Environment and Climate Change Canada
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# GREENHOUSE GAS EMISSIONS

## CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

Canada

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# CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

# GREENHOUSE GAS EMISSIONS

## April 2023

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# Greenhouse gas emissions

Climate change is one of the most important environmental issues of our time. Climate change is caused by the increase in concentrations of greenhouse gases (GHGs) in the atmosphere. These increases are primarily due to GHG emissions resulting from human activities such as the use of fossil fuels or agriculture. This changing climate has impacts on the environment, human health and the economy. The indicators report estimates of Canada's emissions of GHGs over time.

Since 2015 and the signing of the Paris Agreement, Canada adopted 2005 as the base year for its GHG emission reduction target. In 2021, Canada committed to reduce its GHG emissions by 40-45 percent below 2005 levels by 2030. Historically, following Canada's ratification of the Kyoto Protocol, the base year was 1990.

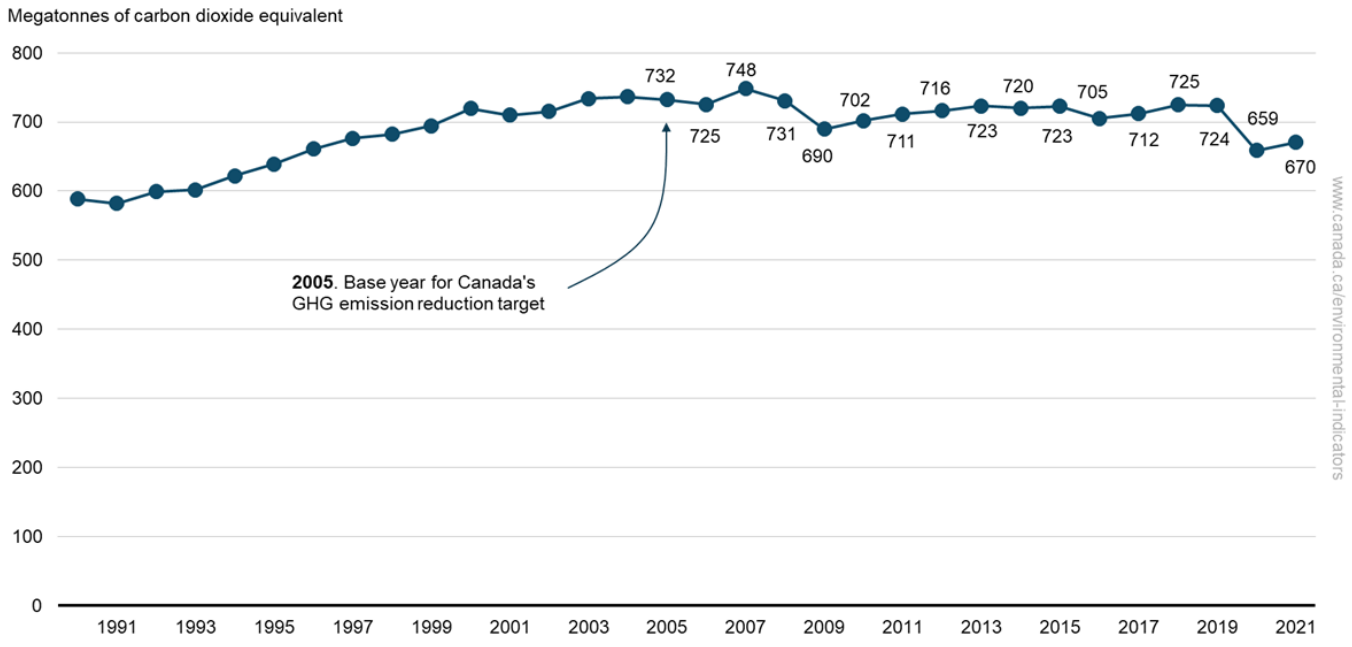
The latest year reported (2021) coincides with the 2nd year of the COVID-19 pandemic which affected a wide range of economic sectors, including the energy and transport sectors. The long-term trends presented must be interpreted in the context of the economic slowdown that influenced results from 2019 to 2021.

## National greenhouse gas emissions

### Key results

- Canada's total GHG emissions in 2021 were 670 megatonnes of carbon dioxide equivalent (Mt $CO_2$ eq), a 1.8% increase from 659 Mt $CO_2$ eq in 2020
- From 2005 to 2021, Canada's GHG emissions decreased by 8.4% (62 Mt $CO_2$ eq)
- Between 1990 and 2021, Canada's GHG emissions increased by 13.9% (82 Mt $CO_2$ eq)

**Figure 1. Greenhouse gas emissions, Canada, 1990 to 2021**




Data for Figure 1

**Note:** Data are presented as rounded figures. The national indicator tracks 7 greenhouse gases released by human activity: carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, perfluorocarbons, hydrofluorocarbons and nitrogen trifluoride. Emission levels for some years have been revised in light of improvements to estimation methods and availability of new data. Emissions and removals from the land use, land use change and forestry sector (LULUCF) are excluded from national totals to allow for a focus on greenhouse gas released from human activity only. Consult the interactive figures to explore the national results in a dynamic and customizable format.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

While the overall trend between 1990 and 2021 was an increase in GHG emissions, some sectors saw a decrease. Canada's overall emissions growth over the 1990 to 2021 period was driven primarily by increased emissions from the oil and gas as well as the transport sectors. The 8.4% decrease in GHG emissions between 2005 and 2021 was mainly a result of emission reductions from the electricity and heavy industry sectors.

The confinement measures introduced in 2020 due to the pandemic created an industrial slowdown and important reductions in trade and travel by air and land. These impacts contributed to the GHG emission decrease, especially in the transport sector where a 16% decrease was observed between 2019 and 2020. Following the partial recovery of economic activities in 2021, a rebound in the emissions was observed compared to 2020 (+12 Mt $CO_2$ eq). The emissions observed in 2021 remained below the pre-pandemic level of 2019.

According to the greenhouse gas equivalencies calculator developed by Natural Resources Canada, the 62 Mt $CO_2$ eq emission reduction for the period from 2005 to 2021 is equivalent to:

- removing around 19 000 000 gas-powered passenger vehicles from the roads for 1 year, or
- the energy-based emissions from around 14 500 000 homes for 1 year

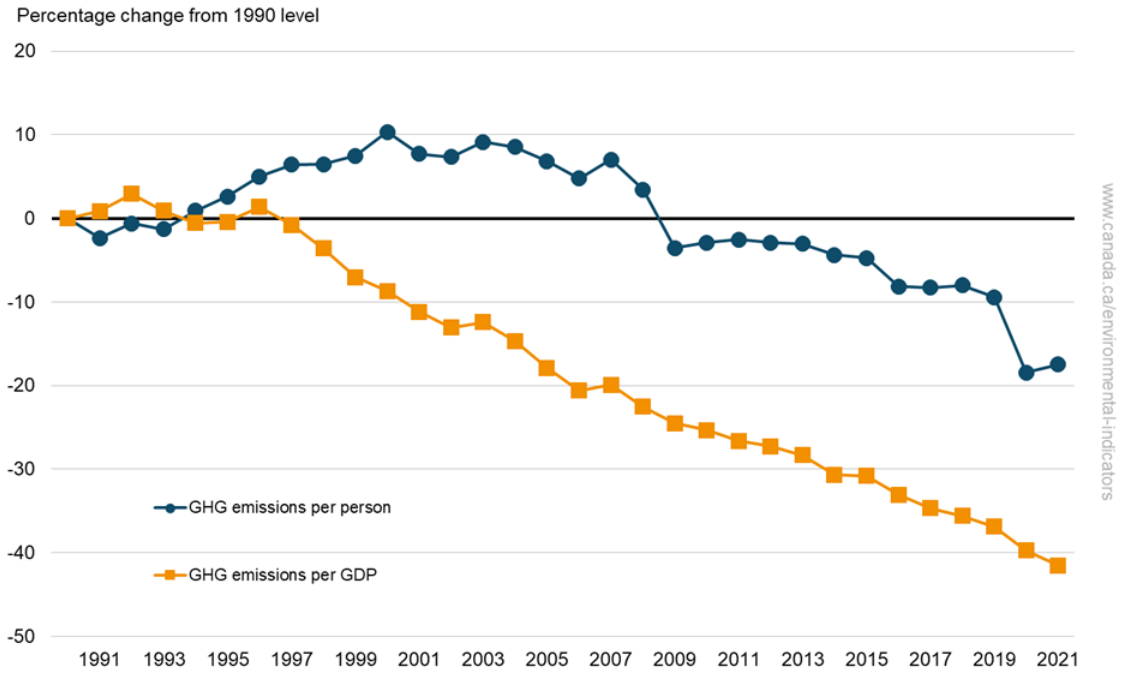
## Greenhouse gas emissions per person and per unit of GDP

While the overall value of GHG emitted is important to measure, the relationship between GHG emissions and economic activity and/or population is useful to monitor the transition to a low-carbon economy. These indicators present the GHG emission intensities relative to Canada's population and its economic activity. GHG emission intensity compares the amount of GHGs emitted per unit of activity or any other specific metric. Decreasing trends would mean that less GHGs are emitted for one unit of the selected metric.

### Key results

- Between 1990 and 2021, the amount of GHGs emitted per person decreased 17% from 21.3 to 17.5 tonnes of carbon dioxide equivalent ($CO_2$ eq) per person
- Over the same period, 42% less GHGs were emitted to produce 1 billion dollars worth of goods and services (from 0.54 to 0.32 megatonnes $CO_2$ eq per billion dollars of GDP)

**Figure 2. Indexed trend in greenhouse gas emissions per person and per unit of GDP, Canada, 1990 to 2021**




Data for Figure 2

**Note:** The chart presents the ratio of annual GHG emissions per person and per unit of GDP relative to those values in 1990 (that is the values are indexed to 1990). Greenhouse gas emissions per unit of GDP is calculated using real inflation-adjusted GDP in 2012 dollars. Emission levels for some years have been revised in light of improvements to estimation methods and availability of new data.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada. Statistics Canada (2023) Table 17-10-0005-01 - Estimates of population, by age group and sex for July 1, Canada, provinces and territories, annual. Statistics Canada (2023) Table 36-10-0369-01 - Gross domestic product at 2012 constant prices, expenditure-based, annual.

The general decreasing trends in GHG emissions per person and per unit of GDP are attributable to a number of factors. More efficient industrial processes, a shift to a more service-based economy and a decrease in the emissions associated with electricity generation are all contributing to these decreases.

Between 2020 and 2021, GHG emissions per person increased (+1.2%) while GHG emissions per unit of GDP decreased (-3.0%). This corresponds to GHG emissions increasing at:

- a higher rate than population growth (which grew by just 0.6%, the lowest rate in the period from 1990 to 2021)
- a lower rate than GDP growth (which increased by 4.9%, the highest rate since 2000)

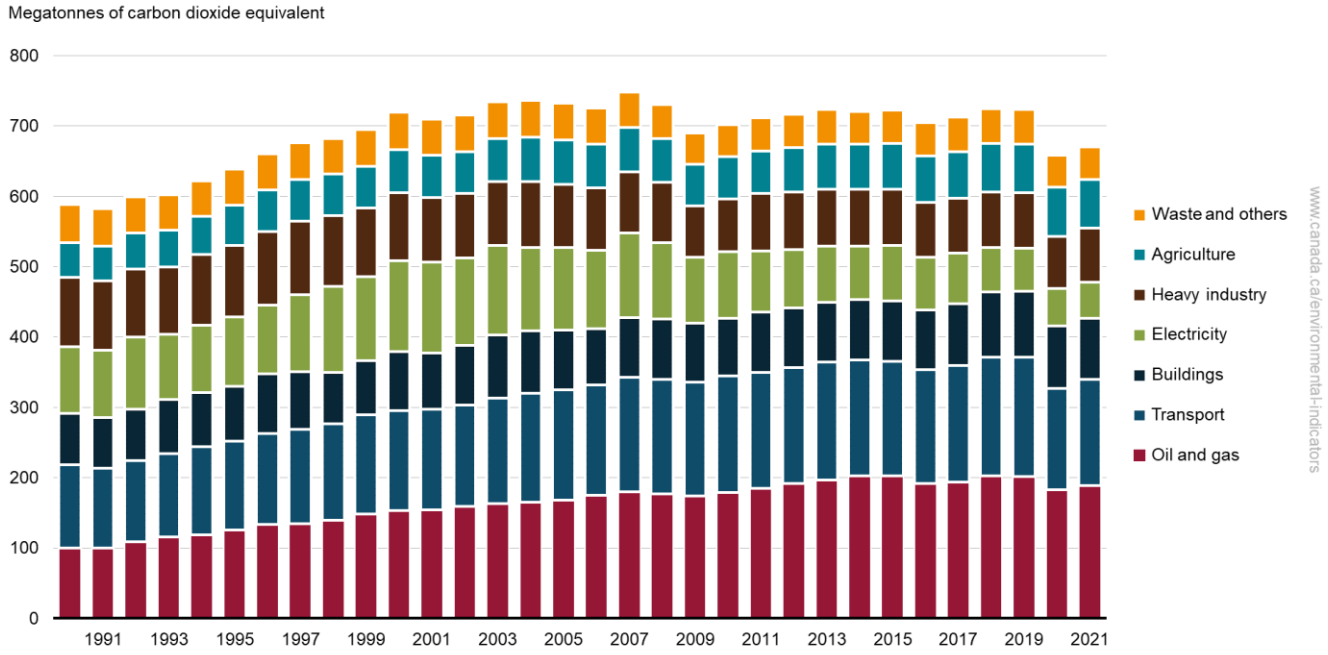
## Greenhouse gas emissions by economic sector

This indicator shows GHG emissions reported by the economic sector in which they are generated. Indicators focusing specifically on the oil and gas, transport, agriculture and electricity sectors follow.

### Key results

- In 2021, the oil and gas sector and transport sector were the largest GHG emitters in Canada, accounting for 28% and 22% of total emissions, respectively
- From 2020 to 2021, GHG emissions from the oil and gas, transport, heavy industry, and "waste and others" sectors grew by between 2% and 5%, while emissions from the buildings, electricity and agriculture sectors decreased by between 2% and 4%
- From 1990 to 2021:
    - an increase in emissions was observed for the oil and gas (+88%), transport (+27%), buildings (+21%) and agriculture sectors (+39%)
    - a decrease in emissions was observed for the electricity (-45%), heavy industry (-22%) and "waste and others" (-14%) sectors

**Figure 3. Greenhouse gas emissions by economic sector, Canada, 1990 to 2021**




Data for Figure 3

**Note:** "Others" in the Waste and others sector consists of emissions from light manufacturing, construction, forest resources and coal production. The Heavy industry sector consists of emissions from mining, smelting and refining, pulp and paper, iron and steel, cement, lime and gypsum, and chemicals and fertilizers. Consult the interactive figures to explore the sectoral results in a dynamic and customizable format.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

Between 1990 and 2021, the increase in total GHG emissions observed was mostly due to a 88% (89 Mt $CO_2$ eq) increase in emissions from the oil and gas sector and a 27% (32 Mt $CO_2$ eq) increase from the transport sector. These increases were partially offset by a 43 Mt $CO_2$ eq decrease in emissions from the electricity sector and a 22 Mt $CO_2$ eq decrease in emissions from heavy industry.

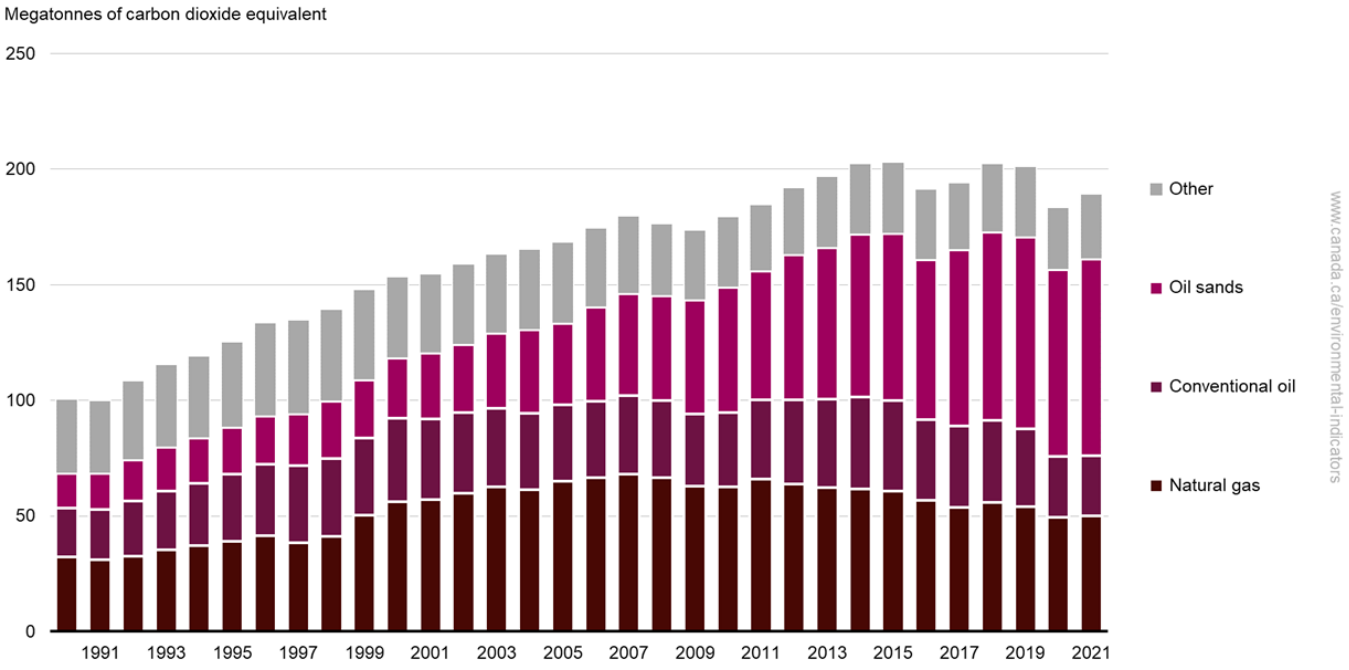
Between 2005 and 2021, the overall 62 Mt $CO_2$ eq decrease resulted mainly from a 66 Mt $CO_2$ eq. (-56%) reduction in emissions from the electricity sector and a 12 Mt $CO_2$ eq. (-14%) reduction from the heavy industry sector. Over that period, GHG emissions have also decreased for the transport (-4%), and the waste and others (-10%) sectors, while emissions increased for the oil and gas (+12%), agriculture (+8%) and buildings (+3%) sectors.

# Greenhouse gas emissions from the oil and gas sector

## Key results

- In 2021, the oil and gas sector was the largest source of GHG emissions, accounting for 28% of total national emissions with 189 megatonnes of carbon dioxide equivalent (Mt $CO_2$ eq) emitted
- In 2021, the sector's GHG emissions were 3% higher than in 2020
- Over the period from 1990 to 2021, the sector's GHG emissions have increased by 88%

**Figure 4. Oil and gas sector greenhouse gas emissions, Canada, 1990 to 2021**




Data for Figure 4

**Note:** Conventional oil includes production from frontier, light and heavy oil fields. The Other category includes downstream oil and gas emissions (combustion and fugitive emissions from the production of refined petroleum products and the distribution of natural gas to end consumers) and oil, natual gas and $CO_2$ transmission emissions (combustion and fugitive emissions from transmission, storage and delivery activities).
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

Between 1990 and 2021, total crude oil production more than doubled in Canada. This was mostly driven by a rapid increase in production from the oil sands, which are more GHG-intensive than conventional sources (that is, more GHGs are emitted per unit cubic meters of oil produced). This change thus had a major impact on total GHG emissions from the sector.

Over that period, GHG emissions from conventional oil production have increased by 24%, while emissions from oil sands production have increased by 463%. More than half of the increase in emissions from oil sands production over this period came from the growth of on site (*in situ*) production. Over the same period, production of natural gas from unconventional sources, such as those requiring the use of multi-stage fracturing techniques, also increased significantly (+55%).

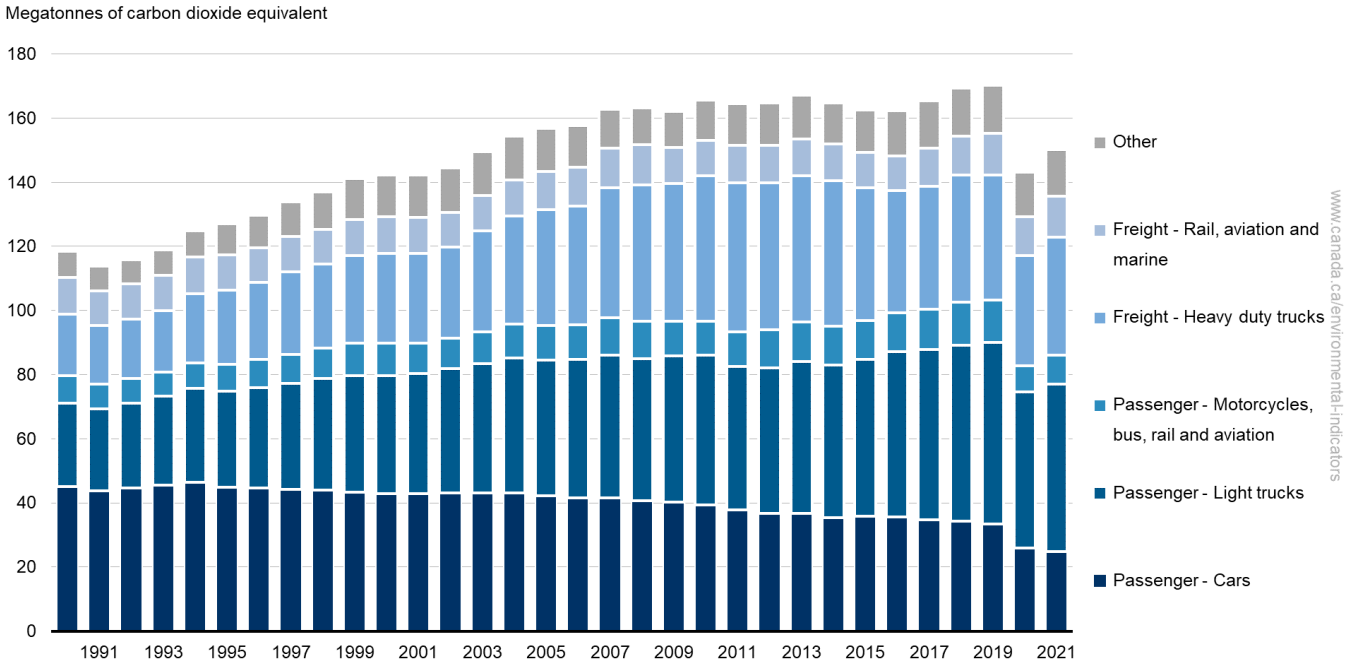
Similar trends were observed between 2005 and 2020, leading to a 12% increase in GHG emissions for that period. However, over that period, emissions from natural gas and conventional oil productions decreased by 23% and 21%, respectively. Emissions from those activities have shown decreasing trends in the past decade.

# Greenhouse gas emissions from the transport sector

## Key results

- In 2021, the transport sector was the second largest source of GHG emissions, accounting for 22% of total national emissions with 150 megatonnes of carbon dioxide equivalent (Mt $CO_2$ eq) emitted
- In 2021, the sector GHG emissions were 4.8% higher than in 2020 (143 Mt $CO_2$ eq)
- Between 1990 and 2021, GHG emissions from the transport sector grew by 27%. The growth in emissions was mostly driven by increases from freight heavy-duty trucks and passenger light trucks

**Figure 5. Transport sector greenhouse gas emissions, Canada, 1990 to 2021**




Data for Figure 5

**Note:** The Other category includes other recreational, commercial and residential uses. Categories have been adapted from the classification used in Annex 10 of the National Inventory Report. For more details, please consult the "Methods" section.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

Between 1990 and 2021, part of the GHG emissions increase was due to a higher number of vehicles on the road and to changes in vehicle type used. Although total emissions from passenger transport grew by 8%, emissions from cars declined by 45%, while emissions from light trucks (including trucks, vans and sport utility vehicles) doubled. Emissions from freight travel grew by 62% between 1990 and 2021. Specifically, emissions from freight heavy-duty trucks almost doubled and emissions from other modes of freight transport increased by 13%.

Emissions from passenger and freight transport are influenced by a variety of factors, including population and economic growth, vehicle type, fuel efficiency and fuel type. Changes in the mix of vehicle type used, such as the increasing preference of passenger vehicle owners for light trucks rather than more fuel-efficient passenger cars, played an important role in shaping the evolution of GHG emissions.

Since 1990, the number of light trucks increased much faster than the increase of other passenger on-road vehicles. While there have been continual improvements in the fuel efficiency of both passenger cars and light

trucks over the last few decades,[1] these improvements were not sufficient to offset the increases in emissions due to the change in composition of the vehicle fleet.

Between 2005 and 2021, GHG emissions from the transport sector decreased by 4.3%. The reduction in emissions was mostly driven by decreases from passenger cars. However, it should be noted that GHG emissions increased by 13 Mt $CO_2$ eq. (+9%) between 2005 and 2019 before being completely offset by a 27 Mt $CO_2$ eq. reduction between 2019 and 2020. This emission reduction is the highest annual decrease since 1990 and was likely influenced by the impacts of the COVID-19 pandemic on the transport sector (fewer kilometres driven and a decrease in air traffic). Between 2020 and 2021, emissions from the transport sector increased by 7 Mt $CO_2$ eq. following recovery of economic activities and the resumption of travel that had been limited by the pandemic.

[1] Natural Resources Canada (2019) Energy efficiency for transportation and alternative fuels.

## Greenhouse gas emissions from the agriculture sector

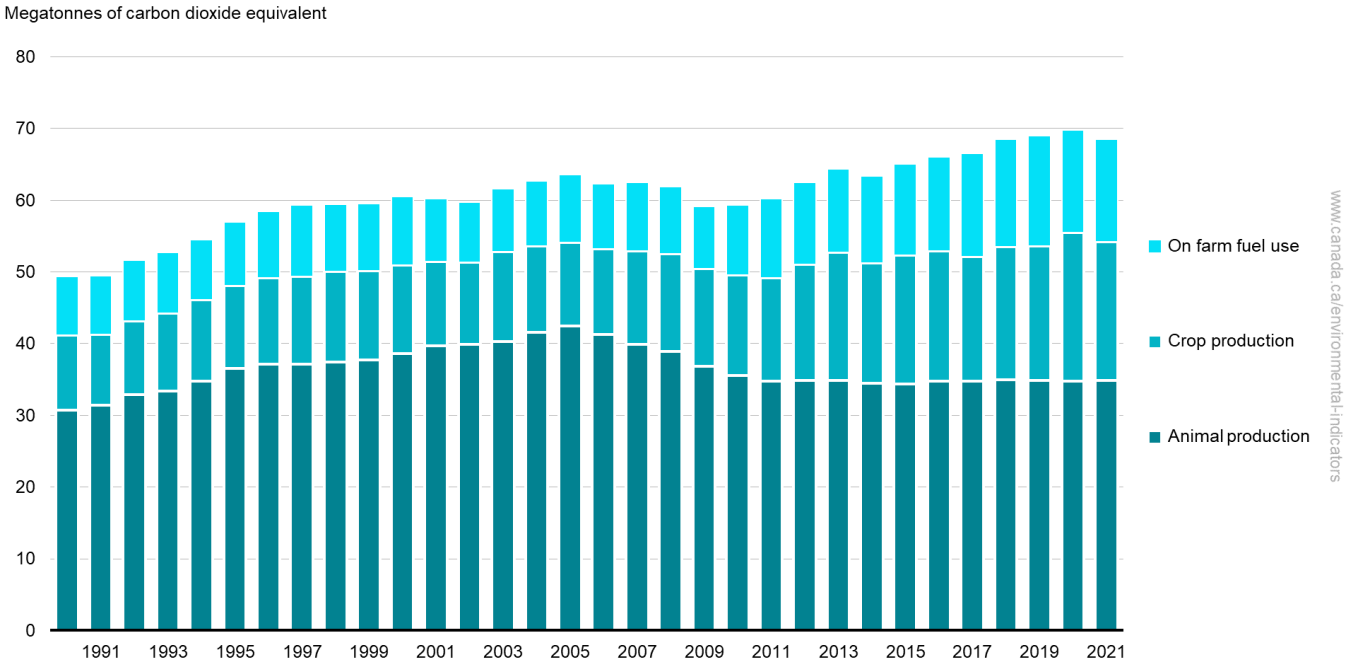
Greenhouse gas emissions from the agriculture sector are essentially attributable to the crop production (such as cereals and oilseeds), and animal production (beef, dairy, poultry and swine). Activities resulting in emissions include:

- Crop production: application of biosolids and inorganic nitrogen fertilizers, decomposition of crop residues, loss of soil organic carbon, cultivation of organic soils, indirect emissions from leaching and volatilization, field burning of agricultural residues, liming, and urea application
- Animal production: animal housing, manure storage, manure deposited by grazing animals, and application of manure to managed soils

### Key results

- In 2021, the agriculture sector was the 5th largest source of GHG emissions, accounting for 10% of total national emissions with 69 megatonnes of carbon dioxide equivalent (Mt $CO_2$ eq) emitted
- In 2021, the sector's GHG emissions were 2% lower than in 2020, mostly driven by a decrease in crop production emissions resulting from a hot and dry growing season
- Between 1990 and 2021, GHG emissions from the agriculture sector grew by 39%, mostly driven by an increase in emissions related to crop production

**Figure 6. Agriculture sector greenhouse gas emissions, Canada, 1990 to 2021**




Data for Figure 6

**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

Between 1990 and 2021, emissions increased from 49 Mt $CO_2$ eq to 69 Mt $CO_2$ eq. This increase is primarily attributable to the doubling of crop production emissions. Even though emissions from animal production have always represented at least half of the total agriculture GHG emissions, since 2005, the proportion of emissions from the crop production has risen, reaching its highest level in 2020. The drivers of the change are a reduction of cattle populations combined with a continued increase of crop production and fertilizer use.

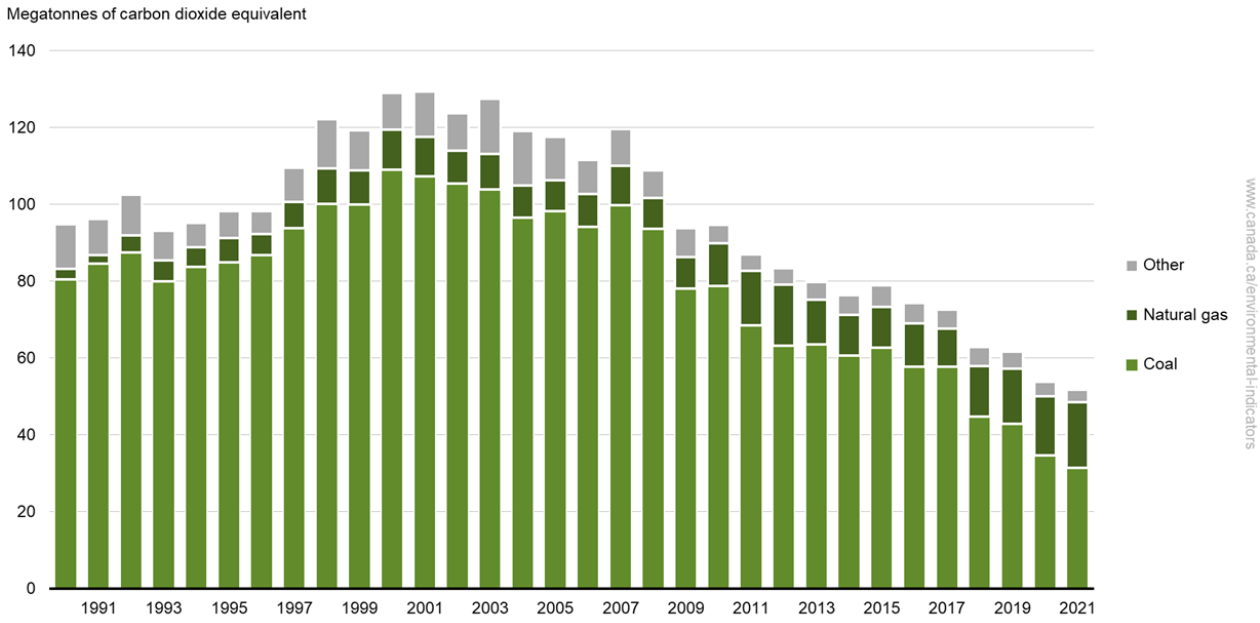
Between 2005 and 2021, GHG emissions from the agriculture sector showed a similar trend with an increase of 8%.

# Greenhouse gas emissions from the electricity sector

## Key results

- In 2021, the electricity sector was the 6th largest source of GHG emissions, accounting for 7.7% of total national emissions with 52 megatonnes of carbon dioxide equivalent (Mt $CO_2$ eq) emitted
- In 2021, the sector's GHG emissions were 4% lower than in 2020, 56% lower than in 2005, and 45% lower than in 1990

**Figure 7. Electricity sector greenhouse gas emissions, Canada, 1990 to 2021**




Data for Figure 7

**Note:** The Other category includes diesel fuel oil, heavy fuel oil, light fuel oil, motor gasoline, petroleum coke, own use of primary electricity, solid wood waste, still gas and non-fuel related emissions.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

Greenhouse gas emissions from combustion-based electricity generation have decreased from 95 megatonnes of carbon dioxide equivalent (Mt $CO_2$ eq) in 1990 to 52 Mt $CO_2$ eq in 2021. The growing share of electricity generated from low-GHG-emitting sources (such as hydro, other renewables and nuclear) and from fuels less GHG-intensive than coal contributed to the decline in GHG emissions from electricity generation. This transition can be observed in the fuel type shares, with coal's share of all combustion emissions having decreased from 85% in 1990 to 61% in 2021, while natural gas' share increased from 2.9% to 33%. Similar trends were observed between 2005 and 2021, leading to a 56% decrease from 118 Mt $CO_2$ eq. to 52 Mt $CO_2$ eq.

Electricity generation technologies have various levels of GHG emission intensity (which is defined as the quantity of GHGs emitted per unit of electricity produced). Hydroelectricity and nuclear power are low emitters of GHGs, while coal-burning power plants have a higher GHG intensity than natural gas-burning power plants. The general decline in the GHG intensity of electricity generation of public electric utilities can be attributed partly to a reduction in the use of coal and increases in other power plant types.

The electricity sector's GHG emissions were 4% lower in 2021 than in 2020. The impact of the pandemic on these emissions is uncertain since the sector's emissions have been decreasing for 13 of the last 15 years. The observed reduction can be considered similar to previous year-to-year fluctuations.

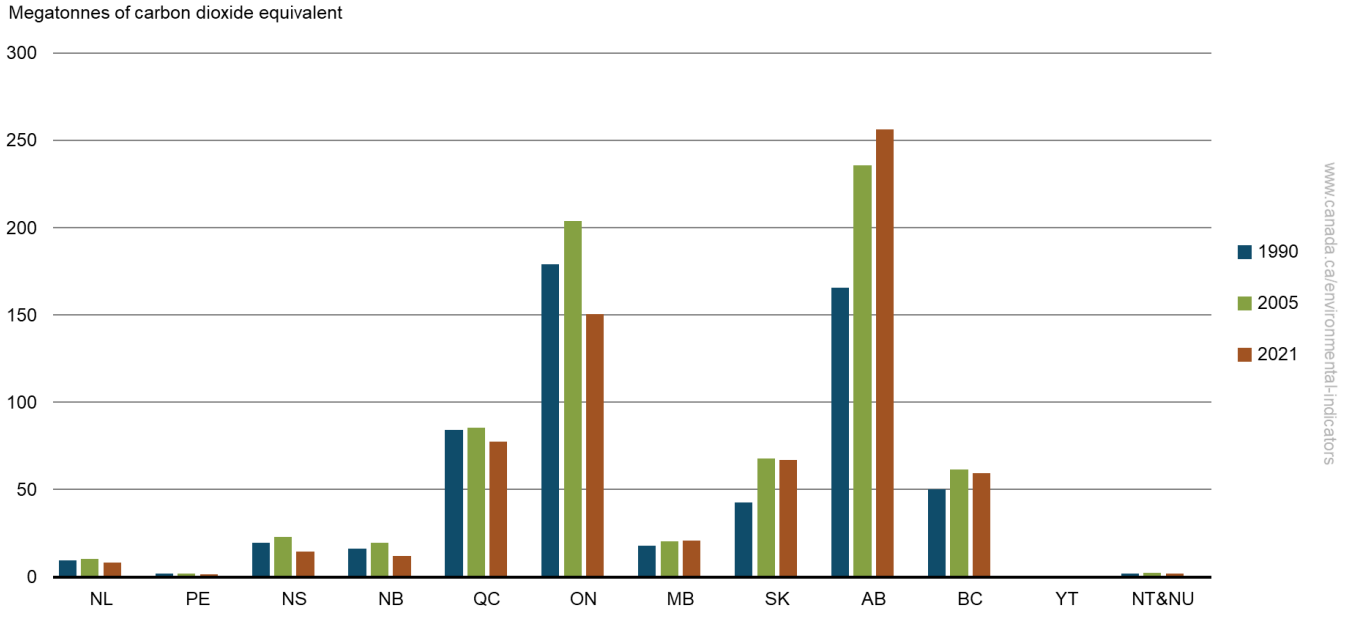
## Greenhouse gas emissions by province and territory

Emissions vary significantly by province. The level of emissions depends on factors such as population, climate, energy sources and economic base. Provinces and territories that are the most populated, have economies based on resource extraction, or rely on fossil fuels to generate electricity will tend to have higher emission levels.

### Key results

- In 2021, the top 5 emitters (Alberta, Ontario, Quebec, Saskatchewan and British Columbia) together released 91% of Canada's national total GHG emissions
- Of the top 5 emitters, greenhouse gas emissions were lower in 2020 than in 1990 for Ontario (-16%) and Quebec (-8%)

**Figure 8. Greenhouse gas emissions by province and territory, Canada, 1990, 2005 and 2021**




Data for Figure 8

**Note:** The years selected correspond to the first (1990) and last (2021) years of the dataset and to the base year (2005) for Canada's GHG emission reduction targets. Consult the interactive figures to explore the regional results in a dynamic and customizable format.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

Between 1990 and 2005, GHG emissions increased in all provinces and territories. In 1990, Ontario's GHG emissions were higher than those from the other provinces because of its large manufacturing industry. Alberta's emissions subsequently surpassed Ontario's and increased by 55% over the period from 1990 to 2021, primarily due to the increasing activity of the oil and gas industry.

Of the top 5 emitters, GHG emissions were lower in 2021 than in 2005 for Ontario (-26%), Quebec (-9.4%), British Columbia (-3.6%) and Saskatchewan (-1.0%).The main drivers for the decreases are presented below.

- Ontario's emissions decrease was primarily driven by the closure of coal-fired electricity generation plants
- Quebec had a 8.1 Mt $CO_2$ eq decrease from its 2005 emissions level mainly attributable to decreasing emissions from the residential sector, aluminium production and petroleum refining industries
- Emissions from British Columbia showed a decrease of 2.2 Mt $CO_2$ eq; essentially due to decreasing emissions from the light manufacturing, heavy industry and waste sectors
- Emissions in Saskatchewan decreased by 0.7 Mt $CO_2$ eq; primarily due to emission reductions from the oil and gas sector (-35% or 9.0 Mt $CO_2$ eq)

Over the first year of the pandemic, from 2019 to 2020, a reduction in GHG emissions was observed for all provinces and territories. From 2020 to 2021, emissions from most provinces and territories increased, except in Newfoundland and Labrador, Manitoba and Nova Scotia. Emission levels in 2021 were equal to or below the pre-pandemic levels observed in 2019 with the exception of Prince Edward Island where emissions came back to almost the same level.

# About the indicators

## What the indicators measure

The indicators show trends in anthropogenic (human-made) greenhouse gas (GHG) emissions. It includes emissions for 7 greenhouse gases (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, perfluorocarbons, hydrofluorocarbons and nitrogen trifluoride). Emissions are presented:

- at the national level (total emissions, emissions per person and emissions per unit of gross domestic product)
- by economic sector
- at the provincial/territorial level

The indicators do not capture:

- emissions from natural processes (for example, material decay, plant and animal respiration, volcanic and thermal venting)
- removal of emissions from the atmosphere by natural sinks (for example, forests, oceans)

## Why these indicators are important

Greenhouse gases trap heat in the Earth's atmosphere, just as the glass of a greenhouse keeps warm air inside. Human activity increases the amount of GHGs in the atmosphere, contributing to a warming of the Earth's surface. This is called the enhanced greenhouse effect.

Over the past 200 years in particular, humans have released GHGs into the atmosphere primarily from burning fossil fuels. As a result, more heat is being trapped and the temperature of the planet is increasing. Sea levels are rising as the Arctic ice melts, and there are changes to the climate, such as more severe storms and heat waves. All of this impacts the environment, the economy and human health.

The Greenhouse gas emissions indicators are used to track the progress of Canada's efforts to lower emissions and reach environmental performance objectives. They also support decision making on sustainable development.

As an Annex I Party to the United Nations Framework Convention on Climate Change, Canada is required to prepare and submit a national inventory of anthropogenic sources and sinks of GHGs on an annual basis.

## Related initiatives

These indicators track progress on the 2022 to 2026 Federal Sustainable Development Strategy, supporting the target: Achieve 40 to 45% greenhouse gas emission reductions below 2005 levels by 2030, and achieve net-zero greenhouse gas emissions by 2050. The most recent data available shows that, in 2021, emissions were 8.4% lower than 2005 emissions. This decrease was driven by emission reductions from the electricity and heavy industry sectors.

In addition, the indicators contribute to the Sustainable Development Goals of the 2030 Agenda for Sustainable Development. They are linked to Goal 9, Industry, Innovation and Infrastructure and Goal 13: "Climate Action"; more specifically to Target 9.4, "By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities" and Target 13.2, "Integrate climate change measures into national policies, strategies and planning."

## Related indicators

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 Greenhouse gas emissions projections indicator provides an overview of Canada's projected GHG emissions up to 2035.

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.

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.

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.

# Data sources and methods

## Data sources

The Greenhouse gas emissions indicators are based on greenhouse gas (GHG) emissions data taken from Environment and Climate Change Canada's National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

### More information

Data used to develop the emission and removal estimates presented in the National Inventory Report are drawn from published and unpublished sources from various government departments, industry sources and scientific papers.

Greenhouse gas emission estimates are provided at the national level, by economic sectors and at the provincial/territorial level. The greenhouse gas emission estimates are compiled annually and reported for the period from 1990 to 2021. Complete details of the temporal coverage for each data source used for the indicators can be found in chapters 3 through 7 of the National Inventory Report.

Preparation of the GHG emissions inventory takes almost 16 months from the end of the reporting year because of the time needed to collect, validate, calculate and interpret the data. Between November and January, emission estimates are prepared by Environment and Climate Change Canada's Pollutant Inventories and Reporting Division with input from numerous experts and scientists across Canada. From January through March, the National Inventory Report text and accompanying emissions data tables are developed. This material is reviewed by external experts and Environment and Climate Change Canada officials, and finally submitted electronically to the United Nations Framework Convention on Climate Change, by mid-April.

## Methods

The National Inventory Report estimates the emissions by combining activity data with the activity's emissions factor. It provides estimates at a sectoral and provincial/territorial level without attribution to individual emitters. The emissions estimates are developed using guidelines produced by the Intergovernmental Panel on Climate Change. Annex 3 of the National Inventory Report describes the methods used to estimate Canada's GHG emissions.

### More information

Since direct measurement of emissions from all sources is not possible, the United Nations Framework Convention on Climate Change requires that countries develop, update, publish and maintain national inventories using internationally approved and comparable emissions and removals estimation methods

for 7 GHGs (carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, perfluorocarbons, hydrofluorocarbons and nitrogen trifluoride). Canada's inventory is developed in accordance with the recently revised United Nations Framework Convention on Climate Change Inventory Reporting Guidelines for Annex I Parties (PDF; 1.67 MB) which require the use of the 2006 methodological guidance developed by the Intergovernmental Panel on Climate Change. The Intergovernmental Panel on Climate Change guidelines are based on the best available science and developed through an international process that involves testing of methods through ongoing inventory development, country studies, technical and regional workshops, and national and international experts consultations.

**Emissions calculation**

In general, GHG emissions are estimated by multiplying activity data by the associated emission factor.

**Emissions = activity data × emission factor**

Activity data refer to the quantitative amount of human activity resulting in emissions during a given time period. The annual activity data for fuel combustion sources, for example, are the total amounts of fuel burned over a year.

Emission factors are based on samples of measurement data, and are representative rates of emissions for a given activity level under a given set of operating conditions. It is the estimated average emission rate of a given pollutant for a given source, relative to units of activity.

Guidelines produced by the Intergovernmental Panel on Climate Change for countries reporting to the United Nations Framework Convention on Climate Change provide various methods for calculating GHG emissions from a given human activity. The methods for estimating emissions are divided into "tiers," each encompassing different levels of activity and technological detail. The same general structure is used for all tiers, while the level of detail at which the calculations are carried out can vary. Annex 3 of the National Inventory Report describes the methods used to estimate Canada's GHG emissions and illustrates that the selection of Intergovernmental Panel on Climate Change method type is highly dependent on the importance of each category and the availability of data.

**Carbon dioxide equivalents**

Greenhouse gas emissions are reported in carbon dioxide equivalents ($CO_2$ eq), determined by multiplying the amount of emissions of a particular greenhouse gas by the global warming potential of that gas. Greenhouse gases differ in their ability to absorb heat in the atmosphere due to their differing chemical properties and atmospheric lifetimes. For example, over a period of 100 years, methane's potential to trap heat in the atmosphere is 25 times greater than carbon dioxide's potential. Therefore, methane is considered to have a global warming potential of 25. The Intergovernmental Panel on Climate Change publishes the global warming potentials and atmospheric lifetimes for each GHG; these can be found in Table 1-1 of the National Inventory Report.

**Greenhouse gas emissions by economic sector**

The Greenhouse gas emissions by economic sector indicator represents a different classification than the activity sector emissions prescribed by the Intergovernmental Panel on Climate Change's methodological guidance and United Nations Framework Convention on Climate Change's reporting guidelines. Instead of reporting on Canada's emissions by activity, GHG emissions have been allocated to the economic sector in which they are generated (for example, transport emissions directly supporting an industrial activity, like off-road trucks in mining activities, have been allocated to the economic sector in which they are generated rather than to the transportation "activity" sector). A comprehensive detailing of the emissions reported by economic sector can be found in chapter 2 and Annex 10 of the National Inventory Report.

**Greenhouse gas emissions from the transport sector**

The Greenhouse gas emissions from the transport sector indicator was calculated using a classification adapted from the one presented in Annex 10 of the National Inventory Report.

For the passenger transport, National Inventory Report's "Cars, light trucks and motorcycles" category was split into 2 separate categories ("Cars" and "Light trucks"), and the "Motorcycles" data were combined with the existing "Bus, rail and aviation" category.

For the freight transport, National Inventory Report's "Heavy duty trucks and rail" category was split into 2 separate categories. "Rail" data were then combined with the existing "Aviation and marine" category.

No change was made to the "Other: recreational, commercial and residential" category.

**Quality assurance, quality control and uncertainty**

Quality assurance and quality control procedures are an essential requirement of the GHG inventory development and submission process. Quality assurance and quality control procedures ensure and improve transparency, consistency, comparability, completeness and confidence in the national emissions for the purpose of meeting Canada's reporting commitments under the United Nations Framework Convention on Climate Change. Chapter 1 (section 1.3) of the National Inventory Report provides a complete description of the quality assurance and quality control procedures.

Uncertainty analysis helps to prioritize improvements and to guide decisions on methodological choices. Annex 2 of the National Inventory Report presents the uncertainty assessment for Canada's GHG emissions. Further details on uncertainty related to specific sectors can be found in the uncertainty sections of chapters 3 through 7 of the National Inventory Report.

## Recent changes

Recalculations are performed annually on Canada's previously reported greenhouse gas emissions estimates to reflect updates to source data and estimation methodology. Recalculations in this latest release of the indicator have resulted in lower emissions for all years (1% to 2% lower). Chapter 8 of the National Inventory Report provides a summary of the recalculations that occurred due to methodological changes and/or refinements since the previous submission. The summary includes:

- brief description, justification and summary of individual impacts on previously reported emission estimates
- details on specific inventory improvements implemented in 2023 as well as planned improvements

## Caveats and limitations

The Greenhouse gas emissions indicators are comprehensive but some emission sources have not been included in the indicators because they are not reported in the National Inventory Report. Owing to their relatively small contributions to the total emissions, these excluded sources do not significantly affect the overall completeness of the inventory. A detailed explanation of the excluded emission sources can be found in Annex 5 of the National Inventory Report.

Although reported in the National Inventory Report, emissions and removals from the land use, land use change and forestry sector are excluded from national totals and subsequently not reported as part of the Greenhouse gas emissions indicators.

The latest year reported (2021) coincides with the 2nd year of the COVID-19 pandemic which strongly affected a wide range of economic sectors, including the energy and transport sectors. The emissions change for the periods from 1990 to 2021, and from 2005 to 2021 must be interpreted with caution as the level of incidence of the pandemic on the emissions is not discussed in detail in the indicators.

# Resources

## References

Environment and Climate Change Canada (2023) Greenhouse gas sources and sinks: executive summary 2022. Retrieved on February 6, 2023.

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Government of Saskatchewan - Ministry of Energy and Resources (2023) Saskatchewan Total Oil Production Volume. Retrieved on January 26, 2023.

Statistics Canada (2023) Census of agriculture. Retrieved on January 26, 2023.

## Related information

Greenhouse gas emissions: drivers and impacts

Canada's action on climate change

Climate change

Guidelines for National Greenhouse Gas Inventories

# Annex

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

- Table A.1. Data for Canada's total GHG emissions in 2021 were 670 megatonnes of carbon dioxide equivalent (Mt $CO_2$ eq), a 1.8% increase from 659 Mt $CO_2$ eq in 2020
- From 2005 to 2021, Canada's GHG emissions decreased by 8.4% (62 Mt $CO_2$ eq)
- Between 1990 and 2021, Canada's GHG emissions increased by 13.9% (82 Mt $CO_2$ eq)

**Figure 1. Greenhouse gas emissions, Canada, 1990 to 2021**

| Year | Total greenhouse gas emissions (megatonnes of carbon dioxide equivalent) |
|---|---|
| 1990 | 589 |
| 1991 | 582 |
| 1992 | 599 |
| 1993 | 602 |
| 1994 | 622 |
| 1995 | 639 |
| 1996 | 661 |
| 1997 | 676 |
| 1998 | 682 |
| 1999 | 695 |
| 2000 | 719 |
| 2001 | 710 |
| 2002 | 715 |
| 2003 | 734 |
| 2004 | 737 |
| 2005 | 732 |
| 2006 | 725 |
| 2007 | 748 |
| 2008 | 731 |
| 2009 | 690 |
| 2010 | 702 |
| 2011 | 711 |
| 2012 | 716 |
| 2013 | 723 |
| 2014 | 720 |
| 2015 | 723 |
| 2016 | 705 |
| 2017 | 712 |
| 2018 | 725 |
| 2019 | 724 |
| 2020 | 659 |
| 2021 | 670 |

**Note:** Data are presented as rounded figures. The national indicator tracks 7 greenhouse gases released by human activity: carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, perfluorocarbons, hydrofluorocarbons and nitrogen trifluoride. Emission levels for some years have been revised in light of improvements to estimation methods and availability of new data. Emissions and removals from the land use, land use change and forestry sector (LULUCF) are excluded from national totals to allow for a focus on greenhouse gas released from human activity only.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

**Table A.2. Data for Figure 2. Indexed trend in greenhouse gas emissions per person and per unit of GDP, Canada, 1990 to 2021**

| Year | Greenhouse gas emissions per person (tonnes of carbon dioxide equivalent per person) | Indexed greenhouse gas emissions per person (percentage change from 1990 level) | Greenhouse gas emissions per unit of gross domestic product (megatonnes of carbon dioxide equivalent per billion dollars gross domestic product) | Indexed greenhouse gas emissions per unit of gross domestic product (percentage change from 1990 level) |
|---|---|---|---|---|
| 1990 | 21.3 | 0.0 | 0.54 | 0.0 |
| 1991 | 20.8 | -2.3 | 0.54 | 0.9 |
| 1992 | 21.1 | -0.6 | 0.56 | 2.9 |
| 1993 | 21.0 | -1.3 | 0.54 | 0.9 |
| 1994 | 21.4 | 0.9 | 0.54 | -0.5 |
| 1995 | 21.8 | 2.6 | 0.54 | -0.4 |
| 1996 | 22.3 | 5.0 | 0.55 | 1.3 |
| 1997 | 22.6 | 6.4 | 0.53 | -0.8 |
| 1998 | 22.6 | 6.5 | 0.52 | -3.6 |
| 1999 | 22.8 | 7.5 | 0.50 | -7.0 |
| 2000 | 23.4 | 10.3 | 0.49 | -8.7 |
| 2001 | 22.9 | 7.7 | 0.48 | -11.2 |
| 2002 | 22.8 | 7.3 | 0.47 | -13.1 |
| 2003 | 23.2 | 9.1 | 0.47 | -12.4 |
| 2004 | 23.1 | 8.5 | 0.46 | -14.7 |
| 2005 | 22.7 | 6.8 | 0.44 | -17.9 |
| 2006 | 22.3 | 4.8 | 0.43 | -20.6 |
| 2007 | 22.7 | 7.0 | 0.43 | -19.9 |
| 2008 | 22.0 | 3.4 | 0.42 | -22.5 |
| 2009 | 20.5 | -3.5 | 0.41 | -24.5 |
| 2010 | 20.6 | -2.9 | 0.40 | -25.4 |
| 2011 | 20.7 | -2.5 | 0.40 | -26.6 |
| 2012 | 20.6 | -2.9 | 0.39 | -27.3 |
| 2013 | 20.6 | -3.0 | 0.39 | -28.3 |
| 2014 | 20.3 | -4.4 | 0.37 | -30.7 |
| 2015 | 20.2 | -4.7 | 0.37 | -30.8 |
| 2016 | 19.5 | -8.2 | 0.36 | -33.1 |
| 2017 | 19.5 | -8.3 | 0.35 | -34.7 |
| 2018 | 19.5 | -8.0 | 0.35 | -35.6 |
| 2019 | 19.2 | -9.5 | 0.34 | -36.9 |
| 2020 | 17.3 | -18.5 | 0.32 | -39.7 |
| 2021 | 17.5 | -17.5 | 0.32 | -41.5 |

**Note:** Data are presented as rounded figures. However, all calculations have been performed using unrounded data. The table presents the ratio of annual greenhouse gas emissions per person and per unit of gross domestic product relative to those values in 1990 (that is the values are indexed to 1990). Greenhouse gas per unit of gross domestic product is calculated using real inflation-adjusted gross domestic product in 2012 dollars. Emission levels for some years have been revised in light of improvements to estimation methods and availability of new data.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada. Statistics Canada (2023) Table 17-10-0005-01 - Estimates of population, by age group and sex for July 1, Canada, provinces and territories, annual. Statistics Canada (2023) Table 36-10-0369-01 - Gross domestic product at 2012 constant prices, expenditure-based, annual.

Table A.3. Data for This indicator shows GHG emissions reported by the economic sector in which they are generated. Indicators focusing specifically on the oil and gas, transport, agriculture and electricity sectors follow.

## Key results

- In 2021, the oil and gas sector and transport sector were the largest GHG emitters in Canada, accounting for 28% and 22% of total emissions, respectively
- From 2020 to 2021, GHG emissions from the oil and gas, transport, heavy industry, and "waste and others" sectors grew by between 2% and 5%, while emissions from the buildings, electricity and agriculture sectors decreased by between 2% and 4%
- From 1990 to 2021:
    - an increase in emissions was observed for the oil and gas (+88%), transport (+27%), buildings (+21%) and agriculture sectors (+39%)
    - a decrease in emissions was observed for the electricity (-45%), heavy industry (-22%) and "waste and others" (-14%) sectors

**Figure 3. Greenhouse gas emissions by economic sector, Canada, 1990 to 2021**

| Year | Oil and gas (megatonnes of carbon dioxide equivalent) | Transport (megatonnes of carbon dioxide equivalent) | Buildings (megatonnes of carbon dioxide equivalent) | Electricity (megatonnes of carbon dioxide equivalent) | Heavy industry (megatonnes of carbon dioxide equivalent) | Agriculture (megatonnes of carbon dioxide equivalent) | Waste and others (megatonnes of carbon dioxide equivalent) |
|---|---|---|---|---|---|---|---|
| 1990 | 100.5 | 118.4 | 72.1 | 94.7 | 98.8 | 49.4 | 54.7 |
| 1991 | 100.0 | 113.8 | 71.4 | 96.1 | 98.6 | 49.5 | 52.6 |
| 1992 | 108.6 | 115.9 | 73.3 | 102.5 | 96.0 | 51.6 | 51.3 |
| 1993 | 115.4 | 118.8 | 76.9 | 93.2 | 95.2 | 52.8 | 49.5 |
| 1994 | 119.2 | 124.9 | 77.2 | 95.2 | 100.7 | 54.5 | 50.2 |
| 1995 | 125.3 | 127.0 | 78.0 | 98.2 | 101.5 | 56.9 | 52.2 |
| 1996 | 133.5 | 129.7 | 84.3 | 98.2 | 104.6 | 58.5 | 52.1 |
| 1997 | 134.8 | 133.9 | 81.8 | 109.5 | 104.2 | 59.3 | 52.9 |
| 1998 | 139.5 | 137.0 | 73.5 | 122.2 | 100.1 | 59.4 | 50.8 |
| 1999 | 148.1 | 141.1 | 77.4 | 119.2 | 97.4 | 59.5 | 51.9 |
| 2000 | 153.4 | 142.2 | 83.9 | 129.1 | 96.8 | 60.5 | 53.4 |
| 2001 | 154.7 | 142.3 | 80.6 | 129.3 | 91.4 | 60.2 | 51.7 |
| 2002 | 159.1 | 144.5 | 84.9 | 123.6 | 91.8 | 59.7 | 52.0 |
| 2003 | 163.2 | 149.6 | 90.2 | 127.4 | 90.5 | 61.6 | 51.7 |
| 2004 | 165.3 | 154.3 | 88.7 | 119.0 | 93.8 | 62.7 | 52.8 |
| 2005 | 168.3 | 156.8 | 84.8 | 117.6 | 89.0 | 63.6 | 52.1 |
| 2006 | 174.6 | 157.7 | 79.7 | 111.6 | 88.7 | 62.3 | 50.7 |
| 2007 | 179.8 | 162.7 | 85.5 | 119.7 | 87.4 | 62.4 | 50.6 |
| 2008 | 176.5 | 163.2 | 85.4 | 108.9 | 85.9 | 61.9 | 48.9 |
| 2009 | 173.8 | 162.0 | 83.9 | 93.8 | 72.5 | 59.2 | 44.4 |
| 2010 | 179.3 | 165.5 | 81.5 | 94.6 | 75.7 | 59.4 | 45.9 |
| 2011 | 184.8 | 164.4 | 86.0 | 86.9 | 81.8 | 60.2 | 47.2 |
| 2012 | 192.1 | 164.6 | 84.5 | 83.3 | 81.8 | 62.5 | 47.5 |
| 2013 | 196.8 | 167.1 | 85.7 | 79.7 | 80.5 | 64.4 | 48.9 |
| 2014 | 202.4 | 164.7 | 86.2 | 76.3 | 80.9 | 63.4 | 46.3 |

| Year | Oil and gas (megatonnes of carbon dioxide equivalent) | Transport (megatonnes of carbon dioxide equivalent) | Buildings (megatonnes of carbon dioxide equivalent) | Electricity (megatonnes of carbon dioxide equivalent) | Heavy industry (megatonnes of carbon dioxide equivalent) | Agriculture (megatonnes of carbon dioxide equivalent) | Waste and others (megatonnes of carbon dioxide equivalent) |
|---|---|---|---|---|---|---|---|
| 2015 | 203.1 | 162.6 | 85.3 | 78.9 | 80.6 | 65.0 | 47.5 |
| 2016 | 191.5 | 162.4 | 84.9 | 74.3 | 78.0 | 66.0 | 48.0 |
| 2017 | 194.0 | 165.4 | 87.7 | 72.6 | 77.3 | 66.5 | 48.7 |
| 2018 | 202.5 | 169.3 | 92.4 | 62.7 | 79.6 | 68.5 | 49.6 |
| 2019 | 201.3 | 170.2 | 93.3 | 61.6 | 78.8 | 69.0 | 49.6 |
| 2020 | 183.4 | 143.2 | 89.1 | 53.7 | 73.6 | 69.8 | 46.1 |
| 2021 | 189.2 | 150.1 | 87.2 | 51.7 | 76.8 | 68.5 | 47.0 |

**Note:** Data are presented as rounded figures. "Others" in the Waste and others sector consists of emissions from light manufacturing, construction, forest resources and coal production. The Heavy industry sector consists of emissions from mining, smelting and refining, pulp and paper, iron and steel, cement, lime and gypsum, and chemicals and fertilizers.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

**Table A.4. Data for Figure 4. Oil and gas sector greenhouse gas emissions, Canada, 1990 to 2021**

| Year | Natural gas (megatonnes of carbon dioxide equivalent) | Conventional oil (megatonnes of carbon dioxide equivalent) | Oil sands, mining and extraction (megatonnes of carbon dioxide equivalent) | Oil sands, in situ (megatonnes of carbon dioxide equivalent) | Oil sands, upgrading (megatonnes of carbon dioxide equivalent) | Other (megatonnes of carbon dioxide equivalent) |
|---|---|---|---|---|---|---|
| 1990 | 32.3 | 21.0 | 2.2 | 4.5 | 8.4 | 32.0 |
| 1991 | 31.0 | 21.8 | 2.4 | 4.3 | 9.0 | 31.6 |
| 1992 | 32.6 | 24.0 | 2.4 | 4.3 | 10.9 | 34.3 |
| 1993 | 35.2 | 25.6 | 2.5 | 4.3 | 12.0 | 35.7 |
| 1994 | 37.3 | 26.7 | 2.7 | 4.5 | 12.7 | 35.4 |
| 1995 | 39.1 | 29.0 | 2.9 | 4.9 | 12.4 | 36.9 |
| 1996 | 41.5 | 30.8 | 2.9 | 5.2 | 12.6 | 40.4 |
| 1997 | 38.5 | 33.2 | 2.9 | 7.3 | 12.3 | 40.6 |
| 1998 | 41.2 | 33.6 | 3.0 | 9.0 | 12.7 | 40.0 |
| 1999 | 50.3 | 33.5 | 3.2 | 8.4 | 13.4 | 39.4 |
| 2000 | 56.1 | 36.1 | 3.2 | 9.0 | 13.7 | 35.3 |
| 2001 | 57.2 | 34.8 | 4.2 | 9.2 | 15.1 | 34.2 |
| 2002 | 59.8 | 34.8 | 4.4 | 9.1 | 16.1 | 34.9 |
| 2003 | 62.7 | 33.9 | 5.4 | 10.3 | 16.9 | 34.1 |
| 2004 | 61.3 | 33.1 | 5.9 | 11.3 | 18.9 | 34.8 |
| 2005 | 65.0 | 33.0 | 5.7 | 12.2 | 17.3 | 35.2 |
| 2006 | 66.5 | 33.0 | 6.2 | 14.2 | 20.3 | 34.4 |
| 2007 | 67.9 | 34.1 | 6.9 | 15.7 | 21.6 | 33.6 |
| 2008 | 66.5 | 33.4 | 7.2 | 18.4 | 19.6 | 31.4 |
| 2009 | 62.9 | 31.2 | 7.8 | 19.8 | 21.6 | 30.5 |
| 2010 | 62.5 | 32.3 | 8.5 | 22.7 | 23.0 | 30.3 |
| 2011 | 65.8 | 34.3 | 8.5 | 24.5 | 22.6 | 29.0 |
| 2012 | 63.9 | 36.4 | 9.2 | 29.3 | 23.9 | 29.3 |
| 2013 | 62.3 | 38.1 | 10.0 | 30.9 | 24.6 | 31.0 |
| 2014 | 61.7 | 39.8 | 10.6 | 35.2 | 24.3 | 30.7 |
| 2015 | 60.6 | 39.2 | 11.1 | 37.6 | 23.6 | 30.9 |
| 2016 | 56.6 | 34.9 | 11.4 | 37.0 | 21.0 | 30.6 |
| 2017 | 53.8 | 35.1 | 13.0 | 40.8 | 22.5 | 28.9 |
| 2018 | 55.9 | 35.4 | 14.9 | 42.8 | 23.7 | 29.7 |
| 2019 | 54.0 | 33.8 | 15.5 | 42.8 | 24.7 | 30.6 |
| 2020 | 49.3 | 26.4 | 15.0 | 41.0 | 24.7 | 26.9 |
| 2021 | 50.0 | 26.0 | 15.5 | 44.6 | 25.2 | 28.0 |

**Note:** Data are presented as rounded figures. Conventional oil includes production from frontier, light and heavy oil fields. The Other category includes downstream oil and gas emissions (combustion and fugitive emissions from the production of refined petroleum products and the distribution of natural gas to end consumers) and oil and gas transmission emissions (combustion and fugitive emissions from transmission, storage and delivery activities).
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

- Table A.5. Data for In 2021, the transport sector was the second largest source of GHG emissions, accounting for 22% of total national emissions with 150 megatonnes of carbon dioxide equivalent (Mt $CO_2$ eq) emitted
- In 2021, the sector GHG emissions were 4.8% higher than in 2020 (143 Mt $CO_2$ eq)
- Between 1990 and 2021, GHG emissions from the transport sector grew by 27%. The growth in emissions was mostly driven by increases from freight heavy-duty trucks and passenger light trucks

**Figure 5. Transport sector greenhouse gas emissions, Canada, 1990 to 2021**

| Year | Passenger - Cars (megatonnes of carbon dioxide equivalent) | Passenger - Light trucks (megatonnes of carbon dioxide equivalent) | Passenger - Motorcycles, bus, rail and aviation (megatonnes of carbon dioxide equivalent) | Freight - Heavy duty trucks (megatonnes of carbon dioxide equivalent) | Freight - Rail, aviation and marine (megatonnes of carbon dioxide equivalent) | Other (megatonnes of carbon dioxide equivalent) |
|---|---|---|---|---|---|---|
| 1990 | 45.2 | 25.9 | 8.6 | 19.2 | 11.4 | 8.1 |
| 1991 | 43.8 | 25.6 | 7.6 | 18.2 | 10.8 | 7.7 |
| 1992 | 44.6 | 26.5 | 7.7 | 18.4 | 11.0 | 7.6 |
| 1993 | 45.5 | 27.8 | 7.4 | 19.3 | 11.0 | 7.8 |
| 1994 | 46.4 | 29.4 | 7.9 | 21.5 | 11.4 | 8.3 |
| 1995 | 44.9 | 30.0 | 8.4 | 23.2 | 10.9 | 9.7 |
| 1996 | 44.7 | 31.3 | 8.8 | 23.9 | 10.9 | 10.1 |
| 1997 | 44.2 | 33.0 | 9.2 | 25.7 | 11.0 | 10.9 |
| 1998 | 43.9 | 34.8 | 9.5 | 26.3 | 10.8 | 11.7 |
| 1999 | 43.3 | 36.4 | 10.0 | 27.4 | 11.3 | 12.6 |
| 2000 | 42.9 | 36.8 | 10.1 | 27.9 | 11.5 | 12.9 |
| 2001 | 42.8 | 37.6 | 9.5 | 27.9 | 11.4 | 13.2 |
| 2002 | 43.0 | 38.8 | 9.5 | 28.4 | 11.0 | 13.8 |
| 2003 | 43.1 | 40.3 | 10.1 | 31.6 | 11.0 | 13.6 |
| 2004 | 43.2 | 41.9 | 10.6 | 33.7 | 11.3 | 13.6 |
| 2005 | 42.1 | 42.5 | 10.8 | 36.1 | 11.8 | 13.5 |
| 2006 | 41.5 | 43.2 | 10.8 | 37.0 | 12.1 | 13.0 |
| 2007 | 41.6 | 44.5 | 11.5 | 40.7 | 12.3 | 12.0 |
| 2008 | 40.6 | 44.4 | 11.6 | 42.4 | 12.5 | 11.6 |
| 2009 | 40.2 | 45.6 | 11.0 | 42.9 | 11.2 | 11.3 |
| 2010 | 39.4 | 46.6 | 10.6 | 45.4 | 11.1 | 12.4 |
| 2011 | 37.8 | 44.6 | 11.0 | 46.3 | 11.7 | 13.0 |
| 2012 | 36.8 | 45.4 | 11.7 | 45.8 | 11.8 | 13.1 |
| 2013 | 36.8 | 47.3 | 12.3 | 45.7 | 11.5 | 13.5 |
| 2014 | 35.5 | 47.6 | 12.0 | 45.3 | 11.5 | 12.8 |
| 2015 | 35.7 | 49.1 | 11.9 | 41.5 | 11.0 | 13.4 |
| 2016 | 35.5 | 51.7 | 12.0 | 38.2 | 10.6 | 14.3 |
| 2017 | 34.8 | 53.2 | 12.6 | 38.3 | 11.8 | 14.8 |
| 2018 | 34.2 | 55.0 | 13.3 | 39.8 | 12.1 | 14.9 |
| 2019 | 33.4 | 56.7 | 13.2 | 39.1 | 12.9 | 15.0 |

| Year | Passenger - Cars (megatonnes of carbon dioxide equivalent) | Passenger - Light trucks (megatonnes of carbon dioxide equivalent) | Passenger - Motorcycles, bus, rail and aviation (megatonnes of carbon dioxide equivalent) | Freight - Heavy duty trucks (megatonnes of carbon dioxide equivalent) | Freight - Rail, aviation and marine (megatonnes of carbon dioxide equivalent) | Other (megatonnes of carbon dioxide equivalent) |
|---|---|---|---|---|---|---|
| 2020 | 25.8 | 48.8 | 8.3 | 34.3 | 12.2 | 13.9 |
| 2021 | 24.9 | 52.1 | 9.1 | 36.7 | 12.9 | 14.5 |

**Note:** Data are presented as rounded figures. However, all calculations have been performed using unrounded data. The Other category includes other recreational, commercial and residential uses. Categories have been adapted from the classification used in Annex 10 of the National Inventory Report. For more details, consult the "Methods" section.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

**Table A.6. Data for Figure 6. Agriculture sector greenhouse gas emissions, Canada, 1990 to 2021**

| Year | On farm fuel use (megatonnes of carbon dioxide equivalent) | Crop production (megatonnes of carbon dioxide equivalent) | Animal production (megatonnes of carbon dioxide equivalent) |
|---|---|---|---|
| 1990 | 8.2 | 10.4 | 30.8 |
| 1991 | 8.2 | 10.0 | 31.4 |
| 1992 | 8.4 | 10.3 | 32.9 |
| 1993 | 8.5 | 10.9 | 33.4 |
| 1994 | 8.4 | 11.3 | 34.8 |
| 1995 | 8.8 | 11.5 | 36.6 |
| 1996 | 9.3 | 12.0 | 37.1 |
| 1997 | 9.9 | 12.3 | 37.1 |
| 1998 | 9.3 | 12.7 | 37.4 |
| 1999 | 9.4 | 12.4 | 37.8 |
| 2000 | 9.6 | 12.4 | 38.6 |
| 2001 | 8.8 | 11.7 | 39.7 |
| 2002 | 8.4 | 11.4 | 39.9 |
| 2003 | 8.8 | 12.5 | 40.3 |
| 2004 | 9.1 | 12.1 | 41.5 |
| 2005 | 9.5 | 11.7 | 42.5 |
| 2006 | 9.0 | 11.9 | 41.3 |
| 2007 | 9.6 | 12.9 | 39.9 |
| 2008 | 9.4 | 13.6 | 38.9 |
| 2009 | 8.7 | 13.6 | 36.9 |
| 2010 | 9.9 | 14.0 | 35.6 |
| 2011 | 11.1 | 14.3 | 34.8 |
| 2012 | 11.4 | 16.2 | 34.9 |
| 2013 | 11.7 | 17.8 | 34.9 |
| 2014 | 12.1 | 16.8 | 34.5 |
| 2015 | 12.7 | 17.9 | 34.3 |
| 2016 | 13.1 | 18.2 | 34.7 |
| 2017 | 14.4 | 17.3 | 34.8 |
| 2018 | 15.0 | 18.5 | 35.0 |
| 2019 | 15.3 | 18.7 | 34.9 |
| 2020 | 14.3 | 20.7 | 34.8 |
| 2021 | 14.3 | 19.4 | 34.9 |

**Note:** Data are presented as rounded figures.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

- Table A.7. Data for In 2021, the electricity sector was the 6th largest source of GHG emissions, accounting for 7.7% of total national emissions with 52 megatonnes of carbon dioxide equivalent (Mt $CO_2$ eq) emitted
- In 2021, the sector's GHG emissions were 4% lower than in 2020, 56% lower than in 2005, and 45% lower than in 1990

**Figure 7. Electricity sector greenhouse gas emissions, Canada, 1990 to 2021**

| Year | Coal (megatonnes of carbon dioxide equivalent) | Natural gas (megatonnes of carbon dioxide equivalent) | Other (megatonnes of carbon dioxide equivalent) |
|---|---|---|---|
| 1990 | 80.5 | 2.7 | 11.5 |
| 1991 | 84.5 | 2.2 | 9.4 |
| 1992 | 87.4 | 4.4 | 10.7 |
| 1993 | 79.9 | 5.4 | 7.8 |
| 1994 | 83.6 | 5.3 | 6.3 |
| 1995 | 84.8 | 6.4 | 7.0 |
| 1996 | 86.8 | 5.5 | 5.9 |
| 1997 | 93.7 | 6.9 | 8.8 |
| 1998 | 100.0 | 9.3 | 12.9 |
| 1999 | 99.9 | 8.9 | 10.4 |
| 2000 | 108.9 | 10.5 | 9.6 |
| 2001 | 107.2 | 10.3 | 11.8 |
| 2002 | 105.5 | 8.5 | 9.6 |
| 2003 | 103.9 | 9.2 | 14.2 |
| 2004 | 96.5 | 8.5 | 14.1 |
| 2005 | 98.2 | 8.0 | 11.4 |
| 2006 | 94.1 | 8.5 | 9.0 |
| 2007 | 99.7 | 10.3 | 9.7 |
| 2008 | 93.6 | 8.0 | 7.2 |
| 2009 | 78.0 | 8.3 | 7.5 |
| 2010 | 78.7 | 11.0 | 4.8 |
| 2011 | 68.4 | 14.3 | 4.1 |
| 2012 | 63.2 | 15.9 | 4.2 |
| 2013 | 63.5 | 11.7 | 4.5 |
| 2014 | 60.7 | 10.6 | 5.0 |
| 2015 | 62.7 | 10.6 | 5.6 |
| 2016 | 57.6 | 11.4 | 5.2 |
| 2017 | 57.7 | 9.9 | 5.0 |
| 2018 | 44.7 | 13.3 | 4.8 |
| 2019 | 42.8 | 14.4 | 4.4 |
| 2020 | 34.7 | 15.4 | 3.6 |
| 2021 | 31.4 | 17.0 | 3.3 |

**Note:** Data are presented as rounded figures. The Other category includes diesel fuel oil, heavy fuel oil, light fuel oil, motor gasoline, petroleum coke, own use of primary electricity, solid wood waste, still gas and non-fuel related emissions.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

**Table A.8. Data for Figure 8. Greenhouse gas emissions by province and territory, Canada, 1990, 2005 and 2021**

| Province or territory | 1990 greenhouse gas emissions (megatonnes of carbon dioxide equivalent) | 2005 greenhouse gas emissions (megatonnes of carbon dioxide equivalent) | 2021 greenhouse gas emissions (megatonnes of carbon dioxide equivalent) |
|---|---|---|---|
| Newfoundland and Labrador (NL) | 9.4 | 10.2 | 8.3 |
| Prince Edward Island (PE) | 1.8 | 1.9 | 1.6 |
| Nova Scotia (NS) | 19.3 | 22.8 | 14.6 |
| New Brunswick (NB) | 16.1 | 19.6 | 11.9 |
| Quebec (QC) | 84.3 | 85.5 | 77.5 |
| Ontario (ON) | 179.1 | 203.7 | 150.6 |
| Manitoba (MB) | 18.0 | 20.3 | 20.7 |
| Saskatchewan (SK) | 42.5 | 67.8 | 67.1 |
| Alberta (AB) | 165.5 | 235.9 | 256.1 |
| British Columbia (BC) | 50.3 | 61.6 | 59.4 |
| Yukon (YT) | 0.5 | 0.6 | 0.7 |
| Northwest Territories (NT) | 1.8[A] | 1.7 | 1.3 |
| Nunavut (NU)[A] | n/a | 0.6 | 0.6 |

**Note:** [A] 1990 emissions data for the Northwest Territories include emissions for Nunavut, which was part of the Northwest Territories until 1999. n/a = not applicable. Data are presented as rounded figures. However, all calculations have been performed using unrounded data. The years selected correspond to the first (1990) and last (2021) years of the dataset and to the base year (2005) for Canada's GHG emission reduction targets.
**Source:** Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada.

Additional information can be obtained at:

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