



CARBON DIOXIDE EMISSIONS FROM A CONSUMPTION PERSPECTIVE

CANADIAN ENVIRONMENTAL
SUSTAINABILITY INDICATORS



Suggested citation for this document: Environment and Climate Change Canada (2020) Canadian Environmental Sustainability Indicators: Carbon dioxide emissions from a consumption perspective. Consulted on *Month day, year*.
Available at: www.canada.ca/en/environment-climate-change/services/environmental-indicators/carbon-dioxide-emissions-consumption-perspective.html.

Cat. No.: En4-144/79-2020E-PDF
ISBN: 978-0-660-35496-5

Unless otherwise specified, you may not reproduce materials in this publication, in whole or in part, for the purposes of commercial redistribution without prior written permission from Environment and Climate Change Canada's copyright administrator. To obtain permission to reproduce Government of Canada materials for commercial purposes, apply for Crown Copyright Clearance by contacting:

Environment and Climate Change Canada
Public Inquiries Centre
12th Floor Fontaine Building
200 Sacré-Coeur Blvd
Gatineau QC K1A 0H3
Telephone: 1-800-668-6767 (in Canada only) or 819-938-3860
Fax: 819-938-3318
Email: ec.enviroinfo.ec@canada.ca

Photos: © Environment and Climate Change Canada

© Her Majesty the Queen in Right of Canada, represented by the Minister of Environment and Climate Change, 2020

Aussi disponible en français

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

CARBON DIOXIDE EMISSIONS FROM A CONSUMPTION PERSPECTIVE

July 2020

Table of contents

- Carbon dioxide emissions from a consumption perspective5**
 - Key results5
 - Comparison of carbon dioxide emissions embodied in international trade6
 - Key results6
 - About the indicators7
 - What the indicators measure7
 - Why these indicators are important7
 - Related indicators7
 - Data sources and methods8
 - Data sources8
 - Methods8
 - Recent changes9
 - Caveats and limitations9
 - Resources11
 - References11
 - Related information12

Annex	13
Annex A. Data tables for the figures presented in this document	13

List of Figures

Figure 1. Production- and consumption-based carbon dioxide emissions from fuel combustion, Canada, 2005 to 2015.....	5
Figure 2. Difference between production- and consumption-based emissions, selected countries and regions, 2005 to 2015.....	6

List of Tables

Table A.1. Data for Figure 1. Production- and consumption-based carbon dioxide emissions from fuel combustion, Canada, 2005 to 2015	13
Table A.2. Data for Figure 2. Difference between production- and consumption-based emissions from fuel combustion, selected countries and regions, 2005 to 2015	13
Table A.3. Data for Figure 2. Production-based carbon dioxide emissions from fuel combustion, selected countries and regions, 2005 to 2015	14
Table A.4. Data for Figure 2. Consumption-based carbon dioxide emissions from fuel combustion, selected countries and regions, 2005 to 2015	14

Carbon dioxide emissions from a consumption perspective

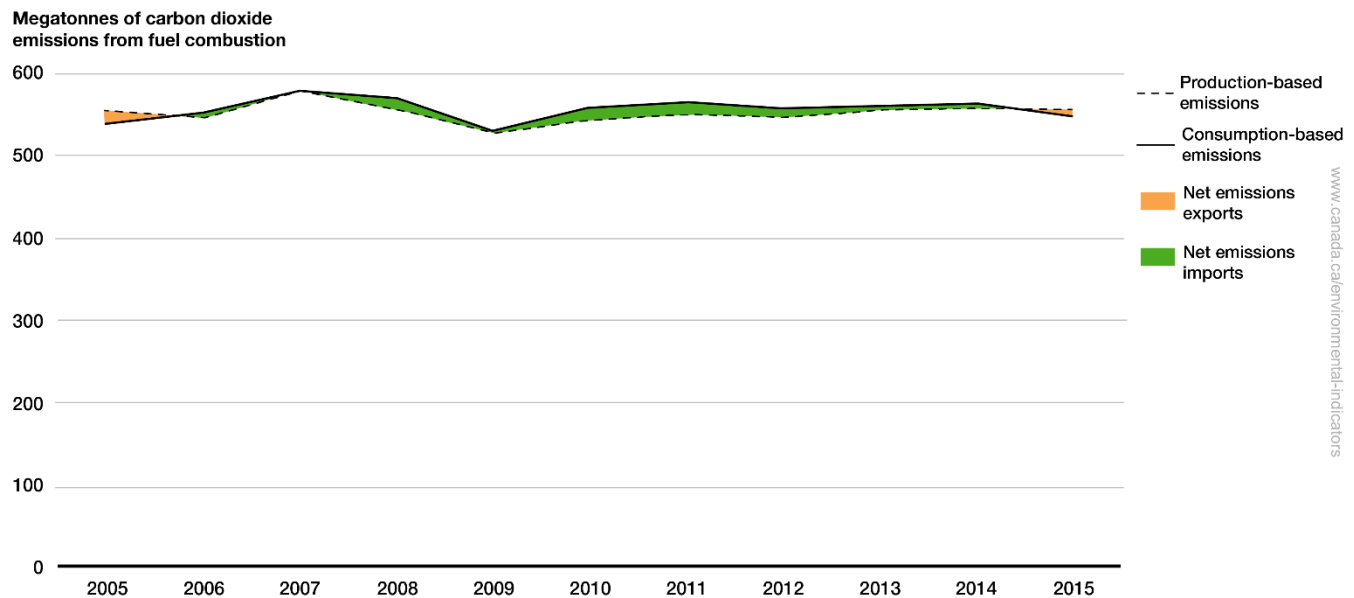
National carbon dioxide emissions inventory accounts for emissions released in the Canadian territory. The Carbon dioxide emissions from a consumption perspective indicators provide an alternative view of carbon dioxide emissions, where the emissions are tied to the consumption of goods and services in Canada, regardless of where they are produced.

A country can be considered a net exporter of carbon dioxide (CO₂) emissions when its production-based CO₂ emissions¹ are higher than its consumption-based emissions. When the reverse is true, the country is a net importer of CO₂ emissions. The worldwide sums of net exports and net imports of CO₂ emissions are equal.

Key results

- Between 2006 and 2014, Canada's consumption-based CO₂ emissions were higher than its production-based emissions², making the country a net importer of CO₂ emissions during that period
- In 2015, Canada was a net exporter of CO₂ with production-based CO₂ emissions reaching 556 megatonnes, or 1.5% above its consumption-based emissions

Figure 1. Production- and consumption-based carbon dioxide emissions from fuel combustion, Canada, 2005 to 2015



[Data for Figure 1](#)

Note: Values for production- and consumption-based emissions presented in this indicator are based on the Organisation for Economic Co-operation and Development data. These numbers may differ from Canada's official accounting of production-based greenhouse gas emissions.

Source: Organisation for Economic Co-operation and Development (2019) [Trade in embodied CO₂ database \(TECO2\)](#).

Consumption-based emissions are directly influenced by, among others, the volume of imports, the mix of energy sources used to produce the goods consumed (for example, goods produced through a process powered by coal plants are more emissions-intensive than those using hydroelectricity) and the volume of goods consumed. From

¹ Production-based emissions account for emissions physically occurring in Canada.

² Production-based emissions presented in this indicator are derived from the International Energy Agency's [CO₂ emissions from fuel combustion](#), and differ slightly from the corresponding values reported in the National inventory report. For more information, please consult the [Data source and methods section](#).

2005 to 2015, the difference between production- and consumption-based emissions has shown little variations, with an absolute difference varying between 0.5% and 2.9%.

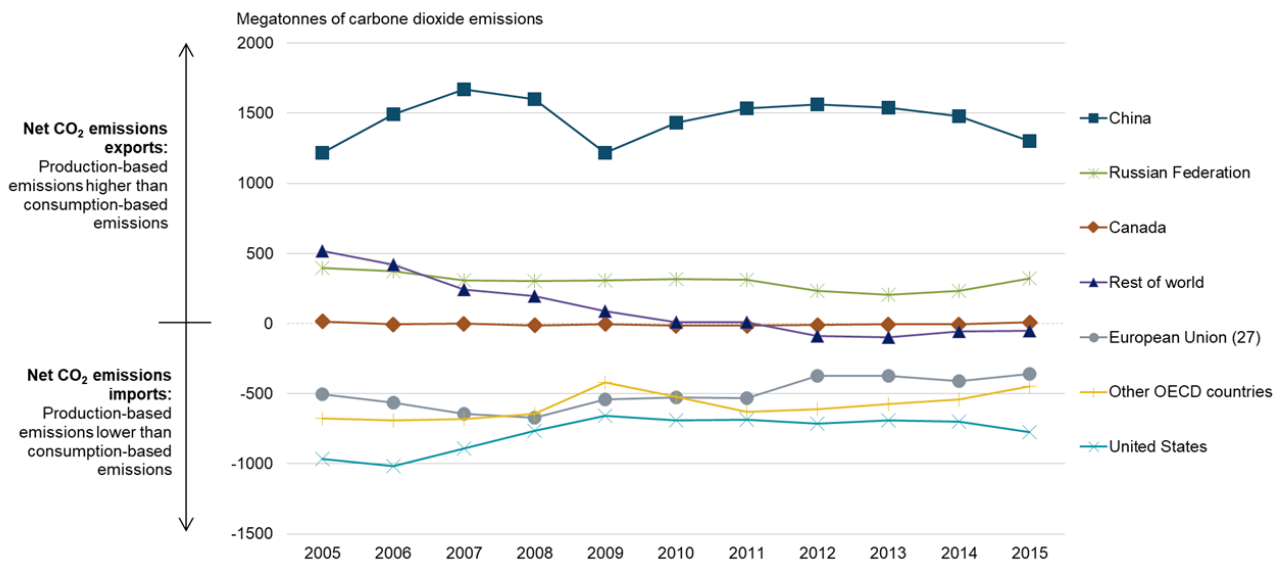
In 2006, Canada switched from being a net exporter to a net importer of CO₂ emissions country, meaning that the consumption-based emissions were higher than the production-based emissions. Following the 2008-2009 global financial crisis, CO₂ emissions (both production- and consumption-based) reduced significantly to a record-low in 2009. However, the CO₂ emissions increased again in 2010. In 2015, Canada switched back to a net exporter of CO₂ emissions to other countries, most likely because of declining emissions intensity in China, which is one of Canada's largest trading partners.

Comparison of carbon dioxide emissions embodied in international trade

Key results

- Over the 2005 to 2015 period, China and the Russian Federation were net exporters of CO₂ emissions
- Over the same period, the United States, the European Union and other countries who are members of the Organisation for Economic Co-operation and Development were net CO₂ importers for the whole period, except Canada which was a net exporter in 2005 and 2015
- Canada is the country with the most stable CO₂ emissions path over the period from 2005 to 2015

Figure 2. Difference between production- and consumption-based emissions from fuel combustion, selected countries and regions, 2005 to 2015



[Data for Figure 2](#)

Note: OECD = Organisation for Economic Co-operation and Development. Values for production- and consumption-based emissions presented in this indicator differ from Canada's official accounting of production-based greenhouse gas emissions. (27) refers to the 27 member states of the European Union as of May 2020. The OECD's inter-country input-output system includes discrepancies in the trade data. In this table, emissions allocated to these inter-country input-output system discrepancies are included in the "rest of the world" region. This ensures that global CO₂ production equals global CO₂ consumption. Countries in the "Other OECD" group include Australia, Chile, Colombia, Iceland, Israel, Japan, Korea, Mexico, New Zealand, Norway, Switzerland, Turkey and United Kingdom.

Source: Organisation for Economic Co-operation and Development (2019) [Trade in embodied CO₂ database \(TECO2\)](#).

In 2015, the largest exporter of CO₂ emissions was China whereas the United States was the largest importer of CO₂ emissions. While both production and consumption of emissions have fallen in the United States since 2005, there has been an increase in China. China has the highest absolute emissions from both a consumption and a production perspective.

Canada's economy represents 2% of the world economy and less than 2% of the world's greenhouse gas emissions. As a result, Canada represents a relatively small portion of CO₂ emissions embodied in global trade.

About the indicators

What the indicators measure

The Carbon dioxide emissions from a consumption perspective indicators provide a view of the impact of Canada's consumption of goods and services, regardless of where they are produced, on the levels of carbon dioxide (CO₂) released into the atmosphere. It is accounting for CO₂ emissions resulting from fuel combustion associated with products and services consumed in Canada and produced either domestically or abroad. The indicator also compares Canada's production- and consumption-based CO₂ emissions with 6 other countries/regions.

Why these indicators are important

The release of greenhouse gases (GHGs) and their increasing concentrations in the atmosphere have been the main drivers of climate change over the last decades and are having significant impacts on the environment, human health and the economy. Carbon dioxide (CO₂) has been the dominant greenhouse gas emitted by human activity. The indicators focus on the CO₂ emissions resulting from fuel combustion since it is considered the primary source of CO₂.

The most common method of accounting for CO₂ emissions, is to assign responsibility for the emissions to the emitting entity, sector or region. This approach (often referred to as production-based emissions accounting) is used by Canada and other countries to report their national GHG emissions inventory to the United Nations Framework Convention on Climate Change. It is also the approach underlying the [national](#) GHG indicators in the [Canadian environmental sustainability indicators](#) program, which are based on Canada's official [National inventory report: greenhouse gas sources and sinks in Canada](#).

Production-based emissions account for emissions physically occurring in Canada. They do not take into account the emissions associated with products imported and, as a consequence, do not include all that is consumed in Canada. On the other hand, it includes emissions associated with the production of products and services being produced in Canada but exported, responding to a demand abroad. The Carbon dioxide emissions from a consumption perspective indicators (Consumption-based emissions) account for emissions associated with products and services consumed in Canada and produced either domestically or abroad.

The location where GHG emissions originate has little or no impact on the resulting influence on climate change. For example, reducing production in a country and purchasing more products abroad may reduce emissions domestically, but the effect on worldwide emissions depends on whether the production taking place in other countries is more or less carbon-intensive than the domestic production. Focusing on consumption-based emissions accounting can support climate change policy by calling attention to the influence of household, business, and government choices on emissions.

Related indicators

The [Greenhouse gas emissions](#) indicators report 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 [Global greenhouse gas emissions](#) indicator provides a global perspective on Canada's share of global GHG emissions.

The [Progress toward Canada's greenhouse gas emissions reduction target](#) indicator provides an overview of Canada's projected GHG emissions up to 2030.

Data sources and methods

Data sources

The data were retrieved in April 2020 from the March 2019 version of the Organisation for Economic Co-operation and Development's [Carbon dioxide emissions embodied in international trade \(TECO2\) database](#).

More information

It should be noted that Statistics Canada also publishes estimates of greenhouse gas emissions by final demand category in its [physical flow accounts](#) data. There are differences between Statistics Canada's and the Organisation for Economic Co-operation and Development's data sets, the most significant being that in developing its estimates Statistics Canada makes the assumption that the resource requirements to produce goods and services abroad are the same as if they were produced in Canada. The source selected for this indicator takes into consideration that those resource requirements do vary across countries.

The database from the Organisation for Economic Co-operation and Development covers 64 countries, while the rest of the world is comprised in a single entry. It presents an industry classification based on the [International standard industrial classification of all economic activities, revision 4](#) (PDF; 1.04 MB).

The analysis covers only fuel combustion-based emissions of carbon dioxide.

The indicator provides information annually from 2005 to 2015, the latest year for which the Organisation for Economic Co-operation and Development's [inter-country input-output tables](#) were available at the time of production of this indicator.

Methods

The consumption-based carbon dioxide (CO₂) emissions presented in the indicator were developed by the Organisation for Economic Co-operation and Development. The Organisation for Economic Co-operation and Development used a Multi-Regional Input-Output model. This approach relies on input-output tables from national accounts coupled with national emissions data allocated to industries. The approach focuses on the emissions from fuel combustion generated to supply and use a specific product or service (including those of all products and services used as intermediate inputs), but does not include emissions associated with disposal.

To develop its data set, the Organisation for Economic Co-operation and Development combined data from the 2018 editions of its [inter-country input-output tables](#) and the International Energy Agency's [CO₂ emissions from fuel combustion](#) estimates.

More information

Carbon dioxide emissions from fuel combustion by industry

The International Energy Agency's CO₂ emissions from fuel combustion estimates are based on its energy data³ and the default methods and emission factors developed by the Intergovernmental panel on climate change (IPCC) in its [2006 IPCC guidelines for national greenhouse gas inventories](#).

The International Energy Agency estimates include CO₂ emissions from fuel combustion in IPCC source/sink category 1 A (fuel combustion activities) and those which may be reallocated to IPCC source/sink category 2 (industrial processes and product use) under the 2006 guidelines.⁴

Inter-country input-output tables

The Organisation for Economic Co-operation and Development's inter-country input-output tables describe the sale and purchase relationships between producers and consumers within an economy and between countries. It relies on data submissions from national statistical institutes. While the Organisation

³ A summary of this data can be accessed through the International Energy Agency's [Key world energy statistics](#) report.

⁴ Further details about the similarities and differences between the International Energy Agency estimates and national estimates can be found in [CO₂ emissions from fuel combustion - Database documentation \(2019 edition\)](#) (PDF; 837 KB).

for Economic Co-operation and Development asks that data be provided in accordance with the International standard industrial classification of all economic activities, Revision 4, in practice, it accepts any relevant data (input-output and/or supply-use tables) at the most detailed and possible level in any detailed format and then converts it on a harmonized basis. In the harmonization process, the Organisation for Economic Co-operation and Development ensures that data tables for all countries are:

- in an industry-by-industry format
- expressed in [basic prices](#)
- aligned with the industry classifications used in the Organisation for Economic Co-operation and development system
- aligned in their treatment of concepts (most notably, the treatment of financial intermediation services indirectly measured, and differences in the treatment of other items, such as non-resident expenditures and resident expenditures abroad).

Estimates of consumption-based carbon dioxide emissions using the Multi-Regional Input-Output approach

The Organisation for Economic Co-operation and Development estimates consumption-based CO₂ emissions by developing CO₂ emissions intensities for all outputs produced by all industries for all countries included in the database. To do this, the total emissions by industry estimated by the Organisation for Economic Co-operation and Development from the International Energy Agency's data is divided by total output for each industry (from the inter-country input-output tables). In the 2019 release of Carbon dioxide emissions embodied in international trade (TECO2), emissions from fuels used for international aviation and maritime transport (that is, aviation and marine bunkers) are also considered.

As a second step, symmetrical industry-by-industry input-output tables are used to develop a Leontief inverse matrix and the final demand matrix. Also known as the total requirements matrix, the Leontief inverse is a representation of all the direct and indirect inter-industry inputs required to provide one unit of output to final demand. Final demand is the sum of household final consumption, general government final consumption, changes in inventories and gross fixed-capital formation.

The final step in estimating consumption-based CO₂ emissions involves multiplying the emissions intensity matrix by the Leontief inverse and the final demand matrix. The result of this final multiplication is a matrix which represents consumption-based emissions in country [s] that are emitted in industry [i] located in country [r]. Country [s] is the country where the final consumption of the output from industry [i] occurs. Country [r] is the country where production of output from industry [i] occurs. In cases where [s] is the same as [r], production-based and consumption-based emissions are the same.

Recent changes

In the 2019 release of the Carbon dioxide (CO₂) emissions embodied in international trade (TECO2) database, emissions from fuels used for international aviation and maritime transport (that is, aviation and marine bunkers) are considered.

The International Energy Agency estimates of CO₂ emissions from fuel combustion are now based on the 2006 IPCC Guidelines. This is in contrast to the estimates presented in the TECO2's 2015 edition which were based on the Revised 1996 IPCC Guidelines.

The 2018 edition of the Organisation for Economic Co-operation and Development's Inter-country input-output (ICIO) tables uses the International Standard Industrial Classification Revision 4, instead of the Revision 3 version as for the previous editions. Also, the data available now cover the period from 2005 to 2015. TECO2's 2015 edition provided data from 1995 to 2011.

Since February 1, 2020, the United Kingdom is no longer a member country of the European Union. To reflect this new situation, the United Kingdom's emissions are now attributed to the "Other OECD countries" region. So are Colombia's emissions which is a member of the OECD since April 28, 2020.

Caveats and limitations

The carbon dioxide (CO₂) emissions estimates presented in the indicator are based on CO₂ emissions from fuel combustion estimates calculated by the International Energy Agency. As such, they vary from those of other

indicators presented in the current set of [national](#) greenhouse gas (GHG) indicators from the Canadian environmental sustainability indicators program, which are based on Canada's official [National inventory report: greenhouse gas sources and sinks in Canada](#).

More information

Differences between emission estimates

The International Energy Agency's CO₂ emissions from fuel combustion estimates include emissions from energy transformation (that is, from oil refineries) which are normally included in Category 1 B in the National Inventory Report. As a result, the closest comparison between production-based CO₂ emissions estimates presented in this indicator and those used in other Canadian environmental sustainability indicators is the National inventory report's CO₂ emissions from the energy sector (including stationary combustion sources, transport, fugitive sources and CO₂ transport and storage). However, further differences persist between the data prepared by the International Energy Agency and the data presented in the National inventory report.⁵ The factors that might lead to differences include the following:

- The International Energy Agency uses a Tier 1 Sectoral Approach based on the 2006 IPCC Guidelines, while countries may be using a Tier 2 or Tier 3 method that takes into account different technologies.
- Energy data based on the International Energy Agency energy balances may differ from those used to prepare the National Inventory Report. In addition to different sources, the methodology used to develop national inventories may differ from that used by the International Energy Agency.
- The International Energy Agency uses average net calorific values for fuels to transform fuel consumption data from physical units to energy units. Country experts may have more detailed data on calorific values available when calculating the energy content of the fuels. This, in turn, could produce different values from those of the International Energy Agency.
- The International Energy Agency uses the default carbon content values which are given in the 2006 IPCC Guidelines. Country experts may have better information available.
- The International Energy Agency cannot allocate emissions from auto producers to the end-use sectors, while country experts may be doing so, according to recommendations from the IPCC.
- Military emissions may be treated differently than in national inventories
- The International Energy Agency estimates include all CO₂ emissions from fuel combustion. Countries may have included parts of these emissions in the IPCC category industrial processes and product use.
- The units may be different.

Organisation for Economic Co-operation and Development's TECO₂ database includes emissions from fuels used for international aviation and maritime transport, whereas the National Inventory Report does not.

Development of worldwide national accounts

In developing the Inter-country input-output tables, the Organisation for Economic Co-operation and Development converts data it receives from national agencies on a harmonized basis (a process discussed in the [Inter-country input-output tables](#) section). As a result, national data presented in the Inter-country input-output tables might differ from those presented by national statistical agencies such as Statistics Canada's [National symmetric input-output tables](#).

The level of aggregation found in the Organisation for Economic Co-operation and Development's Inter-country input-output tables (36 industries) means that the scope of potential analysis of specific products is limited. In addition, cross-country variations in data definitions mean that a specific product might not always fall under the same International Standard Industrial Classification category across all countries.

Consumption-based carbon dioxide emissions

⁵ Further details about the similarities and differences between the International Energy Agency estimates and national estimates can be found in [CO₂ emissions from fuel combustion - Database documentation \(2019 edition\)](#) (PDF; 837 KB).

The multi-regional input-output approach used by the Organisation for Economic Co-operation and Development to estimate consumption- and production-based CO₂ emissions by country and industry combines CO₂ emissions estimates by industry with Inter-country input-output tables. As a result, the accuracy of the results of the Multi-Regional Input-Output analysis is subject to the same caveats as those mentioned above in this section. In addition, the Multi-Regional Input-Output analysis does not include the impact of product disposal, and is thus a "cradle-to-gate" rather than "cradle-to-grave" analysis.⁶ Furthermore, as the data from the Inter-country input-output tables are in nominal terms, emissions intensity improvements may be partly explained by changes in price levels over time.

It should also be noted that there can be a time disconnect between the Organisation for Economic Co-operation and Development's consumption-based CO₂ emissions data and its production-based emissions data and other similar CO₂ emissions data sources, such as Canada's National Inventory Report. This is due to the fact that the Organisation for Economic Co-operation and Development's CO₂ emissions estimates are tied to Inter-country input-output tables, which include inventory movements (for example, when products are moved from one country to another in the production process) that, by definition, can create a disconnect between the time a product is made and when it is consumed. In the National Inventory Report, the emissions are accounted for in the year when they actually occur, while in the case of the consumption-based CO₂ emissions estimates, inventory movements could influence when consumption-based emissions are reported.

The Organisation for Economic Co-operation and Development also takes into account the fact that in some countries, some data are suppressed to preserve confidentiality and that there are also some rounding errors which need to be corrected. In addition, adjustments to country-specific data might also be required to deal with valuation differences in imports.⁷ The Organisation for Economic Co-operation and Development must develop estimates of trade flows between countries, using available information on import use or making assumptions when that information is not available.⁸

Data gaps

At this time, the Organisation for Economic Co-operation and Development excludes GHGs other than CO₂ from its analysis due to problems with data availability and difficulties in matching non-CO₂ GHG emissions with the International Standard Industrial Classification categories.

Resources

References

International Energy Agency (2019) [CO₂ emissions from fuel combustion \(2018 edition\)](#). Retrieved on April 29, 2020.

International Energy Agency (2019) [CO₂ emissions from fuel combustion - Database documentation \(2019 edition\)](#) (PDF; 837 KB). Retrieved on April 29, 2020.

Nakano S, Okamura A, Sakurai N, Suzuki M, Tojo Y and Yamano N (2009) [The measurement of CO₂ embodiments in international trade: evidence from the harmonised input-output and bilateral trade database](#). Organisation for Economic Co-operation and Development. Retrieved on April 29, 2020.

Organisation for Economic Co-operation and Development (2019) [Carbon dioxide emissions embodied in international trade](#). Retrieved on April 29, 2020.

Organisation for Economic Co-operation and Development (2019) [Trade in embodied CO₂ database \(TECO2\)](#). Retrieved on April 29, 2020.

⁶ Norman J et al. (2007) [Economic input-output life cycle assessment of trade between Canada and the United States](#). Environmental Science and Technology 41(5):1523-1532.

⁷ A discussion of the process and assumptions made in order to convert country-submitted data is available in the [OECD Input-Output Database: 2006 edition](#).

⁸ A description of the process and assumptions made in order to convert country-submitted data can be found in [Trade in value-added: concepts, methodologies and challenges](#) (PDF; 973 KB) and [Estimating consumption-based CO₂ emissions using the OECD ICIO 2015](#).

Organisation for Economic Co-operation and Development and World Trade Organization (2012) [Trade in value-added: concepts, methodologies and challenges](#) (PDF; 973 KB). Retrieved on April 29, 2020.

Victor P A and Dolter B (2013) Demand-Based GHG Accounting. Environment and Climate Change Canada.

Victor P A and Dolter B (2016) Casting a long shadow: Demand-based accounting of Canada's greenhouse gas emissions responsibility. Environment and Climate Change Canada.

Wiebe K S and Yamano N (2015) [Estimating consumption-based CO₂ emissions using the OECD ICIO 2015](#). Organisation for Economic Co-operation and Development. Retrieved on April 29, 2020.

Yamano N and Ahmad N (2006) [The OECD input-output database: 2006 edition](#). Organisation for Economic Co-operation and Development. Retrieved on April 29, 2020.

Related information

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

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

[Environment and Climate Change Canada - Climate change](#)

Environment and Climate Change Canada (2020) [National inventory report: greenhouse gas sources and sinks in Canada](#).

Intergovernmental Panel on Climate Change (1996) [Revised 1996 IPCC guidelines for national greenhouse gas inventories](#).

Intergovernmental Panel on Climate Change (2006) [2006 IPCC guidelines for national greenhouse gas inventories](#).

Miller R E and Blair P D (2009) Input-output analysis: Foundations and extensions (second edition).

United Nation Framework Convention on Climate Change (2014) [Reporting guidelines on annual inventories for Parties included in Annex I to the Convention](#).

Wiedmann T (2009) A review of recent multi-region input-output models used for consumption-based emission and resource accounting. Ecological Economics 69(2):211-222.

Annex

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

Table A.1. Data for Figure 1. Production- and consumption-based carbon dioxide emissions from fuel combustion, Canada, 2005 to 2015

Year	Production-based emissions (megatonnes of carbon dioxide)	Consumption-based emissions (megatonnes of carbon dioxide)	Net emissions exports (megatonnes of carbon dioxide)	Net emissions imports (megatonnes of carbon dioxide)
2005	555.4	539.8	15.5	n/a
2006	547.0	553.8	n/a	6.8
2007	577.4	579.1	n/a	1.7
2008	556.6	570.4	n/a	13.8
2009	527.6	530.4	n/a	2.8
2010	543.3	558.8	n/a	15.6
2011	550.9	565.8	n/a	14.9
2012	546.8	557.9	n/a	11.0
2013	555.9	561.8	n/a	5.9
2014	558.0	563.6	n/a	5.6
2015	556.4	547.9	8.6	n/a

Note: n/a = not applicable. Data are presented as rounded figures. However, all calculations have been performed using unrounded data. Values for production- and consumption-based emissions presented in this indicator are based on the Organisation for Economic Co-operation and Development data. These numbers may differ from Canada's official accounting of production-based greenhouse gas emissions.

Source: Organisation for Economic Co-operation and Development (2019) [Trade in embodied CO₂ database \(TECO2\)](#).

Table A.2. Data for Figure 2. Difference between production- and consumption-based emissions from fuel combustion, selected countries and regions, 2005 to 2015

Year	China (megatonnes of carbon dioxide)	Russian Federation (megatonnes of carbon dioxide)	Rest of world (megatonnes of carbon dioxide)	Canada (megatonnes of carbon dioxide)	Other OECD countries (megatonnes of carbon dioxide)	United States (megatonnes of carbon dioxide)	European Union (27) (megatonnes of carbon dioxide)
2005	1217.1	396.6	523.6	15.5	-681.7	-965.2	-505.9
2006	1492.2	370.9	424.2	-6.8	-697.0	-1017.6	-566.0
2007	1670.3	306.6	249.8	-1.7	-690.2	-892.1	-642.7
2008	1598.6	301.4	205.8	-13.8	-658.2	-763.0	-670.7
2009	1216.6	309.7	98.5	-2.8	-425.2	-656.7	-540.0
2010	1431.0	316.3	19.8	-15.6	-536.0	-688.2	-527.4
2011	1535.2	313.4	28.0	-14.9	-646.2	-683.8	-531.8
2012	1563.3	234.7	-66.9	-11.0	-631.5	-713.4	-375.1
2013	1537.0	206.4	-82.2	-5.9	-589.8	-690.4	-375.1
2014	1480.4	232.2	-38.9	-5.6	-558.9	-699.3	-409.9
2015	1302.9	320.1	-36.8	8.6	-459.4	-774.5	-360.9

Note: OECD = Organisation for Economic Co-operation and Development. Totals may not add up due to rounding. Values for production- and consumption-based emissions presented in this indicator differ from Canada's official accounting of production-based greenhouse gas emissions. (27) refers to the 27 member states of the European Union as of May 2020. The OECD's inter-country input-output system includes discrepancies in the trade data. In this table, emissions allocated to these inter-country input-output system discrepancies are included in the "rest of the world" region. This ensures that global CO₂ production equals global CO₂ consumption. Countries in the "Other OECD" group include Australia, Chile, Colombia, Iceland, Israel, Japan, Korea, Mexico, New Zealand, Norway, Switzerland, Turkey and United Kingdom.

Source: Organisation for Economic Co-operation and Development (2019) [Trade in embodied CO₂ database \(TECO2\)](#).

Table A.3. Data for Figure 2. Production-based carbon dioxide emissions from fuel combustion, selected countries and regions, 2005 to 2015

Year	China (megatonnes of carbon dioxide)	Russian Federation (megatonnes of carbon dioxide)	Rest of world (megatonnes of carbon dioxide)	Canada (megatonnes of carbon dioxide)	Other OECD countries (megatonnes of carbon dioxide)	United States (megatonnes of carbon dioxide)	European Union (27) (megatonnes of carbon dioxide)
2005	5478.1	1495.8	6441.0	555.4	3661.6	5833.6	3604.2
2006	6040.0	1551.0	6719.5	547.0	3718.5	5723.6	3624.6
2007	6555.6	1548.5	7066.1	577.4	3815.7	5822.5	3593.9
2008	6759.4	1567.6	7404.4	556.6	3736.9	5630.7	3547.4
2009	7236.2	1454.6	7500.8	527.6	3621.8	5216.5	3257.7
2010	7904.8	1543.9	7890.2	543.3	3772.5	5463.6	3371.6
2011	8686.6	1621.3	8119.9	550.9	3832.9	5248.6	3278.0
2012	8935.4	1566.5	8483.9	546.8	3920.4	5012.7	3203.5
2013	9319.0	1531.2	8701.5	555.9	3909.2	5146.6	3124.3
2014	9264.0	1511.1	9044.5	558.0	3819.5	5155.5	2975.1
2015	9280.8	1487.6	9080.3	556.4	3823.3	5020.0	3027.5

Note: OECD = Organisation for Economic Co-operation and Development. Totals may not add up due to rounding. Values for production- and consumption-based emissions presented in this indicator differ from Canada's official accounting of production-based greenhouse gas emissions. (27) refers to the 27 member states of the European Union as of May 2020. The OECD's inter-country input-output system includes discrepancies in the trade data. In this table, emissions allocated to these inter-country input-output system discrepancies are included in the "rest of the world" region. This ensures that global CO₂ production equals global CO₂ consumption. Countries in the "Other OECD" group include Australia, Chile, Colombia, Iceland, Israel, Japan, Korea, Mexico, New Zealand, Norway, Switzerland, Turkey and United Kingdom.

Source: Organisation for Economic Co-operation and Development (2019) [Trade in embodied CO₂ database \(TECO2\)](#).

Table A.4. Data for Figure 2. Consumption-based carbon dioxide emissions from fuel combustion, selected countries and regions, 2005 to 2015

Year	China (megatonnes of carbon dioxide)	Russian Federation (megatonnes of carbon dioxide)	Rest of world (megatonnes of carbon dioxide)	Canada (megatonnes of carbon dioxide)	Other OECD countries (megatonnes of carbon dioxide)	United States (megatonnes of carbon dioxide)	European Union (27) (megatonnes of carbon dioxide)
2005	4261.0	1099.2	5917.4	539.8	4343.4	6798.8	4110.1
2006	4547.8	1180.1	6295.3	553.8	4415.5	6741.2	4190.6
2007	4885.4	1241.9	6816.3	579.1	4505.8	6714.6	4236.6
2008	5160.8	1266.3	7198.7	570.4	4395.0	6393.7	4218.1
2009	6019.6	1144.9	7402.4	530.4	4047.0	5873.2	3797.7
2010	6473.8	1227.6	7870.4	558.8	4308.5	6151.8	3899.0
2011	7151.4	1307.9	8091.9	565.8	4479.1	5932.4	3809.8
2012	7372.1	1331.8	8550.8	557.9	4551.9	5726.2	3578.5
2013	7782.1	1324.8	8783.7	561.8	4499.0	5837.0	3499.4
2014	7783.6	1279.0	9083.4	563.6	4378.4	5854.9	3385.0
2015	7977.9	1167.5	9117.0	547.9	4282.8	5794.5	3388.3

Note: OECD = Organisation for Economic Co-operation and Development. Totals may not add up due to rounding. Values for production- and consumption-based emissions presented in this indicator differ from Canada's official accounting of production-based greenhouse gas emissions. (27) refers to the 27 member states of the European Union as of May 2020. The OECD's inter-country input-output system includes discrepancies in the trade data. In this table, emissions allocated to these inter-country input-output system discrepancies are included in the "rest of the world" region. This ensures that global CO₂ production equals global CO₂ consumption. Countries in the "Other OECD" group include Australia, Chile, Colombia, Iceland, Israel, Japan, Korea, Mexico, New Zealand, Norway, Switzerland, Turkey and United Kingdom.

Source: Organisation for Economic Co-operation and Development (2019) [Trade in embodied CO₂ database \(TECO2\)](#).

Additional information can be obtained at:

Environment and Climate Change Canada

Public Inquiries Centre

12th Floor Fontaine Building

200 Sacré-Coeur Blvd

Gatineau QC K1A 0H3

Telephone: 1-800-668-6767 (in Canada only) or 819-938-3860

Fax: 819-938-3318

Email: ec.enviroinfo.ec@canada.ca