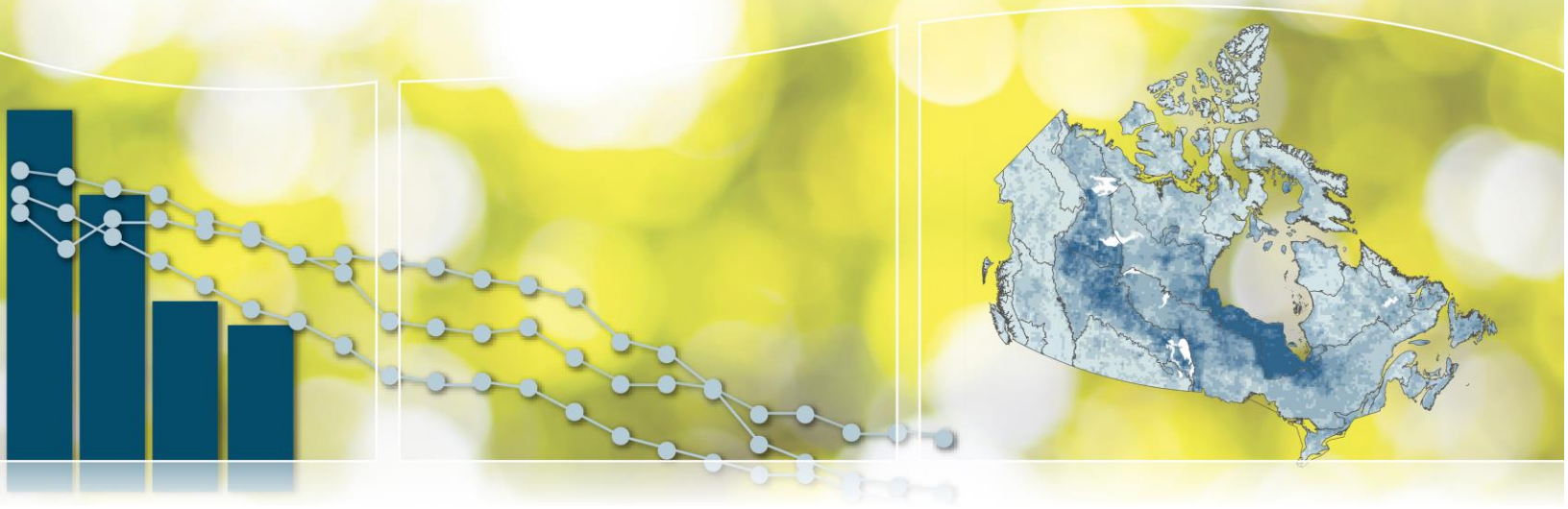
Environment and Climate Change Canada
Environnement et Changement climatique Canada

Canadian Environmental Sustainability Indicators

Progress towards Canada's greenhouse gas emissions reduction target



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Canadian Environmental Sustainability Indicators

Progress towards Canada's greenhouse gas emissions reduction target

January 2019

Table of Contents

Progress towards Canada's greenhouse gas emissions reduction target 5
Greenhouse gas projections 5
Key results 5
Projected greenhouse gas emissions reductions 6
Key results 6
About the indicator 7
What the indicator measures 7
Why this indicator is important 8
Related indicators 8
Data sources and methods 9
Data sources 9
Methods 9
Recent changes 10
Caveats and limitations 10

Resources 11
References 11
Related information 11
Annex 12
Annex A. Data tables for the figures presented in this document 12

List of Figures

Figure 1. Historical greenhouse gas emissions and projections, Canada, 2005 to 2030 5
Figure 2. Projected emissions reductions in 2030 7

List of Tables

Table A.1. Data for Figure 1. Historical greenhouse gas emissions and projections, Canada, 2005 to 2030 12
Table A.2. Data for Figure 2. Projected emissions reductions in 2030 13

Progress towards Canada's greenhouse gas emissions reduction target

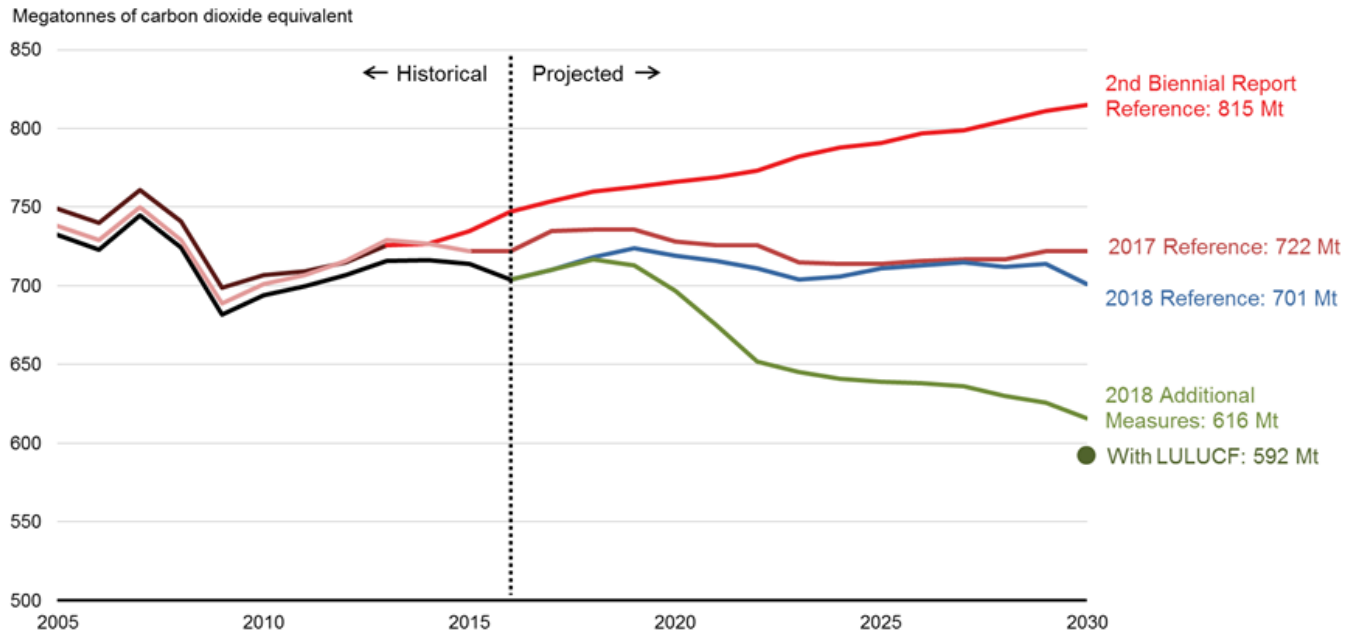
Greenhouse gases (GHGs) trap heat in the Earth's atmosphere, just as the glass of a greenhouse keeps warm air inside. Human activity increases the amount of GHG in the atmosphere. When more heat is trapped, the temperature of the planet increases. Under the Paris Agreement, Canada has committed to reducing its GHG emissions by 30% below 2005 levels by 2030. This indicator tracks Canada's progress towards meeting its target.

Greenhouse gas projections

Key results

- In the Second Biennial Report, published in early 2016, GHG emissions in 2030 were projected to be 815 megatonnes of carbon dioxide equivalent (Mt CO_2 eq)
- Environment and Climate Change Canada publishes updated projections annually. Most recently, in December 2018, projections were updated and 2 scenarios were developed:
    - under the Reference Case scenario, emissions are projected to be 701 Mt CO_2 eq in 2030, or 4% below 2005 levels. The 2018 Reference Case scenario includes actions taken by governments, consumers and businesses put in place up to September 2018.
    - under the Additional Measures scenario and including the contribution of the land use, land use change and forestry (LULUCF) sector, emissions are projected to be 592 Mt CO_2 eq, or 19% below 2005 levels. This scenario accounts for additional policies and measures that are under development but have not yet been fully implemented.

Figure 1. Historical greenhouse gas emissions and projections, Canada, 2005 to 2030



Data for Figure 1

Note: LULUCF = land use, land use change and forestry. The land use, land use change and forestry sector is estimated to contribute an additional 24 Mt CO_2 eq reduction in greenhouse gases in 2030. For more information on the projection

scenarios, refer to the Data sources and methods.
Source: Environment and Climate Change Canada (2018) National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada. Environment and Climate Change Canada (2018) Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.

Canada committed to reducing its GHG emissions by 30% below the 2005 level of 732 Mt CO_2 eq by 2030.

Under the 2018 Reference Case scenario, it is projected that Canada's emissions in 2030 would be 701 Mt CO_2 eq, or 114 Mt CO_2 eq below the projections published in the Second Biennial Report.

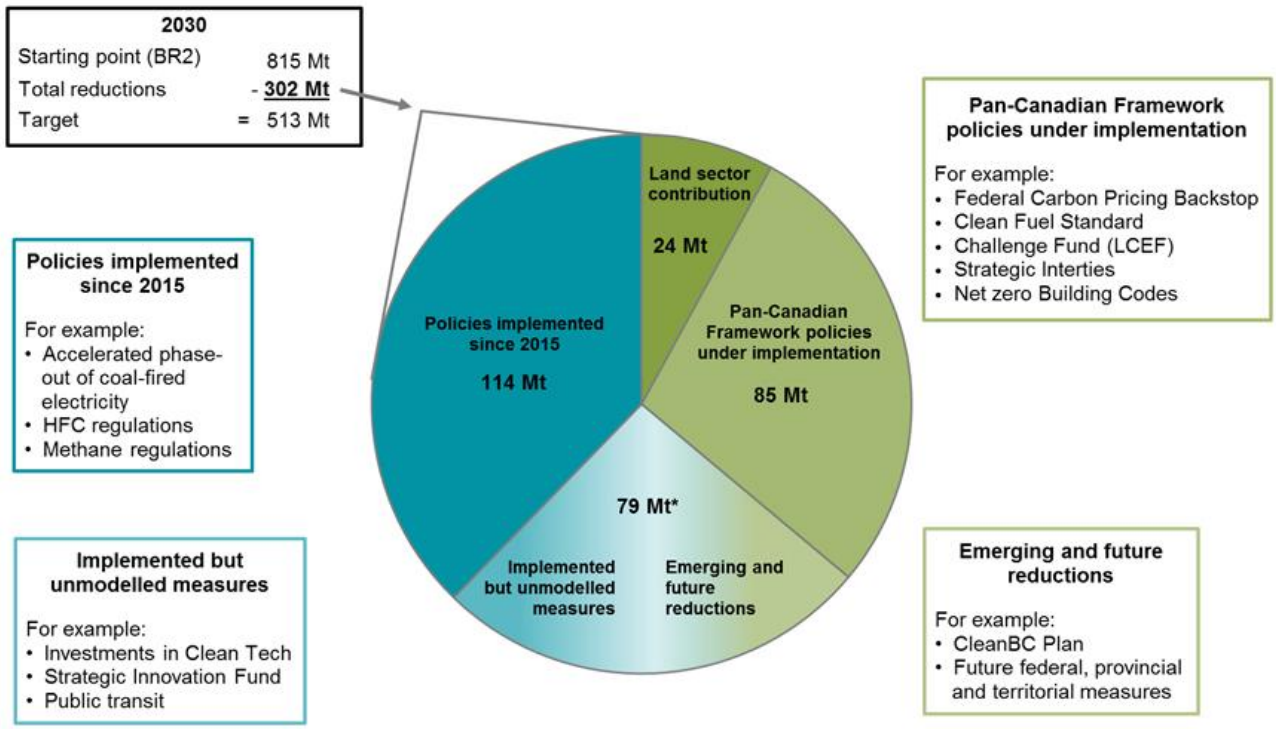
Taking into consideration climate change policies and measures that have been announced in Canada and for which enough information is available, an Additional Measures scenario has also been developed. Under this scenario and accounting for a 24 Mt CO_2 eq reduction from the land use, land use change and forestry (LULUCF) sector, emissions in 2030 would be 592 Mt CO_2 eq, or 223 Mt CO_2 eq below the projections published in February 2016. This decline, equivalent to approximately 30% of Canada's emissions in 2016, encompasses all economic sectors, demonstrating the effectiveness of Canada's climate plan.

Projected greenhouse gas emissions reductions

Key results

- Canada's 2030 emissions target is 513 Mt CO_2 eq
- To reach the target, Canada needs a 302 Mt CO_2 eq reduction in projected 2030 emissions from the starting point in the Second Biennial Report. These reductions will come from:
    - policies implemented since 2015 (114 Mt CO_2 eq)
    - Pan-Canadian Framework policies under implementation (85 Mt CO_2 eq)
    - land sector contribution (24 Mt CO_2 eq)
    - implemented but unmodelled measures and emerging and future reductions (79 Mt CO_2 eq)

Figure 2. Projected emissions reductions in 2030



Data for Figure 2

Note: BR2 = Second Biennial Report. * Please refer to the 2018 Canada's Greenhouse Gas and Air Pollutant Emissions Projections report for information about the changes relative to the 2017 projections. Land sector is short for the land use, land use change and forestry sector. The starting point projections are reported in Canada's Second Biennial Report on Climate Change. For more information on the projection emissions in 2030, refer to chapter 1.4 of the Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.
Source: Environment and Climate Change Canada (2018) Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.

About the indicator

What the indicator measures

The indicator provides an overview of Canada's projected GHG emissions up to 2030. These 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 National Energy Board, Statistics Canada and Finance Canada
- policies and measures that were in place as of September 2018 (for the Reference Case scenario of the December 2018 projections)
- policies and measures that are under development but not yet fully implemented (for the Additional Measures scenario)

Why this indicator is important

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. Under the Agreement, Canada has committed to a target to reduce GHG emissions by 30% below 2005 levels by 2030.

This indicator allows the public and policy-makers to see Canada's progress towards meeting its GHG emissions target.

This indicator also contributes to the measurement of progress towards the 2016–2019 Federal Sustainable Development Strategy target: Canada's GHG emissions. By 2030, reduce Canada's total GHG emissions by 30%, relative to 2005 emission levels.

Further, this indicator is important because of the human health, environmental and economic impacts associated with GHG emissions. For more information on these impacts, consult Greenhouse gas emissions: drivers and impacts.

Related indicators

The Greenhouse gas emissions indicators report trends in total anthropogenic (human-made) GHG emissions.

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 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.

Effective action on climate change

This indicator supports the measurement of progress towards the following 2016–2019 Federal Sustainable Development Strategy long-term goal: A low-carbon economy contributes to limiting global average temperature rise to well below 2 degrees Celsius and supports efforts to limit the increase to 1.5 degrees Celsius.

Data sources and methods

Data sources

The data for this indicator come from Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018. The indicator reflects the latest GHG emissions projections published by Environment and Climate Change Canada at time of production.

The latest projections (December 2018) use historical GHG emissions data from the 2018 National Inventory Report for the years 2005 to 2016. The projection scenarios cover the years 2017 to 2030.

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 Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.

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 data available for key drivers, 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 vetted 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 (E3MC)

The methodology for developing the emissions scenarios is described in Annex 5 of Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.

Scenarios

The indicator presents 4 different scenarios:

- the Second Biennial Report Reference Case, shown from 2014 to 2030, is reported as the "with measures" projections in Canada's Second Biennial Report on Climate Change. This scenario includes policies and measures in place as of September 2015. Historical GHG emissions data from 2005 to 2013 were taken from the National Inventory Report 1990-2013: Greenhouse gas sources and sinks in Canada
- the 2017 Reference Case, shown from 2016 to 2030, is reported as the "with measures" scenario in Canada's Seventh National Communication and Third Biennial Report to the United Nations Framework Convention on Climate Change and include policies and

measures in place as of September 2017. Historical GHG emissions data from 2005 to 2015 were taken from the National Inventory Report 1990-2015: Greenhouse gas sources and sinks in Canada

- the 2018 Reference Case, shown from 2017 to 2030, is reported in Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018. This scenario includes policies and measures in place as of September 2018. Historical GHG emissions data from 2005 to 2016 were taken from the National Inventory Report 1990-2016: Greenhouse gas sources and sinks in Canada
- the 2018 Additional Measures scenario, also shown from 2017 to 2030, and reported in Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018. This scenario includes all of the actions, policies and measures of the 2018 Reference Case as well as all climate change policies and measures that have been announced in Canada and for which enough information is available. This scenario accounts for those additional policies and measures that are under development but have not yet been fully implemented, some of which were announced as part of the Pan-Canadian Framework on Clean Growth and Climate Change (for example, the federal carbon pollution pricing system). Historical GHG emissions data from 2005 to 2016 were taken from the National Inventory Report 1990-2016: Greenhouse gas sources and sinks in Canada

Recent changes

The calculation of this indicator reflects methodological revisions that were applied to the 2018 National Inventory Report, as well as to the Energy, Emissions and Economy Model for Canada. For a list of the modelling and methodological changes, refer to Annex 5 of Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.

The projections for 2030 now take into account the contribution of the land use, land use change and forestry (LULUCF) sector towards GHG emissions targets. More details about LULUCF reporting and accounting can be found in Section 1.3.8 and Annex 3 of Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.

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

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 2018 Reference Case assume no further government actions to address GHG emissions beyond those already in place as of September 2018.

Under the Pan-Canadian Framework on Clean Growth and Climate Change, a number of policies and measures have been announced. As the policy development process is not yet finished, some policies were not included in the 2018 Reference Case, but they were included in the 2018 Additional Measures scenario. For a complete list of included policies and measures modelled under each scenario, refer to Table A10 in Annex 1 of Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018. Note that the modelled policies and measures do not match the full list of announced measures. This is because the economic modelling will only account for measures where sufficiently detailed data exist that makes it possible to add them to the modelling platform.

It is expected that GHG estimates will continue to decline in the near to medium term, especially as current estimates do not include the full reductions from investment in public

transit, clean technology and innovation. Furthermore, these projected emission reductions do not account for additional mitigation measures that could be implemented by the provinces and territories, as well as the federal government, between now and 2030. Emissions reductions from additional future actions will be assessed as new measures are implemented.

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 the inevitable but as yet unknown changes that will occur 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. The analysis focuses on variability in 2 key factors: future economic growth and population projections, and the evolution of oil and natural gas prices and production. For more details about the sensitivity analysis, please consult Section 1.5.2 and Annex 2 of Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.

While the Energy, Emissions and Economy Model for Canada is a sophisticated analytical tool, no model can fully capture the complicated interactions associated with given policy measures between and within markets or between firms and consumers. 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 modeling results reflect rigidities such as unemployment and government surpluses and deficits. Furthermore, the model, as used by Environment and Climate Change Canada, does not generate changes in nominal interest rates and exchange rates, as would occur under a monetary policy response to a major economic event.

Resources

References

Environment and Climate Change Canada (2018) National Inventory Report 1990-2016: Greenhouse gas sources and sinks in Canada. Retrieved on November 23, 2018.

Environment and Climate Change Canada (2018) Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018. Retrieved on December 21, 2018.

Related information

Greenhouse gas emissions: drivers and impacts

Annex

Annex A. Data tables for the figures presented in this document

Table A.1. Data for Figure 1. Historical greenhouse gas emissions and projections, Canada, 2005 to 2030

Year	Second Biennial Report Reference Case[A] (megatonnes of carbon dioxide equivalent)	2017 Reference Case[B] (megatonnes of carbon dioxide equivalent)	2018 Reference Case[C] (megatonnes of carbon dioxide equivalent)	2018 Additional Measures[C] (megatonnes of carbon dioxide equivalent)	Canada's target (megatonnes of carbon dioxide equivalent)
2005	749	738	732	732	n/a
2006	740	729	723	723	n/a
2007	761	750	745	745	n/a
2008	741	729	724	724	n/a
2009	699	689	682	682	n/a
2010	707	701	694	694	n/a
2011	709	707	700	700	n/a
2012	715	716	707	707	n/a
2013	726	729	716	716	n/a
2014	727	727	716	716	n/a
2015	735	722	714	714	n/a
2016	747	722	704	704	n/a
2017	754	735	710	710	n/a
2018	760	736	718	717	n/a
2019	763	736	724	713	n/a
2020	766	728	719	697	n/a
2021	769	726	716	675	n/a
2022	773	726	711	652	n/a
2023	782	715	704	645	n/a
2024	788	714	706	641	n/a
2025	791	714	711	639	n/a
2026	797	716	713	638	n/a
2027	799	717	715	636	n/a
2028	805	717	712	630	n/a
2029	811	722	714	626	n/a
2030	815	722	701	592[D]	513

Note: n/a = not applicable. [A] Reported in Canada's Second Biennial Report on Climate Change. This scenario includes policies and measures in place as of September 2015. Historical greenhouse gas emissions data from 2005 to 2013 were taken from the National Inventory Report 1990-2013: Greenhouse gas sources and sinks in Canada. [B] This scenario is reported in Canada's Seventh National Communication and Third Biennial Report to the United Nations Framework Convention

on Climate Change and includes policies and measures in place as of September 2017. Historical greenhouse gas emissions data from 2005 to 2015 were taken from the National Inventory Report 1990-2015: Greenhouse gas sources and sinks in Canada. [C] The 2018 scenarios are reported in Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018. Historical greenhouse gas emissions data from 2005 to 2016 were taken from the National Inventory Report 1990-2016: Greenhouse gas sources and sinks in Canada. The Reference Case scenario includes policies and measures in place as of September 2018. The Additional Measures scenario includes additional measures from Canada's clean growth and climate change plan that have been announced but are still under development. [D] This value includes the 24 Mt CO_2 eq contribution of the land use, land use change and forestry sector. For more information on the projection scenarios, refer to the Data sources and methods.
Source: Environment and Climate Change Canada (2018) National Inventory Report 1990-2016: Greenhouse Gas Sources and Sinks in Canada. Environment and Climate Change Canada (2018) Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.

Table A.2. Data for Figure 2. Projected emissions reductions in 2030

Reduction measure	Projected emissions reductions in 2030 (megatonnes of carbon dioxide equivalent)	Examples of actions
Policies implemented since 2015	114	• Accelerated phase-out of coal-fired electricity • HFC regulations • Methane regulations
Pan-Canadian Framework policies under implementation	85	• Federal Carbon Pricing Backstop • Clean Fuel Standard • Challenge Fund (LCEF) • Strategic Interties • Net Zero Building Codes
Land sector contribution	24	n/a
Implemented but unmodelled measures	79	• Investments in Clean Tech • Strategic Innovation Fund • Public transit
Emerging and future reductions		• CleanBC Plan • Future federal, provincial and territorial measures
Total	302	n/a

Note: n/a = not applicable.
Source: Environment and Climate Change Canada (2018) Canada's Greenhouse Gas and Air Pollutant Emissions Projections 2018.

Additional information can be obtained at:

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