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# GLOBAL GREENHOUSE GAS EMISSIONS

## CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS



Canada 

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# GLOBAL GREENHOUSE GAS EMISSIONS

August 2023

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# Global greenhouse gas emissions

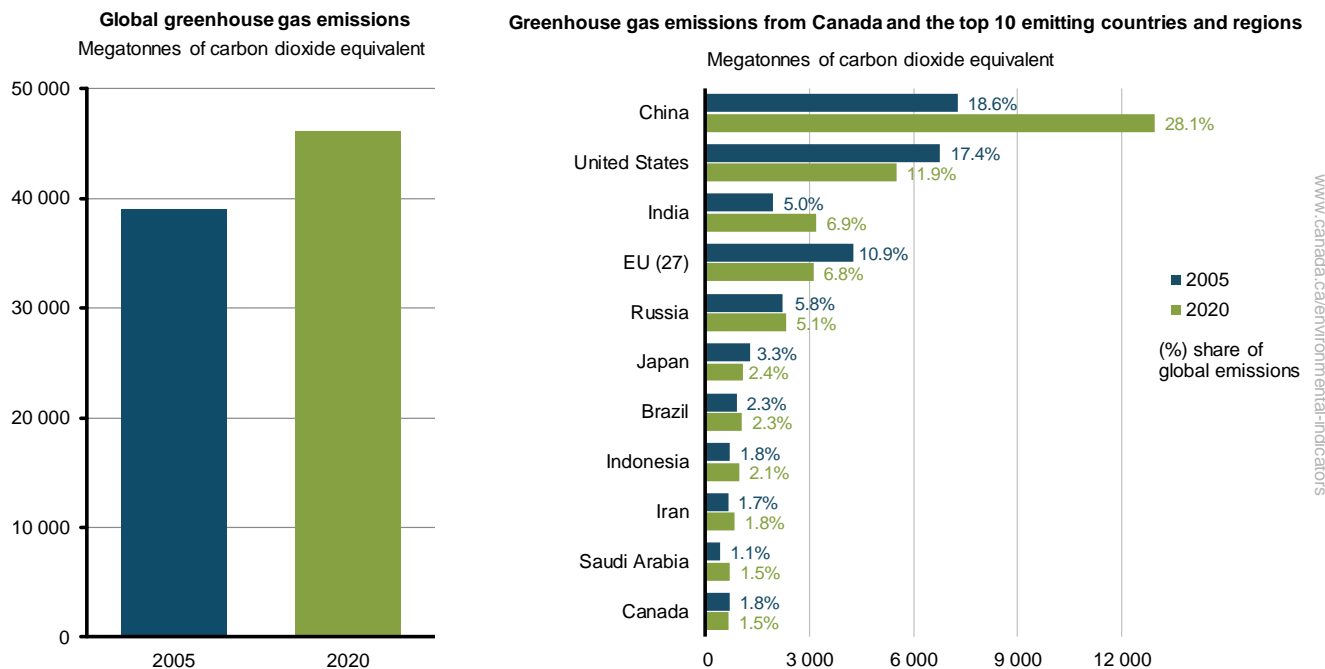
The release of greenhouse gases (GHGs) and their increasing concentration in the atmosphere is leading to a changing climate. This change has an impact on the environment, human health and the economy. Greenhouse gases remain in the atmosphere for periods ranging from a few years to thousands of years. As such, they have a worldwide impact, no matter where they were first emitted. This indicator highlights GHG emissions caused by human activity around the world.

The latest year reported (2020) coincides with the 1<sup>st</sup> 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 2020.

## Key results

- Between 2005 and 2020, global GHG emissions increased by 18.2%, from 39 004 to 46 121 megatonnes of carbon dioxide equivalent (Mt CO<sub>2</sub> eq)
- In 2020, the highest emitting country was China with 12 943 Mt CO<sub>2</sub> eq, or 28.1% of global GHG emissions. Since 2005, emissions from China increased by 78.2%
- Canada's emissions<sup>1</sup> in 2020 reached 678 Mt CO<sub>2</sub> eq, which made up 1.5% of global GHG emissions

**Figure 1. Greenhouse gas emissions for the world, Canada and the top 10 emitting countries and regions, 2005 and 2020**



[Data for Figure 1](#)

**Note:** Greenhouse gas emissions for each country and region presented in this comparison were calculated by the World Resources Institute. For certain countries, including Canada, these values differ from the official estimates of greenhouse gas emissions submitted to the United Nations Framework Convention on Climate Change. For more information, please consult the [Caveats and limitation](#) section.

**Source:** World Resources Institute (2023) [Climate Watch Country Historical Greenhouse Gas Emissions](#).

<sup>1</sup> To allow comparison between Canada and other countries, emissions data are taken from the same source - the World Research Institute. Canada's emissions reported in this indicator (i.e. 678 Mt CO<sub>2</sub> eq in 2020) differ from Canada's official estimate of greenhouse gas emissions submitted in 2022 to the United Nations Framework Convention on Climate Change (i.e. 672 Mt CO<sub>2</sub> eq in 2020).

In 2020, Canada ranked as the 11th largest GHG emitting country/region. Canada's share of global emissions decreased from 1.8% in 2005 to 1.5% in 2020. Like that of other economically developed countries, Canada's share is anticipated to continue to decline due to the expected rapid increase in emissions from economically developing and emerging countries, particularly China (+78.2% from 2005 to 2020), India (+62.8%), Brazil (+18.6%), and Indonesia (+37.3%).

The confinement measures introduced in many countries 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 a 4% decrease (from 48 117 to 46 123 Mt CO<sub>2</sub> eq) in global GHG emissions from 2019 to 2020.

On December 12, 2015, Canada and 194 other countries reached the [Paris Agreement](#), an ambitious and balanced agreement to fight climate change. This new agreement strengthens the effort to limit the global average temperature rise to well below 2°C and pursue efforts to limit the increase to 1.5°C. Under the Agreement, Canada has committed to reduce its GHG emissions by 30% below 2005 levels by 2030. In 2022, the Government of Canada introduced [Canada's 2030 Emissions Reduction Plan](#), which aims to achieve 40-45% emissions reductions below 2005 levels by 2030.

According to the Intergovernmental Panel on Climate Change, reaching this goal implies large-scale changes in energy systems and potentially land use across the world. In addition, the efforts and associated costs needed to reach this goal will vary between countries, with the distribution of costs across countries potentially being different from the distribution of the actions themselves.<sup>2</sup>

Canada is committed to implementing its strengthened climate plan to ensure Canada not only meets, but exceeds its 2030 emissions reduction goal, and beginning work so that Canada can achieve net-zero emissions by 2050.

## Global greenhouse gas emissions per capita

Global greenhouse gas emissions measured per capita are the amount of emissions an individual person emits in a particular country or region on average.

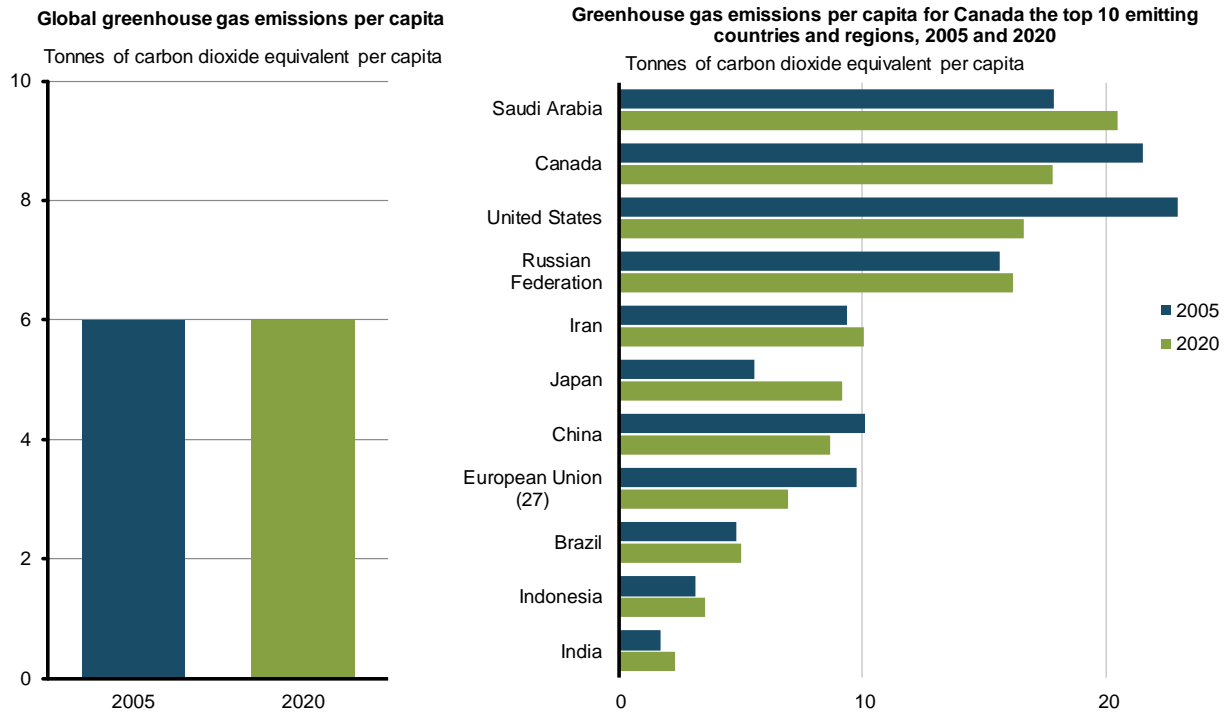
### Key results

- Between 2005 and 2020, global GHG emissions per capita decreased 0.8%, from 6.0 to 5.9 tonnes of carbon dioxide equivalent (t CO<sub>2</sub> eq)
- In 2020, Canada was the second largest GHG emitting country per capita among the top 11 emitting countries with 17.8 t CO<sub>2</sub> eq per person
- Canada's GHG emissions per capita has decreased 17.2% since 2005, from 21.5 t CO<sub>2</sub> eq to 17.8 t CO<sub>2</sub> eq

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<sup>2</sup> Intergovernmental Panel on Climate Change (2014) [Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change – Summary for Policy Makers](#) (PDF; 2.0 MB). Retrieved on June 26, 2023.

**Figure 2. Greenhouse gas emissions per capita for the world, Canada and the top 10 emitting countries and regions, 2005 and 2020**



www.canada.ca/en/environmental-indicators

[Data for Figure 2](#)

**Note:** Greenhouse gas emissions for each country and region presented in this comparison were calculated by the World Resources Institute. For certain countries, including Canada, these values differ from the official estimates of greenhouse gas emissions submitted to the United Nations Framework Convention on Climate Change. For more information, please consult the [Caveats and limitations](#) section.  
**Source:** World Resources Institute (2023) [Climate Watch Country Historical Greenhouse Gas Emissions](#).

Although Canada is ranked 11th in the world for total GHG emissions, Canada has the second-highest GHG emission per capita rate among the top 11 emitting countries and regions. If Canada's GHG emissions per year were shared equally by each person in Canada, each person would emit 17.8 t CO<sub>2</sub> eq per year – which is 3 times the global rate. That is the same amount of GHG emissions released as someone driving around the world in a gasoline-powered car twice per year (about 73 436 km total).<sup>3</sup>

## About the indicator

### What the indicator measures

The Global greenhouse gas emissions indicator reports global human emissions of GHGs for 2005 and 2020, both in total and per capita. Emissions from energy and non-energy related sources are included in this indicator, while emissions from land use, land use change, and forestry are excluded. The emissions of GHGs include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.

### Why this indicator is important

The indicator provides a global perspective on Canada's share of GHG emissions, both in total and per capita.

<sup>3</sup> Environmental Protection Agency (2022) [Greenhouse Gas Equivalencies Calculator](#). Retrieved June 26, 2023.

## Related indicators

The [Greenhouse gas emissions](#) indicator reports 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 [Greenhouse gas emissions projections](#) indicator provides an overview of Canada's projected GHG emissions up to 2035.

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 emissions and emissions per capita data used to compile the Global greenhouse gas emissions indicator were retrieved from the [Climate Watch Country Historical Greenhouse Gas Emissions](#) dataset developed by the World Resources Institute. The dataset is accessible through the Climate Watch GHG Emissions platform which presents data from various sources. It was previously published through the World Resources Institute's Climate Analysis Indicator Tool (CAIT). The data are based on the June 2023 version of the dataset.

#### More information

The World Resources Institute's [Climate Watch Country Historical Greenhouse Gas Emissions](#) dataset uses information and emissions from different sources:

- Food and Agriculture Organization of the United Nations for [Land Use Change and Forestry Data](#)
- Global Carbon Project for their [Global Carbon Budget](#) reports
- International Energy Agency for their [CO<sub>2</sub> Emissions from Fuel Combustion](#)
- United States Environmental Protection Agency for their [Global Anthropogenic Non-CO<sub>2</sub> GHG Emissions: 1990-2030](#)

It covers anthropogenic GHG emissions across the world, excluding emissions attributed to land use, land use change, and forestry. The data are reported by the World Resources Institute's 2 to 3 years after data collection. The latest year available at the time of the update was 2020.

The population data used to calculate the GHG emissions per capita are retrieved from the World Bank's [World Development Indicators](#).

### Methods

The indicator is composed of the GHG emission totals for the world, Canada, and the top 10 emitting countries/regions for 2005 and 2020 as retrieved from the World Resources Institute's Climate Watch Country Historical Greenhouse Gas Emissions dataset. The dataset is available on the [Climate Watch Historical GHG Emissions](#) platform.

#### More information

The national GHG emission totals from the World Resources Institute's Climate Watch Country Historical Greenhouse Gas Emissions are compiled by using as many as 5 different GHG emissions data sources. The selection of these data sources is done by the use of different completeness criteria like geographic coverage, temporal coverage, and accuracy. For more information on the data sources selection and the national and global emissions compilation consult the [Climate Watch Country Greenhouse Gas Emission Data Method Note](#) (PDF; 498 kB) document from the World Resources Institute.



Greenhouse gas emissions are reported in carbon dioxide equivalent (CO<sub>2</sub> eq), determined by multiplying the amount of emissions of a particular gas by its global warming potential. The indicator uses the Intergovernmental Panel on Climate Change's 1995 100-year [global warming potentials](#).

Greenhouse gas emissions per capita are determined by dividing a country/region's total greenhouse gas emissions by its population.

## Recent changes

The time coverage of the indicator has been modified and now presents data for 2005 and 2020. It previously presented data for 2005 and 2019.

Emissions from the European Union (27) for all years do not include emissions from United Kingdom.

## Caveats and limitations

The emissions in the World Resources Institute's [Climate Watch Country Historical Greenhouse Gas Emissions](#) dataset as of June 2023 may reflect revisions of data previously published by that organization. The emissions reported by the World Resources Institute are also slightly different from the emissions reported by member countries in their National Inventory Report to the United Nations Framework Convention on Climate Change.

### More information

Due to the differences in data sources and methodologies used, Climate Watch estimated country GHG emissions may be different than official inventories prepared by countries. Caution is advised when comparing data released in different years and reports.

Emissions from international bunker fuels (which are estimated based on the location of marine and aviation refueling) are not reflected in reported countries and regions emissions totals. However, they are included in the total world emissions and the "Rest of the world" emissions.

Greenhouse gas data in the Climate Analysis Indicators Tool have uncertainties due to the fact that they are using many different data sources. Despite the uncertainties, the World Resources Institute has chosen to err on the side of inclusiveness, by capturing the widest possible range of GHG sources and sinks that contribute to global climate change. For more information on uncertainties please consult the [Climate Watch Country Greenhouse Gas Emission Data Method Note](#) (PDF; 498 kB).

## Resources

### References

International Energy Agency (2019) [Fuel Economy in Major Car Markets: Technology and Policy Drivers, 2005-2017](#) (PDF; 6.5 MB). Retrieved June 20, 2023.

United States Environmental Protection Agency (2021) [Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019](#) (PDF; 3 MB). Retrieved June 20, 2023.

World Resources Institute (2023) [Climate Watch Country Historical Greenhouse Gas Emissions](#). Retrieved on June 20, 2023.

### Related information

[Canada's action on climate change](#)

[Climate change](#)

[Greenhouse gas emissions: drivers and impacts](#)

[Greenhouse gas emissions](#)

# Annex

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

Table A.1. Data for Figure 1. Greenhouse gas emissions for the world, Canada and the top 10 emitting countries and regions, 2005 and 2020

Country or region	2005 greenhouse gas emissions (megatonnes of carbon dioxide equivalent)	Share of global greenhouse gas emissions in 2005 (percent)	2020 greenhouse gas emissions (megatonnes of carbon dioxide equivalent)	Share of global greenhouse gas emissions in 2020 (percent)	2005 to 2020 percent change in national emissions
China	7 264	18.6%	12 943	28.1%	78.2%
United States	6 773	17.4%	5 505	11.9%	-18.7%
India	1 966	5.0%	3 201	6.9%	62.8%
European Union (27) <sup>[A]</sup>	4 260	10.9%	3 119	6.8%	-26.8%
Russian Federation	2 244	5.8%	2 331	5.1%	3.9%
Japan	1 290	3.3%	1 095	2.4%	-15.1%
Brazil	897	2.3%	1 065	2.3%	18.6%
Indonesia	711	1.8%	976	2.1%	37.3%
Iran	653	1.7%	845	1.8%	29.4%
Saudi Arabia	425	1.1%	713	1.5%	67.6%
Canada	694	1.8%	678	1.5%	-2.3%
Rest of the world <sup>[B]</sup>	11 827	30.3%	13 654	29.6%	15.4%
World	39 004	100.0%	46 124	100.0%	18.3%

**Note:** Totals may not add up due to rounding. Greenhouse gas emissions for each country and region presented in this comparison were calculated by the World Resources Institute. For certain countries, including Canada, these values differ from the official estimates of greenhouse gas emissions submitted to the United Nations Framework Convention on Climate Change. For more information, please consult the [Caveats and limitation](#) section.

<sup>[A]</sup> European Union (27) includes: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

<sup>[B]</sup> "Rest of the world" includes international bunkers.

**Source:** World Resources Institute (2023) [Climate Watch Country Historical Greenhouse Gas Emissions](#).

**Table A.2. Data for Figure 2. Greenhouse gas emissions per capita for the world, Canada and the top 10 emitting countries and regions, 2005 and 2020**

Country or region	2005 greenhouse gas emissions per capita (tonnes of carbon dioxide equivalent)	2020 greenhouse gas emissions per capita (tonnes of carbon dioxide equivalent)	2005 to 2020 percent change in national emissions per capita
Saudi Arabia	17.9	20.5	14.7%
Canada	21.5	17.8	-17.2%
United States	22.9	16.6	-27.5%
Russian Federation	15.6	16.2	3.5%
Iran	9.4	10.1	7.5%
China	5.6	9.2	64.6%
Japan	10.1	8.7	-14.1%
European Union (27) <sup>[A]</sup>	9.8	7.0	-28.7%
Brazil	4.8	5.0	3.9%
Indonesia	3.1	3.6	13.7%
India	1.7	2.3	35.7%
World	6.0	5.9	-0.8%

**Note:** Totals may not add up due to rounding. Greenhouse gas emissions for each country and region presented in this comparison were calculated by the World Resources Institute. For certain countries, including Canada, these values differ from the official estimates of greenhouse gas emissions submitted to the United Nations Framework Convention on Climate Change. For more information, please consult the [Caveats and limitation](#) section.

<sup>[A]</sup> European Union (27) includes: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden.

**Source:** World Resources Institute (2023) [Climate Watch Country Historical Greenhouse Gas Emissions](#).

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