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# Data Sources and Methods for the Global Greenhouse Gas Emissions Indicator

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## 1. Introduction

The Global Greenhouse Gas Emissions indicator ([www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=54C061B5-1](http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=54C061B5-1)) is part of the Canadian Environmental Sustainability Indicators (CESI) program ([www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=47F48106-1](http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=47F48106-1)), which provides data and information to track Canada's performance on key environmental sustainability issues.

## 2. Description and rationale of the Global Greenhouse Gas Emissions indicator

### 2.1 Description

The indicator reports Canada's share of global greenhouse gas (GHG) emissions for the years 1990, 2005 and 2011 compared to 185 countries (including the top 10 global emitters). Emissions from energy and non-energy related sources are included in this indicator. The emissions of greenhouse gases (GHGs) include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF<sub>6</sub>).

### 2.2 Rationale

The indicator provides a global perspective on Canada's share of GHG emissions. In December 2009, Canada signed the Copenhagen Accord committing to reduce its GHG emissions to 17% below 2005 levels by 2020. The Accord includes emission reduction commitments from all major emitters, including the United States, China, India and Brazil, and provides for international review of both developed and developing countries' targets and actions.

### 2.3 Recent changes to the indicator

The Global Greenhouse Gas Emissions indicator replaces the Global Carbon Dioxide Emissions from Fuel Combustion indicator. The previous indicator only included CO<sub>2</sub> emissions from fuel combustion. CO<sub>2</sub> emissions from non-energy related sources (processes), gas flaring, and emissions of other GHGs, including CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>, were not included. The new Global GHG Emissions indicator includes all these sources and therefore provides a more comprehensive view of GHG emissions.

## 3. Data

### 3.1 Data source

The data used to compile the Global Greenhouse Gas Emissions indicator were retrieved from the World Resources Institute (WRI) Climate Analysis Indicators Tool (CAIT 2.0) ([cait2.wri.org/](http://cait2.wri.org/)). This tool uses information and emissions from different sources:

- United Nations Framework Convention on Climate Change (UNFCCC) for GHG emissions ([unfccc.int/ghg\\_data/items/3800.php](http://unfccc.int/ghg_data/items/3800.php)).
- Carbon Dioxide Information Analysis Center (CDIAC) for Global, Regional, and National Fossil-Fuel CO<sub>2</sub> Emissions ([cdiac.ornl.gov/trends/emis/overview\\_2010.html](http://cdiac.ornl.gov/trends/emis/overview_2010.html)).
- Food and Agriculture Organization (FAO) of the United Nations for Land Use Change and Forestry Data ([faostat3.fao.org/faostat-gateway/go/to/download/G2/\\*E](http://faostat3.fao.org/faostat-gateway/go/to/download/G2/*E)).
- International Energy Agency (IEA) for their CO<sub>2</sub> Emissions from Fuel Combustion (2013 edition) ([data.iea.org/ieastore/statslisting.asp](http://data.iea.org/ieastore/statslisting.asp)).
- The World Bank for their World Development Indicators 2014 ([data.worldbank.org/products/wdi](http://data.worldbank.org/products/wdi)).
- United States Energy Information Administration (EIA) for their International Energy Statistics ([www.eia.gov/countries/data.cfm](http://www.eia.gov/countries/data.cfm)).

- United States Environmental Protection Agency (EPA) for their Global Non-CO<sub>2</sub> GHG Emissions: 1990-2030 ([www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html](http://www.epa.gov/climatechange/EPAactivities/economics/nonco2projections.html)).

Canada's emissions are directly retrieved from the National Inventory Report 1990–2012: Greenhouse Gas Sources and Sinks in Canada ([www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1](http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1)).

### 3.2 Spatial coverage

The indicator provides global coverage.

### 3.3 Temporal coverage

The indicator uses the years 1990, 2005 and 2011.

### 3.4 Data completeness

The analysis of global GHG emissions includes almost all the countries of the world (185 countries). This covers all UNFCCC Parties except Andorra, Liechtenstein, Marshall Islands, Micronesia, Monaco (combined with France), San Marino (combined with Italy), Somalia, Tuvalu, Timor-Leste, South Sudan, and Palestine. For these countries, there are generally inadequate emissions data.

### 3.5 Data timeliness

The data are current up to 2011. The Global Greenhouse Gas Emissions indicator is reported by the World Resources Institute two to three years after data collection.

## 4. Methods

The Global Greenhouse Gas Emissions indicator covers GHG emissions from energy, as well as non-energy sources. It does not include the emissions for land use change and forestry. All emissions are reported in carbon dioxide equivalents (CO<sub>2</sub> eq). The indicator is composed of the national GHG emission totals directly retrieved from the WRI CAIT 2.0 ([cait2.wri.org/](http://cait2.wri.org/)) with the exception of Canada where emission totals are derived directly from the National Inventory Report (NIR).

The national GHG emission totals from the WRI CAIT 2.0 are compiled by using as many as five different GHG emissions data sources (see section 3). 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 document CAIT 2.0: Country Greenhouse Gas Sources & Methods from the WRI

([www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fcait2.wri.org%2Fdocs%2FCAIT2.0\\_CountryGHG\\_Methods.pdf&ei=QWq1VNKaBMKbyATYIYLACw&usg=AFQjCNGjrXHGv9VIy3xfk1mDIPsRzp\\_Rxg](http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fcait2.wri.org%2Fdocs%2FCAIT2.0_CountryGHG_Methods.pdf&ei=QWq1VNKaBMKbyATYIYLACw&usg=AFQjCNGjrXHGv9VIy3xfk1mDIPsRzp_Rxg)).

GHG emissions are reported in carbon dioxide equivalents, determined by multiplying the amount of emissions of a particular gas by the global warming potential (GWP) of that gas. The indicator uses the 1995 Intergovernmental Panel on Climate Change (IPCC) global warming potentials ([unfccc.int/ghg\\_data/items/3825.php](http://unfccc.int/ghg_data/items/3825.php)).

## 5. Caveats and limitations

The emissions in the WRI CAIT 2.0 ([cait2.wri.org/](http://cait2.wri.org/)) for April 2014 may be different from those previously published by that organization. They are also slightly different than the emissions submitted by member countries to the UNFCCC. Caution is advised when comparing data released in different years and reports.

To ensure consistency with international reporting by Canada, the WRI figures for Canada were not used and, instead, data was taken directly from Canada's NIR as submitted to the UNFCCC. The WRI results for Canada would be slightly lower for earlier years and slightly higher for most recent years when calculating change over time, while the estimate of percentage share of global emissions is nearly the same.

### Comparison of WRI and Canada's National Inventory Report greenhouse gas emissions, 1990, 2005 and 2011

Canada emissions	1990 GHGs emissions (megatonnes of CO <sub>2</sub> eq)	2005 GHGs emissions (megatonnes of CO <sub>2</sub> eq)	2011 GHGs emissions (megatonnes of CO <sub>2</sub> eq)
World Resources Institute	572	734	716
Canada's National Inventory Report	591	736	701
Canada's share of global emissions	1.9%	1.9%	1.6%

**Note:** Emissions from land use change and forestry are not included in these totals.

**Source:** World Resources Institute (2014) CAIT 2.0 – WRI's Climate Data Explorer

([cait2.wri.org/wri/Country%20GHG%20Emissions?indicator%5b%5d=Total%20GHG%20Emissions%20Excluding%20Land-Use%20Change%20and%20Forestry&indicator%5b%5d=Total%20GHG%20Emissions%20Including%20Land-Use%20Change%20and%20Forestry&year%5b%5d=2011&chartType=geo](http://cait2.wri.org/wri/Country%20GHG%20Emissions?indicator%5b%5d=Total%20GHG%20Emissions%20Excluding%20Land-Use%20Change%20and%20Forestry&indicator%5b%5d=Total%20GHG%20Emissions%20Including%20Land-Use%20Change%20and%20Forestry&year%5b%5d=2011&chartType=geo)). Environment Canada (2014) National Inventory Report 1990–2012: Greenhouse Gas Sources and Sinks in Canada ([www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1](http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1)).

Emissions from International Bunker fuels (which are estimated based on the location of marine and aviation refueling) are not included as part of a country's emissions total but are included in the world emissions total in CAIT 2.0.

Greenhouse gas data in CAIT 2.0 have uncertainties due to the fact that they are using many different data sources. Despite the uncertainties, WRI 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 section 7 of the document CAIT 2.0: Country Greenhouse Gas Sources & Methods

([www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0C CIQFjAA&url=http%3A%2F%2Fcait2.wri.org%2Fdocs%2FCAIT2.0\\_CountryGHG\\_Methods.pdf&ei=QWq1VNKaBMKbyATYIYLACw&usq=AFQjCNGjrXHGv9VIy3xfk1mDIPsRzp\\_Rxg](http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0C CIQFjAA&url=http%3A%2F%2Fcait2.wri.org%2Fdocs%2FCAIT2.0_CountryGHG_Methods.pdf&ei=QWq1VNKaBMKbyATYIYLACw&usq=AFQjCNGjrXHGv9VIy3xfk1mDIPsRzp_Rxg)).

## 6. References and further reading

### 6.1 References

World Resources Institute (2014) CAIT 2.0 – WRI's Climate Data Explorer. Retrieved in December 2014. Available from:

[cait2.wri.org/wri/Country%20GHG%20Emissions?indicator%5b%5d=Total%20GHG%20Emission%20Excluding%20Land-Use%20Change%20and%20Forestry&indicator%5b%5d=Total%20GHG%20Emissions%20Including%20Land-Use%20Change%20and%20Forestry&year%5b%5d=2011&chartType=geo](http://cait2.wri.org/wri/Country%20GHG%20Emissions?indicator%5b%5d=Total%20GHG%20Emission%20Excluding%20Land-Use%20Change%20and%20Forestry&indicator%5b%5d=Total%20GHG%20Emissions%20Including%20Land-Use%20Change%20and%20Forestry&year%5b%5d=2011&chartType=geo).

Environment Canada (2014) National Inventory Report 1990–2012: Greenhouse Gas Sources and Sinks in Canada. Retrieved in January 2015. Available from: [www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1](http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=83A34A7A-1).

## 6.2 Further reading

Carbon Dioxide Information Analysis Center (2013) Global, Regional, and National Fossil-Fuel CO<sub>2</sub> Emissions. Available from: [cdiac.ornl.gov/trends/emis/overview\\_2009.html](http://cdiac.ornl.gov/trends/emis/overview_2009.html).

International Energy Agency (2013) CO<sub>2</sub> Emissions from Fuel Combustion. Available from: [wds.iea.org/WDS/tableviewer/document.aspx?FileId=1464](http://wds.iea.org/WDS/tableviewer/document.aspx?FileId=1464).

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