Environment and Climate Change Canada
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GLOBAL GREENHOUSE GAS EMISSIONS

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

Canada

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CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

GLOBAL GREENHOUSE GAS EMISSIONS

July 2025

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Global greenhouse gas emissions

The release of greenhouse gases (GHGs) and their increasing concentration in the atmosphere is causing climate change, one of the most important environmental issues of our time. This change has an impact on the environment, human health and the economy. The increase in GHG concentrations is primarily due to human activities, such as the use of fossil fuels. 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.

Total global greenhouse gas emissions are the amount of emissions by an entire country or region, while per capita global greenhouse gas emissions are the amount of emissions an individual person emits in a particular country or region on average.

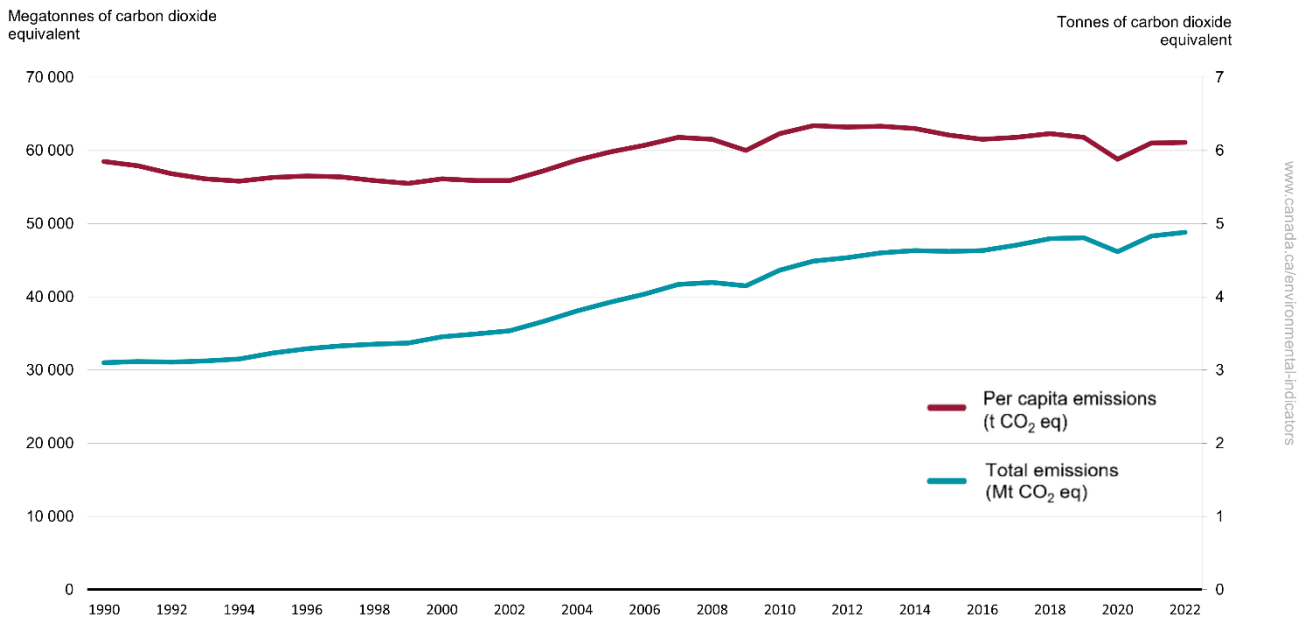
Global emissions

This indicator presents greenhouse gas emissions at the global level, both in terms of total emissions and per capita emissions.

Key results

- Between 2005 and 2022, global GHG emissions increased by 24.2%, from 39 300 to 48 824 megatonnes of carbon dioxide equivalent (Mt CO_2 eq)
- Between 2005 and 2022, per capita global GHG emissions increased by 2.17%, from 5.98 to 6.11 tonnes of carbon dioxide equivalent (t CO_2 eq)

Figure 1. Global total greenhouse gas emissions and per capita greenhouse gas emissions, 1990 to 2022



Data for Figure 1

Source : World Resources Institute (2025) Climate Watch Country Historical Greenhouse Gas Emissions.

Global per capita emissions saw a notable low period (as low as 5.55 and a maximum of 5.68 t CO_2 eq per person) between 1992 and 2002. The fall of the USSR contributed to this decrease because of its ensuing economic slowdowns in Eastern Europe and Central Asia.[1]

Both total and per capita global GHG emissions saw a sharp increase from 2003 to 2007 (by 18.2% and 13.7%, respectively). This increase was partially driven by China's fossil-fuel powered economic growth and increased manufacturing during this period.[2] The global financial crisis in 2008 led to an economic slowdown, reductions in manufacturing and lower demand for electricity. This crisis influenced the decline of total and per capita emissions (by 1.13% and 2.44%, respectively) from 2008 to 2009.[3]

The confinement measures introduced in many countries in 2020 due to the COVID-19 pandemic created an industrial slowdown and reductions in trade and travel by air and land. These impacts contributed to a 3.95% decrease in total GHG emissions and a 4.85% decrease in per capita global GHG emissions from 2019 to 2020. Total global emissions then climbed above pre-pandemic levels (4.64% increase from 2020 to 2021), and per capita global emissions were almost as high as in 2019 (3.74% increase from 2020 to 2021).

In 2015, Canada and 194 other countries reached the Paris Agreement 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 committed to reduce its GHG emissions by 30% below 2005 levels by 2030. In 2021, Canada announced a commitment to cut its GHG emissions by 40% to 45% below 2005 levels by 2030. In December 2024, Canada presented a 2035 GHG emission reduction target of 45% to 50% below 2005 levels.

According to the Intergovernmental Panel on Climate Change, limiting global warming, as targeted by the Paris Agreement, demands continuous, rapid and significant transitions across all sectors. While many effective mitigation and adaptation options are already available, their effectiveness will diminish as temperatures rise, increasing the risk of losses and damages.

Canada is committed to implementing its strengthened climate plan (2030 Emissions Reduction Plan) and beginning work so that Canada can achieve net-zero emissions by 2050.

[1] Schierhorn F et al (2019) Large greenhouse gas savings due to changes in the post-Soviet food systems. Environmental Research Letters, 14(6). Retrieved on June 23, 2025.

[2] Chong Wei (2022) Historical trend and drivers of China's CO_2 emissions from 2000 to 2020. Retrieved on June 23, 2025.

[3] Zhange et al. (2023) What can we learn from the 2008 financial crisis for global power decarbonization after COVID-19?. Retrieved on June 23, 2025.

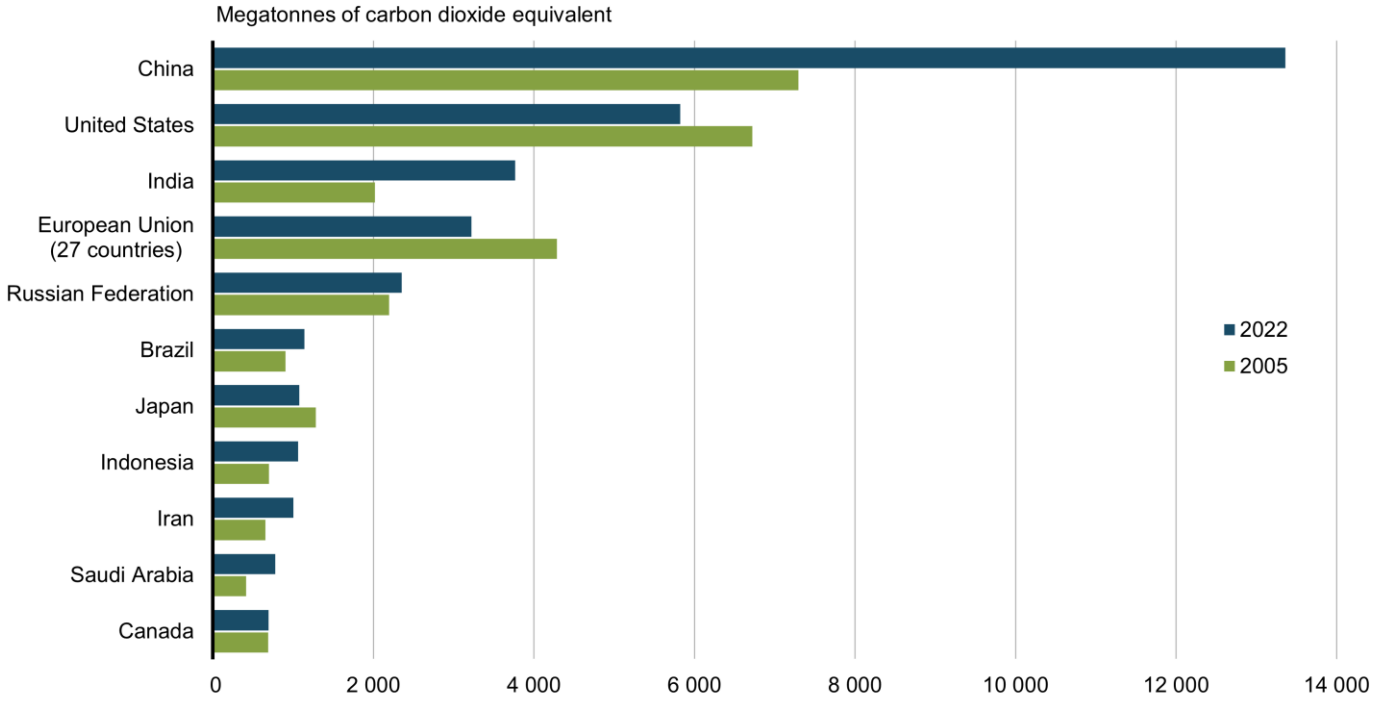
Greenhouse gas emissions by country

This indicator presents total greenhouse gas emissions and per capita greenhouse gas emissions from Canada and the top 10 emitting countries and regions.

Key results

- In 2022, total emissions:
  - were highest in China with 13 363 megatonnes of carbon dioxide equivalent (Mt CO_2 eq), corresponding to 27.4% of global GHG emissions, up from 18.6% in 2005. Since 2005, emissions from China increased by 83.1%
  - in Canada reached 695 Mt CO_2 eq, which made up 1.4% of total global GHG emissions. This places Canada as the 11th largest emitter in the world
- In 2022, Canada's per capita emissions:
  - were the second highest among the top 10 total emitting countries and regions, where Canada produced 17.9 tonnes of carbon dioxide equivalent per person (t CO_2 eq)
  - decreased by 16.1% since 2005, from 21.29 to 17.86 t CO_2 eq per person

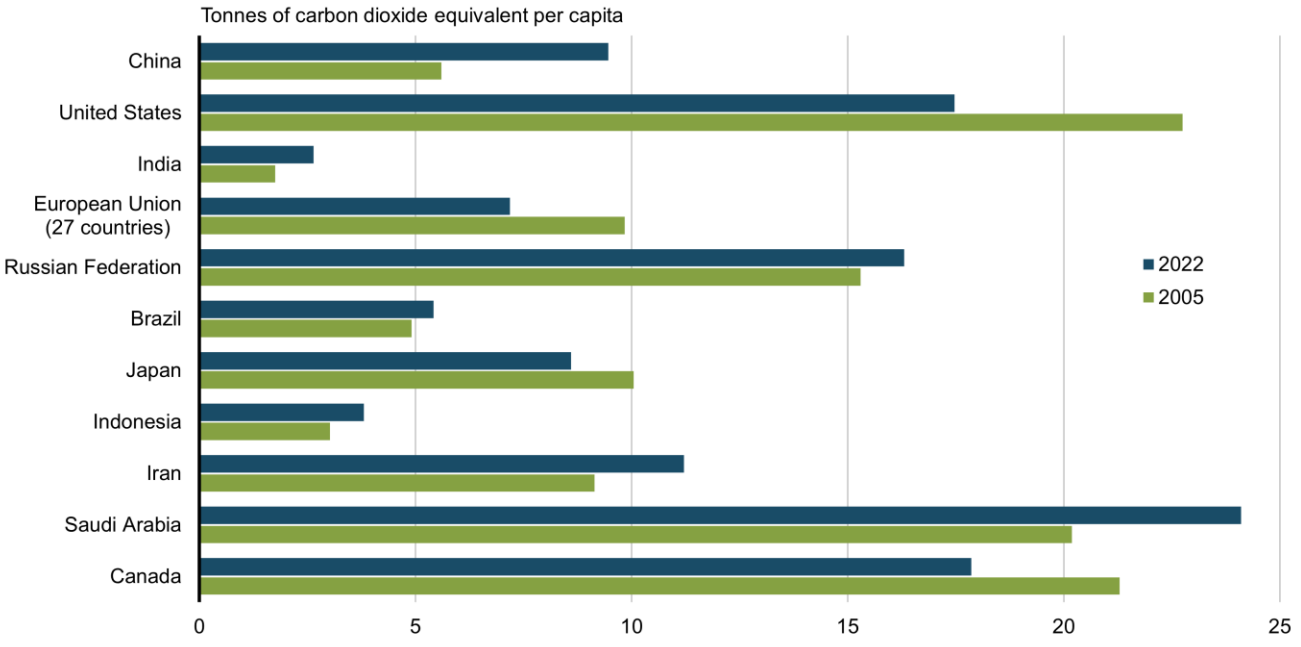
Figure 2. Total greenhouse gas emissions from Canada and the top 10 emitting countries and regions, 2005 and 2022



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 (2025) Climate Watch Country Historical Greenhouse Gas Emissions.

Figure 3. Per capita greenhouse gas emissions for Canada and the top 10 emitting countries and regions, 2005 and 2022



Data for Figure 3

Source : World Resources Institute (2025) Climate Watch Country Historical Greenhouse Gas Emissions.

In 2022, Canada ranked as the 11th largest GHG emitting country/region. Canada's share of global emissions decreased from 1.75% in 2005 to 1.42% in 2022. 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 India (+86.6% from 2005 to 2022), China (+83.1%), Indonesia (+52.6%), and Brazil (+25.8%).

Canada's total emissions increased by 1.30% (from 687 to 695 Mt CO_2 eq) from 2005 to 2022. Other western countries and regions had a decrease, notably the United States with -13.4% (from 6 722 to 5 824 Mt CO_2 eq) and the European Union with -24.9% (from 4 287 to 3 222 Mt CO_2 eq).

Canada has the second highest GHG emission per capita rate among the top 10 emitting countries and regions. If Canada's GHG emissions per year were shared equally by each person in Canada, each person would emit 17.9 t CO_2 eq per year, which is almost 3 times the global rate. That is close to the same amount of GHG emissions released as someone driving around the world in a gasoline-powered car twice per year (about 73 358 km total).[4]

Canada's per capita emissions have decreased by 16.1% since 2005, while the United States' have decreased by 23.2% and the European Union's by 26.9%. The 3 countries in the top 10 total emitters with the lowest GHG emissions per capita are India (2.64 t CO_2 eq), Indonesia (3.81 t CO_2 eq) and Brazil (5.42 t CO_2 eq).

About the indicator

What the indicator measures

The Global greenhouse gas emissions indicator reports global human emissions of GHGs from 1990 to 2022. The Greenhouse gas emissions by country indicator reports emissions coming from the top 10 total emitting countries

[4] Environmental Protection Agency (2024) Greenhouse Gas Equivalencies Calculator. Retrieved June 23, 2025.

and regions and Canada for 2005 and 2022. Both indicators measure total and per capita emissions. 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 the world's historical GHG emissions and Canada's part in global GHG emissions, both in total and per capita.

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 Greenhouse gas 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 May 2025 version of the dataset.

More information

The World Resources Institute's dataset uses information and emissions from different sources:

- Robbie M. Andrew for global and country-level CO_2 emissions from cement production
- 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 Greenhouse Gas Emissions from Energy
- United States Environmental Protection Agency for their Global Non-CO_2 Greenhouse Gas Emission Projections & Mitigation Potential: 2015-2050

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 2022.

The population data used by the World Resources Institute to calculate the GHG emissions per capita are retrieved from the World Bank's World Development Indicators.

Methods

The indicator is composed of the total and per capita GHG emission totals for the world from 1990 to 2022, and total and per capita GHG emissions for Canada and the top 10 emitting countries/regions for 2005 and 2022, as

retrieved from the World Resources Institute's Climate Watch Country Historical Greenhouse Gas Emissions dataset. The dataset is available on their 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 using 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 Emissions Data and Methodology.

Greenhouse gas emissions are reported in carbon dioxide equivalent (CO_2 eq), determined by multiplying the amount of emissions of a particular gas by its global warming potential. The Climate Watch Country Historical Greenhouse Gas Emissions dataset uses the 100-year global warming potentials from the Intergovernmental Panel on Climate Change's Fourth Assessment Report.

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

Caveats and limitations

The previous 2 years reported (2020 and 2021) coincide with the first and second years of the COVID-19 pandemic which affected a wide range of economic sectors, including the energy and transport sectors. The trends presented must be interpreted in the context of the economic slowdown that influenced results from 2019 to 2020, and the economic rebound that influenced them from 2020 to 2021.

The emissions in the World Resources Institute's Climate Watch Country Historical Greenhouse Gas Emissions dataset as of May 2025 reflect recalculations which are performed annually on previously reported GHG emissions estimates to reflect updates to source data and estimation methodology. The emissions reported by the World Resources Institute are also 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.

Greenhouse gas data in the Climate Analysis Indicators Tool have uncertainties since 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 and Methodology Technical Note.

Resources

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International Energy Agency (2019) Fuel Economy in Major Car Markets: Technology and Policy Drivers, 2005-2017 (PDF; 6.5 MB). Retrieved June 23, 2025.

United States Environmental Protection Agency (2021) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2019 (PDF; 3 MB). Retrieved June 23, 2025.

World Resources Institute (2025) Climate Watch Country Historical Greenhouse Gas Emissions. Retrieved on June 23, 2025.

Related information

Canada's action on climate change

Climate change

Greenhouse gas emissions

Annex

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

Table A.1. Data for Figure 1. Global emissions and per capita greenhouse gas emissions, 1990 to 2022

Year	Global emissions (megatonnes of carbon dioxide equivalent)	Per capita global emissions (tonnes of carbon dioxide equivalent per person)
1990	31 002	5.85
1991	31 179	5.79
1992	31 091	5.68
1993	31 241	5.61
1994	31 518	5.58
1995	32 312	5.63
1996	32 912	5.65
1997	33 309	5.64
1998	33 519	5.59
1999	33 706	5.55
2000	34 544	5.61
2001	34 926	5.59
2002	35 366	5.59
2003	36 652	5.72
2004	38 088	5.87
2005	39 300	5.98
2006	40 394	6.07
2007	41 689	6.18
2008	41 983	6.15
2009	41 511	6.00
2010	43 638	6.23
2011	44 899	6.34
2012	45 343	6.32
2013	46 016	6.33
2014	46 312	6.30
2015	46 206	6.21
2016	46 321	6.15
2017	47 052	6.18
2018	47 972	6.23
2019	48 071	6.18
2020	46 170	5.88
2021	48 312	6.10
2022	48 824	6.11

Source : World Resources Institute (2025) Climate Watch Country Historical Greenhouse Gas Emissions.

Table A. 2. Data for Figure 2. Total greenhouse gas emissions from Canada and the top 10 emitting countries and regions, 2005 and 2022

Country or region	2005 total greenhouse gas emissions (megatonnes of carbon dioxide equivalent)	2022 total greenhouse gas emissions (megatonnes of carbon dioxide equivalent)
China	7 297	13 363
United States	6 722	5 824
India	2 020	3 768
European Union (27) [A]	4 287	3 222
Russian Federation	2 196	2 353
Brazil	906	1 141
Japan	1 284	1 076
Indonesia	696	1 063
Iran	656	1 003
Saudi Arabia	415	775
Canada	687	695

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.
[A] 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 (2025) Climate Watch Country Historical Greenhouse Gas Emissions.

Table A.3. Data for Figure 3. Per capita greenhouse gas emissions for Canada and the top 10 emitting countries and regions, 2005 and 202

Country or region	2005 greenhouse gas emissions per capita (tonnes of carbon dioxide equivalent)	2022 greenhouse gas emissions per capita (tonnes of carbon dioxide equivalent)
China	5.60	9.46
United States	22.75	17.47
India	1.75	2.64
European Union (27) [A]	9.84	7.19
Russian Federation	15.30	16.31
Brazil	4.91	5.42
Japan	10.05	8.60
Indonesia	3.02	3.81
Iran	9.14	11.21
Saudi Arabia	20.19	24.10
Canada	21.29	17.86

Note: [A] 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 (2025) Climate Watch Country Historical Greenhouse Gas Emissions.

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