

An overview of how Canada reports on progress toward its GHG emissions reduction targets is provided in Canada's First Biennial Transparency Report.

Scenarios

Canada's First Biennial Transparency Report under the Paris Agreement presents 2 bottom-up scenarios.

- the "With measures" scenario which includes policies and measures in place as of August 2024 and the accounting contribution from the Land Use, Land-Use Change and Forestry (LULUCF) sector
- the "With additional measures" scenario which adds in policies and measures that are under development but have not yet been fully implemented, including nature-based-climate solutions (NBCS), agriculture measures and credits purchased under the Western Climate Initiative (WCI)

Recent changes

The calculation of this indicator reflects methodological revisions that were applied to the 2024 National Inventory Report, as well as revisions to the Energy, Emissions and Economy Model for Canada. Recalculations have resulted in upward revisions to emissions for all years. This upward revision is mainly driven by the use of updated global warming potentials as published in IPCC's Fifth Assessment report and methodological improvements implemented in the upstream oil and gas sector. For a list of the modelling and methodological changes, refer to Annex 4 of Canada's First Biennial Transparency Report under the Paris Agreement (PDF; 11.8 MB).

Caveats and limitations

Emissions projections are subject to uncertainty and are most appropriately viewed as a range of plausible outcomes. Many of the events that shape emissions and energy markets cannot be anticipated. In addition, future developments in technologies, demographics and resources cannot be foreseen with certainty.

More information

Scenarios' description

The projection scenarios derive from a series of plausible assumptions regarding, among others, population and economic growth, prices, demand and supply of energy, and the evolution of energy efficiency technologies. The "With measures" scenario assumes no further government actions to address GHG emissions beyond those already in place as of August 2024. The "With additional measures" scenario includes all federal, provincial, and territorial policies and measures from the "With measures" scenario as well as those that have been announced but have not yet been fully implemented. This scenario also includes the accounting contribution from the Land Use, Land-Use Change and Forestry (LULUCF) sector, in addition to the impact of nature-based climate solutions, agriculture measures, and credits purchased under the Western Climate Initiative.

Nature-based climate solutions and agriculture measures contribution was estimated for the year 2030 only. The scenario assumes the 2030 estimate (reduction of 11 to 13 megatonnes of carbon dioxide equivalent, with a central estimate of 12) is constant out to 2040.

A list of all policies and measures included in both cases is available in Annex 4 of Canada's First Biennial Transparency Report under the Paris Agreement (PDF; 11.8 MB).

Uncertainty and sensitivity

The projections are conservative relative to the significant investments and economic transformation likely to unfold over the coming decade. Certain investments, such as those in clean technology or public transit, are difficult to quantify in advance but can be expected to have a material impact on emissions. These projections also do not account for the reality that Canada is just starting along the innovation curves associated with promising decarbonization technologies.

The projections presented in the indicator are based on a series of assumptions, including that the current planned policy context will continue into the future. The projections do not attempt to account for unknown

changes in government policy; energy supply, demand and technology; or domestic and international economic and political events.

The future level of GHG emissions in Canada depends on a number of factors, including changes in future energy markets and economic assumptions, technological change, consumer behaviour, and introduction of additional policies aimed at emissions reductions. A sensitivity analysis was conducted to address the uncertainty regarding the key drivers of GHG emissions and identify a range of possible emissions projections. The analysis focuses on variability in 2 key factors: future economic and population growth, and the evolution of world fossil fuel prices. For more details about the sensitivity analysis, please consult Annex 4 of Canada's First Biennial Transparency Report under the Paris Agreement (PDF; 11.8 MB).

Modelling

While the Energy, Emissions and Economy Model for Canada is a sophisticated analytical tool, no model can fully capture the complicated interactions between policy measures, markets, firms and consumers.

The Energy, Emissions and Economy Model for Canada has a broad model boundary that captures the complex interactions that occur between producers, consumers, and the environment across all energy sectors in the Canadian context. In addition, the Energy, Emissions and Economy Model for Canada has an explicit causal structure that can be used to understand the origins of the patterns of behavior observed and also captures capital stock dynamics. Combined with the fact that it is calibrated to the Canadian experience, these provide considerable flexibility for the modelling of energy and environmental policies.

Unlike computable general equilibrium models, the Energy, Emissions and Economy Model for Canada does not fully equilibrate government budgets and the markets for employment and investment. That is, the modelling results reflect rigidities such as unemployment and government surpluses and deficits. The model, as used by Environment and Climate Change Canada, also does not generate changes in nominal interest rates and exchange rates, as would occur under a monetary policy response to a major economic event. Consequently, the model is not designed to undertake welfare analysis.

Finally, the model lacks endogenous technological change for the industrial and transportation sectors. As a result, the Energy, Emissions and Economy Model for Canada is not well-suited to modelling disruptive technological changes.

For more details about the Energy, Emissions and Economy Model for Canada, please consult Annex 4 of Canada's First Biennial Transparency Report under the Paris Agreement (PDF; 11.8 MB).

Resources

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Related information

Canada's climate plan

Greenhouse gas emissions projections

Annex

Annex A. Data table for the figure presented in this document

Table A.1. Data for Figure 1. Historical greenhouse gas emissions and projections, Canada, 2005 to 2040

Year	Historical emissions[A] (megatonnes of carbon dioxide equivalent)	"With measures" scenario (megatonnes of carbon dioxide equivalent)	"With additional measures" scenario – no NBCS and agriculture measures (megatonnes of carbon dioxide equivalent)	"With additional measures" scenario [B] (megatonnes of carbon dioxide equivalent)
2005	761	n/a	n/a	n/a
2006	754	n/a	n/a	n/a
2007	780	n/a	n/a	n/a
2008	762	n/a	n/a	n/a
2009	702	n/a	n/a	n/a
2010	738	n/a	n/a	n/a
2011	756	n/a	n/a	n/a
2012	745	n/a	n/a	n/a
2013	748	n/a	n/a	n/a
2014	722	n/a	n/a	n/a
2015	750	n/a	n/a	n/a
2016	722	n/a	n/a	n/a
2017	723	n/a	n/a	n/a
2018	736	n/a	n/a	n/a
2019	726	n/a	n/a	n/a
2020	667	n/a	n/a	n/a
2021	669	n/a	n/a	n/a
2022	720	n/a	n/a	n/a
2023	n/a	648	638	n/a
2024	n/a	668	658	n/a
2025	n/a	659	642	n/a
2026	n/a	652	628	n/a
2027	n/a	642	597	n/a
2028	n/a	626	565	n/a
2029	n/a	614	541	n/a
2030	n/a	597	514	502
2031	n/a	592	505	492
2032	n/a	588	498	486
2033	n/a	584	492	480
2034	n/a	583	485	473

Year	Historical emissions[A] (megatonnes of carbon dioxide equivalent)	"With measures" scenario (megatonnes of carbon dioxide equivalent)	"With additional measures" scenario – no NBCS and agriculture measures (megatonnes of carbon dioxide equivalent)	"With additional measures" scenario [B] (megatonnes of carbon dioxide equivalent)
2035	n/a	577	470	458
2036	n/a	575	464	451
2037	n/a	569	458	446
2038	n/a	565	451	439
2039	n/a	561	446	434
2040	n/a	559	444	431

Note: n/a = not applicable. NBCS = nature-based climate solutions. [A] Historical emissions data from 2005 to 2022 correspond to the emissions presented in the National Inventory Report 1990-2022: Greenhouse gas sources and sinks in Canada (excluding net GHG flux from Land Use, Land-Use Change and Forestry [LULUCF]) to which were added the accounting contribution from the LULUCF. [B] The GHG impact of NBCS and agriculture measures contribution was estimated for the year 2030 only. Since the reductions from NBCS and agriculture measures are considered permanent, it is assumed that the 2030 estimate (a reduction of 11 to 13 megatonnes of carbon dioxide equivalent, with a central estimate of 12) is constant out to 2040. For more information on the projection scenarios, refer to the Data sources and methods.
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