



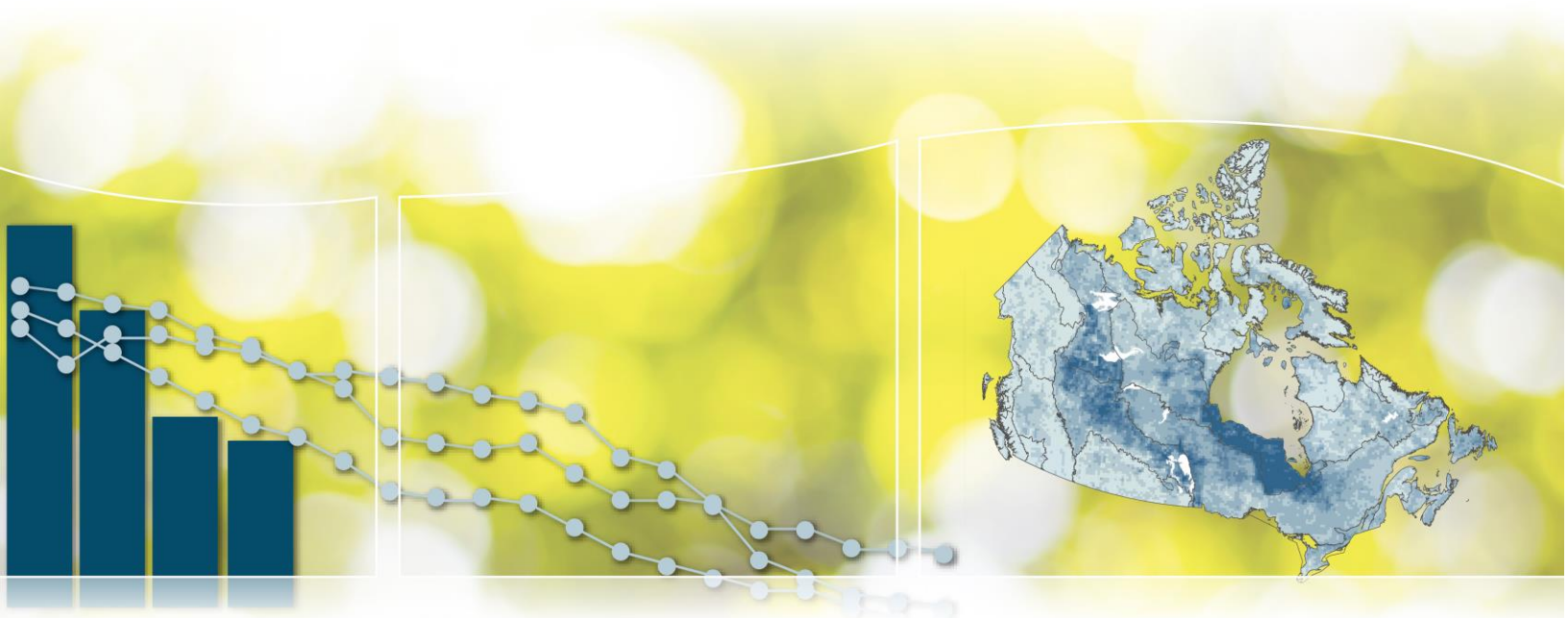
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Canadian Environmental Sustainability Indicators

Air Pollutant Emissions



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Canadian Environmental Sustainability Indicators

Air Pollutant Emissions

May 2016

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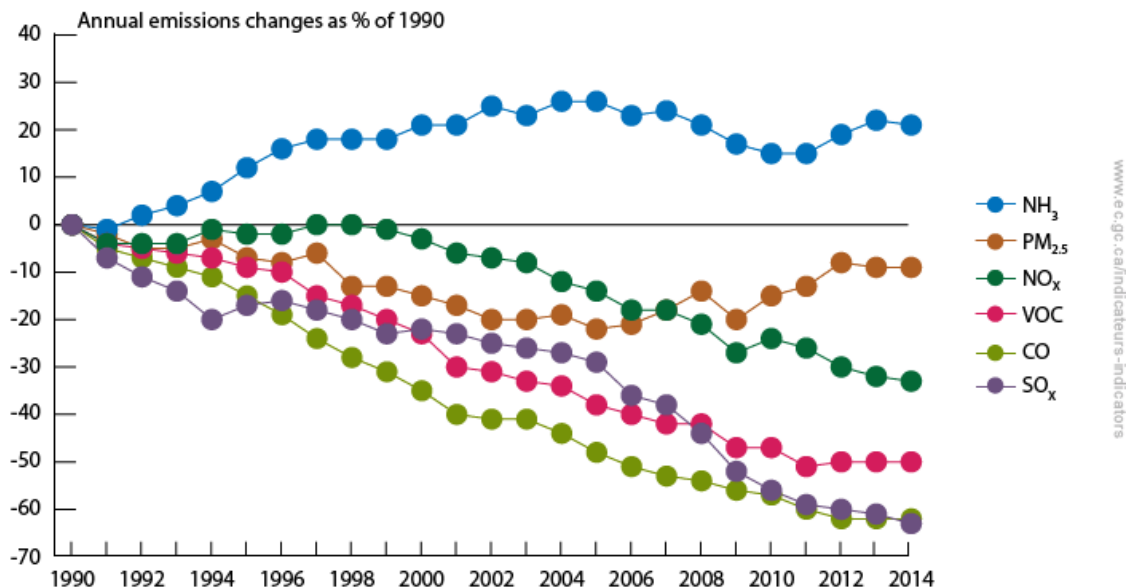
Part 1. Air Pollutant Emissions Indicators

Air pollution problems such as smog and acid rain result from the presence of and interactions among various air pollutants that are released into the atmosphere. These air pollutants are released through human activities such as transportation (e.g., cars and trucks), the burning of fuels for electricity and heat production, industrial processes, and the use of certain products (e.g., paints and solvents). They are also released through natural sources.¹

Air Pollutant Emissions indicators track emissions from human-related sources of sulphur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), ammonia (NH₃), carbon monoxide (CO) and fine particulate matter (PM_{2.5}). The emissions for these key air pollutants are retrieved from the Air Pollutant Emission Inventory compiled in part from the National Pollutant Release Inventory (NPRI), Canada's legislated, publicly accessible inventory of pollutant releases from industrial and commercial facilities.

In 2014, emission levels of five key air pollutants (SO_x, CO, VOC, NO_x and PM_{2.5}) were 63% to 9% lower than in 1990; for NH₃, emissions were 21% higher than in 1990.

Figure 1. Air pollutant emissions, Canada, 1990 to 2014



[Data for Figure 1](#)

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

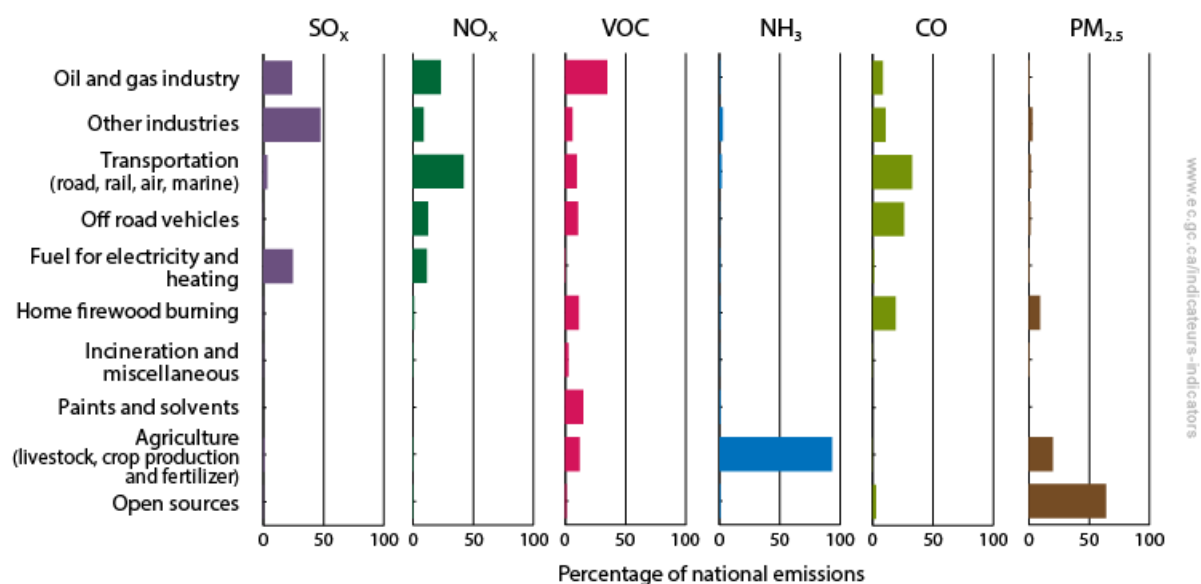
¹ For example, emissions of volatile organic compounds from vegetation.

Overview of sources of air pollutant emissions

In 2014, the majority of Canada's SO_x emissions came from industrial activities such as non-ferrous smelting and refining, from the oil and gas sector, and from the use of fuels for electricity and heating.

Transportation (road, rail, air and marine) released the largest proportion of Canada's NO_x and CO emissions. Off-road vehicles were also an important source of NO_x and CO emissions. The oil and gas industry was an important contributor to NO_x emissions. Most of Canada's VOC emissions came from the oil and gas industry and from the use of paints and solvents. Agricultural activities were the main source of NH₃ emissions. Finally, open sources, largely activities associated with construction operations and dust from paved and unpaved roads, were the most important sources of the PM_{2.5} in Canada.

Figure 2. Distribution of air pollutant emissions by source, Canada, 2014



[Data for Figure 2](#)

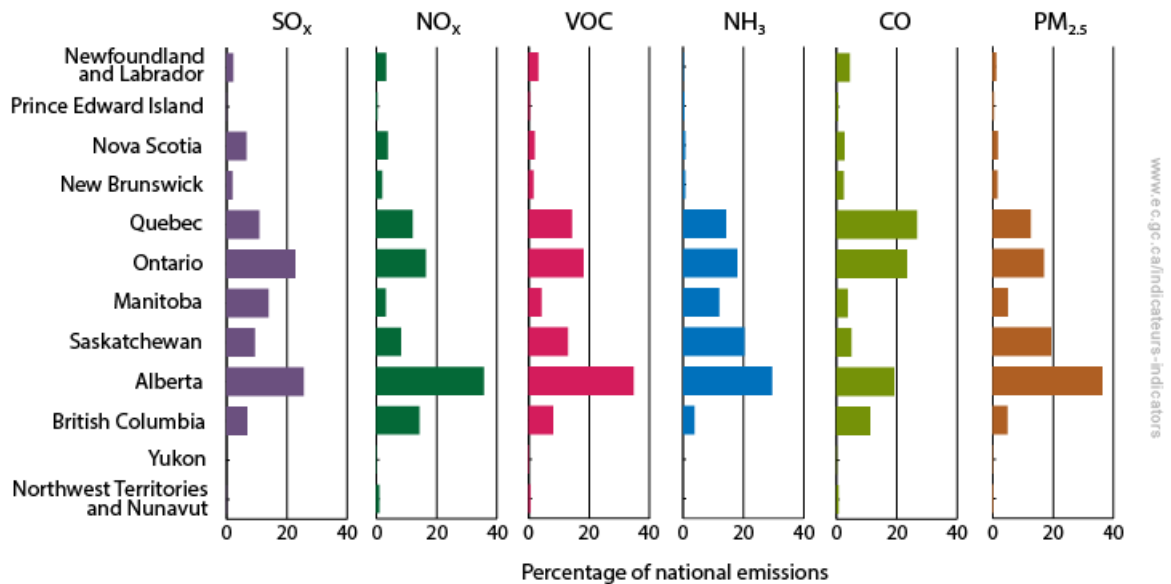
Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Overview of pollutant emissions by province and territory

In 2014, Alberta had the highest emissions of all pollutants except CO. Emissions of SO_x, NO_x and VOC in the province were high mainly due to the oil and gas industry, NH₃ as a result of agriculture and PM_{2.5} related to construction activities. Quebec had the highest CO emission levels, mainly because of high emissions from transportation and home fire wood burning.

Figure 3. Distribution of air pollutant emissions by province and territory, Canada, 2014



[Data for Figure 3](#)

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

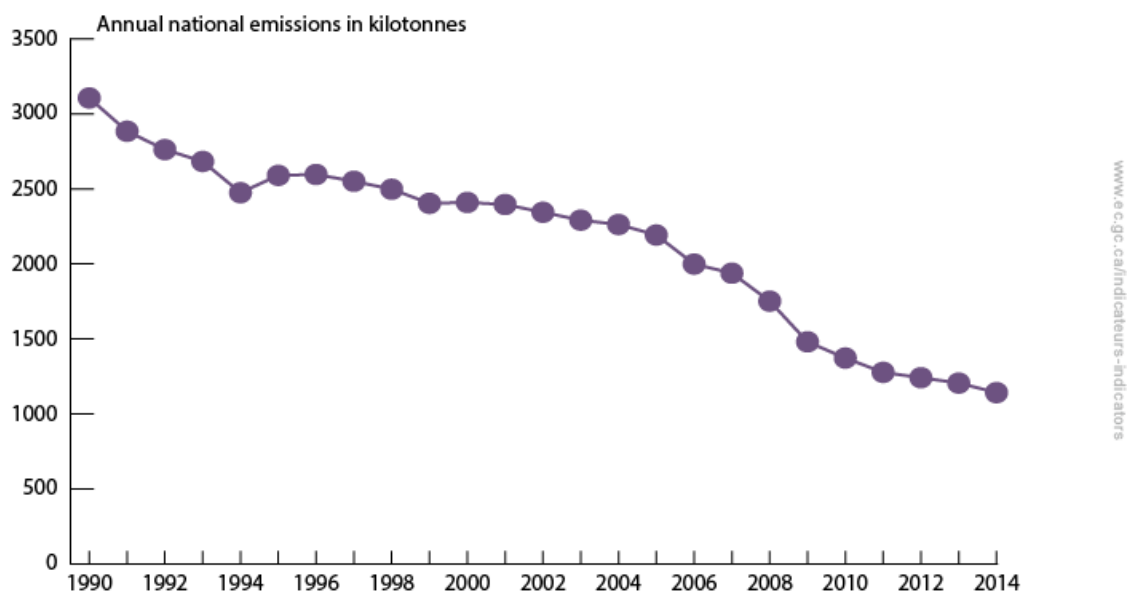
Sulphur oxide emissions

Sulphur oxide (SO_x) emissions decreased by 5%, or 64 kilotonnes (kt), from 2013 emission levels to 1142 kt in 2014. Emissions of SO_x in 2014 were 1963 kt (63%) lower than in 1990.

This significant drop in SO_x emissions is due in large part to government actions to fight acid rain, and related federal-provincial and United States agreements^{2,3} on capping SO_x emissions by 1994. Further reductions were also realized through:

- technological upgrades and new air pollution controls for non-ferrous metal smelters;
- lower emissions from fossil-fuel-fired (e.g., coal-fired) power-generating utilities as a result of better removal technologies and plant closures;
- improved emission controls for the petroleum refining sector; and
- the implementation of low-sulphur fuels.⁴

Figure 4. Sulphur oxide emissions, Canada, 1990 to 2014



[Data for Figure 4](#)

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

² Environment and Climate Change Canada (1991) [Canada–United States Air Quality Agreement](#). Retrieved on January 5, 2016.

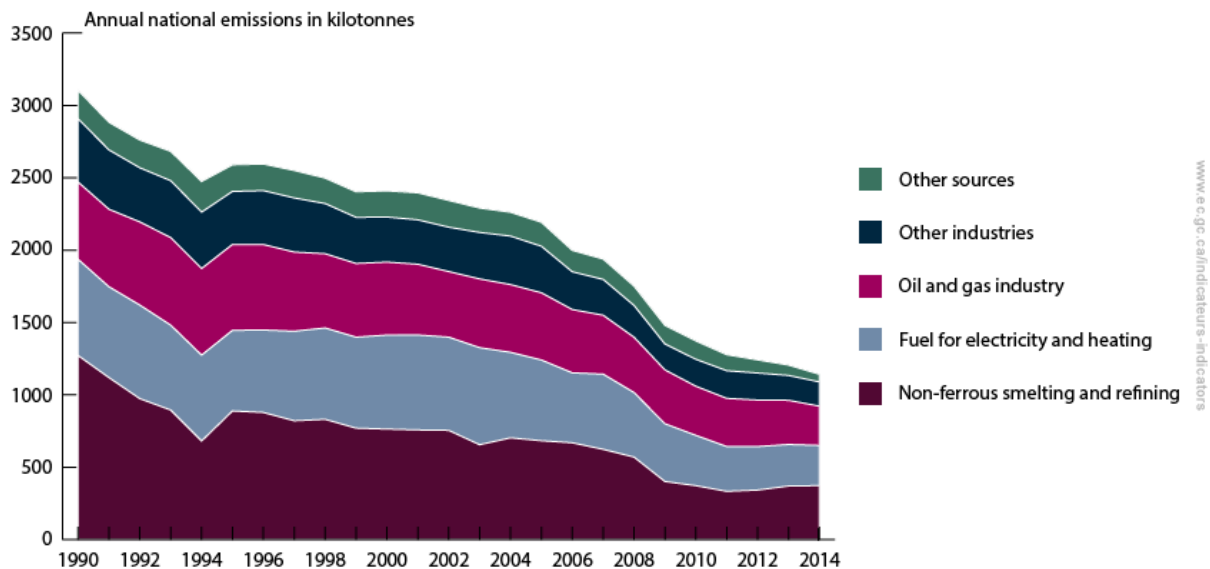
³ Canadian Council of Ministers of the Environment (1998) [The Canada-Wide Acid Rain Strategy for Post 2000](#). Retrieved on January 5, 2016.

⁴ Environment and Climate Change Canada (2015) [Sulphur in Gasoline Regulations](#) and Environment and Climate Change Canada (2012) [Sulphur in Diesel Fuel Regulations](#). Retrieved on January 5, 2016.

Sources of sulphur oxide emissions

In 2014, the largest proportion of SO_x emissions came from non-ferrous smelting and refining, representing 33% (373 kt) of total emissions. Emissions from the use of fuel for electricity and heating, and the oil and gas industry, emitted the next largest proportions, both representing 24% (278 kt and 271 kt) of national emissions. The largest reduction in emissions between the years 1990 and 2014 was from non-ferrous smelting and refining, with an emissions reduction of 902 kt. The installation of newer technologies or processes at facilities, along with the closure of three major smelters in Manitoba, Ontario and Quebec contributed to the decline.

Figure 5. Sulphur oxide emissions by source, Canada, 1990 to 2014



[Data for Figure 5](#)

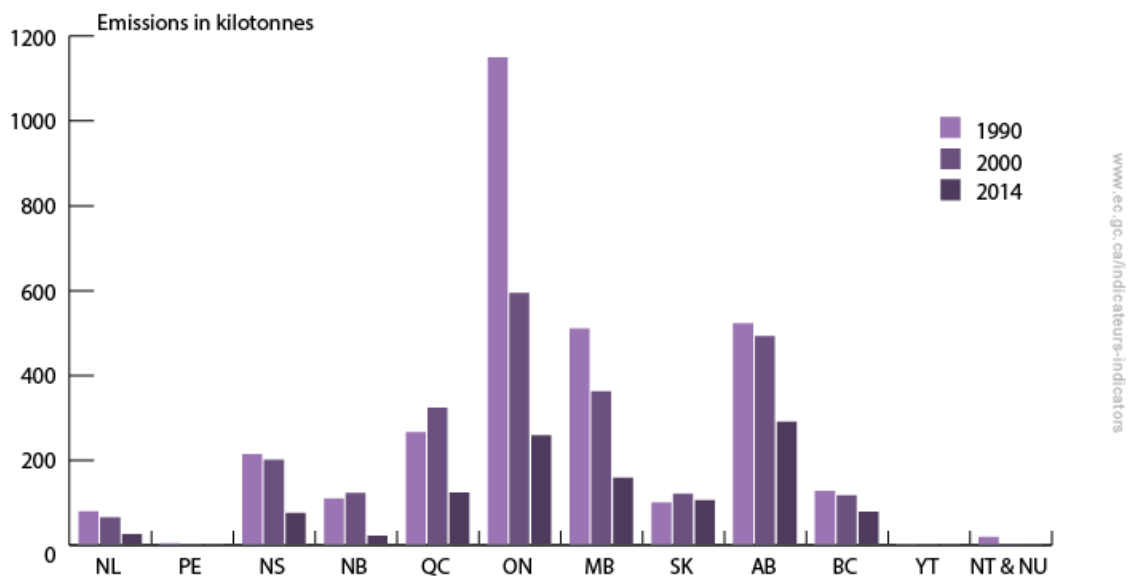
Note: The indicator only reports air pollutant emissions from human-related sources. The source "Other industries" does not include SO_x emissions from non-ferrous smelting and refining, as it is presented for the purpose of this chart as a stand-alone source. "Other sources" include off-road vehicles, home firewood burning, incineration and miscellaneous, transportation (road, rail, air and marine), and open sources (e.g., landfills). Consult Table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Sulphur oxide emissions by province and territory

Alberta had the highest SO_x emissions level in 2014, representing 26% (291 kt) of total national emissions (1142 kt). SO_x emissions in Alberta mainly came from the oil and gas industry, and electricity power-generating plants. Ontario, with the second-highest emission level, contributed 23% (259 kt) of national emissions, mainly from non-ferrous smelting and refining, and the oil and gas industry. Manitoba ranked third, with 14% (158 kt) of national SO_x emissions; non-ferrous smelting and refining was the most important source of emissions in that province. Ontario experienced the sharpest reduction in emissions between 1990 and 2014, mainly due to emission reductions from non-ferrous smelting and refining, and electricity power-generating plants.

Figure 6. Sulphur oxide emissions by province and territory, Canada, 1990, 2000 and 2014



[Data for Figure 6](#)

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Sulphur oxide emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory (NPRI) provides detailed information on air pollutant emissions from industrial and commercial facilities. The Canadian Environmental Sustainability Indicators (CESI) program provides access to this information through an online interactive map.

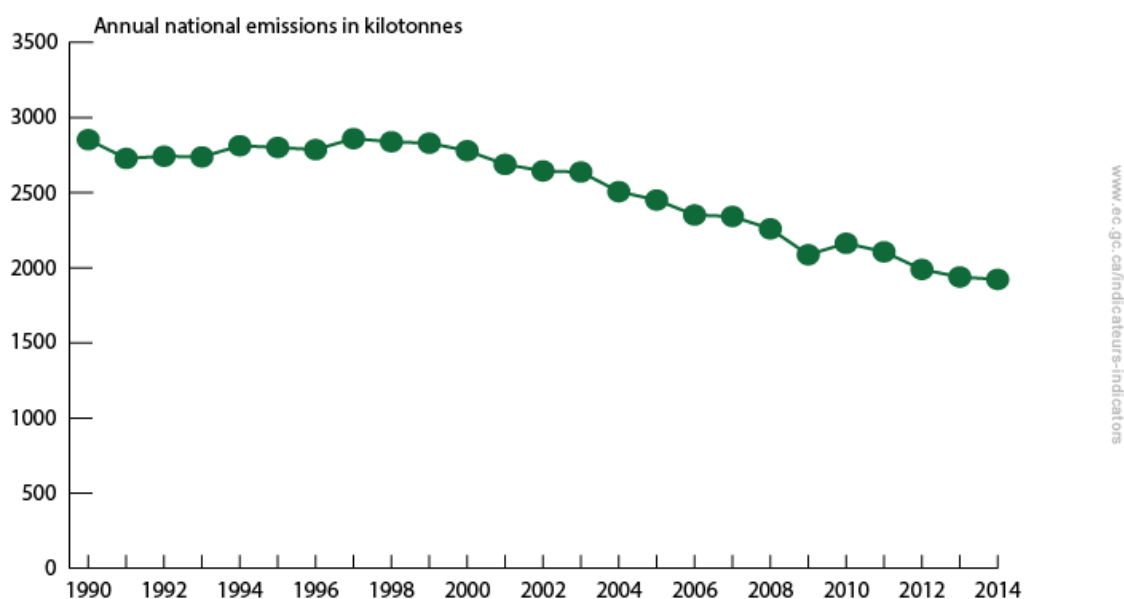
With the [CESI interactive map](#), you can zoom in to local areas and obtain details on SO_x emissions specific to reporting facilities.

Nitrogen oxide emissions

In 2014, nitrogen oxide (NO_x) emissions were 1923 kilotonnes (kt), a decrease of 16 kt (1%) from 2013 emission levels. The level of NO_x emissions in 2014 was 930 kt (33%) lower than in 1990.

The decline in NO_x emissions is mostly attributable to two factors: a reduction in emissions from transportation, given the progressive introduction of cleaner technology and fuels for vehicles; and a reduction in emissions from electricity generation as a result of regulations and domestic and international agreements. Decreases also occurred in emissions emitted from industry as a whole, with the exception of the oil and gas industry that experienced growth between 1990 and 2014.

Figure 7. Nitrogen oxide emissions, Canada, 1990 to 2014



[Data for Figure 7](#)

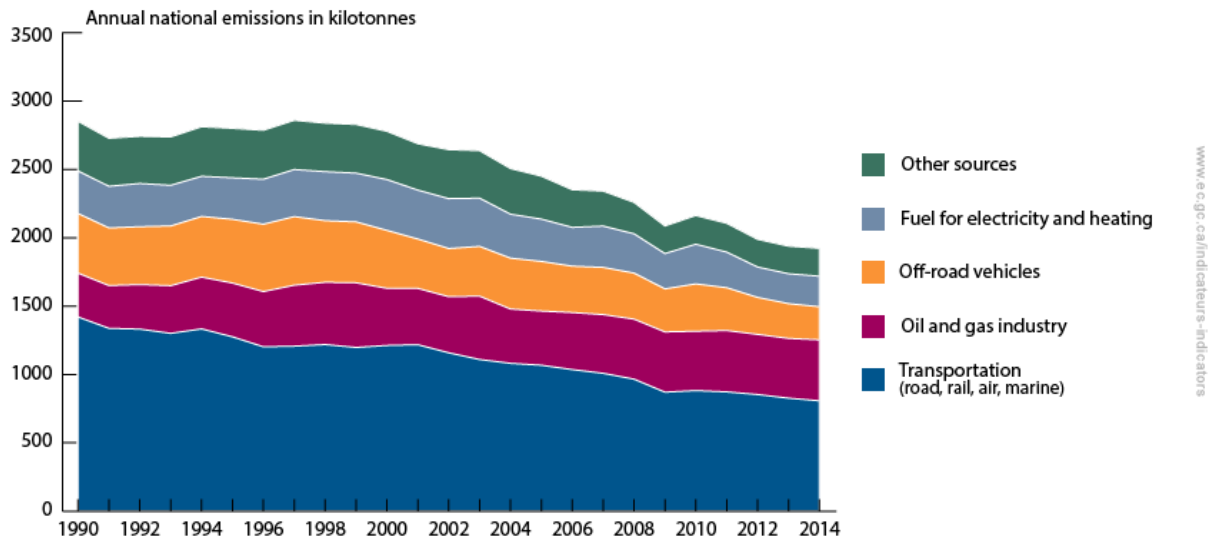
Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Sources of nitrogen oxide emissions

In 2014, transportation (road, rail, air and marine) was the major contributor to Canada's NO_x emissions, representing 42% (807 kt). The oil and gas industry emitted the next largest proportions of national NO_x emissions, representing 23% (446 kt), followed by off-road vehicles with 13% (242 kt). Between 1990 and 2014, the source that had the largest reduction (613 kt) in NO_x emissions was transportation (road, rail, air and marine) while the oil and gas industry is the only sector having experienced an increase (125 kt).

Figure 8. Nitrogen oxide emissions by source, Canada, 1990 to 2014



[Data for Figure 8](#)

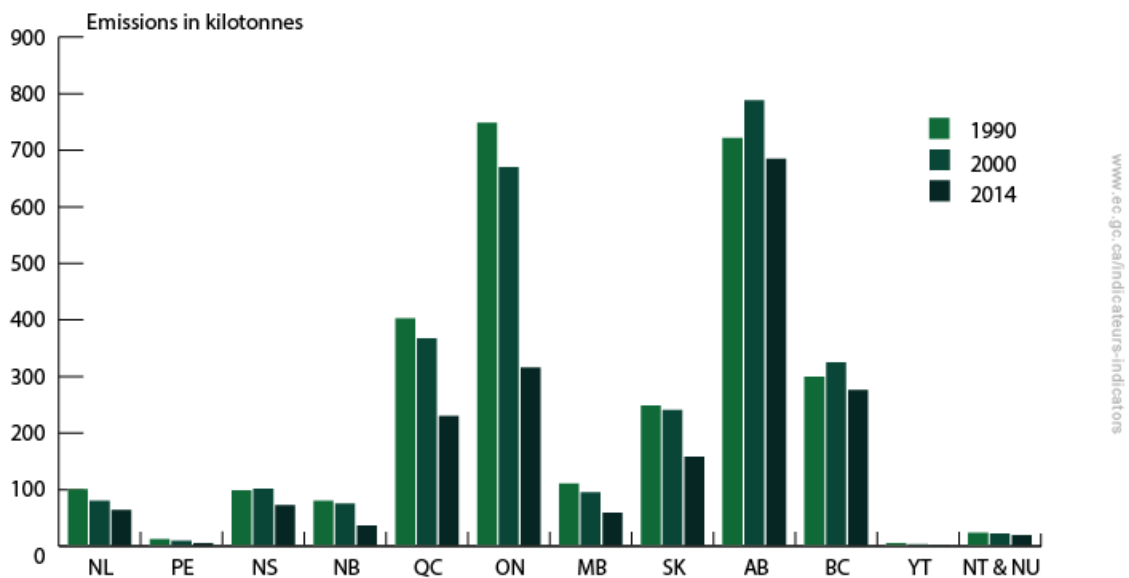
Note: The indicator only reports air pollutant emissions from human-related sources. "Other sources" include home firewood burning, incineration and miscellaneous, other industries, and open sources (e.g., landfills). Consult table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Nitrogen oxide emissions by province and territory

Alberta was the province with the highest proportion of NO_x emissions, with 36% (685 kt) of national emissions (1923 kt). The oil and gas industry emitted the largest amount of NO_x for this province. Ontario contributed the second-largest proportion of NO_x, with 16% (316 kt) of national emissions. British Columbia ranked third, with 14% (276 kt) of national emissions. In both Ontario and British Columbia, transportation (road, rail, air and marine) was the most important source of NO_x emissions. The oil and gas industry was also an important source of NO_x emissions in British Columbia. Off-road vehicles were the second most important source in Ontario. Ontario experienced the largest reduction in emissions level (433 kt) between 1990 and 2014 mainly due to emission reductions from transportation and electricity power-generating plants.

Figure 9. Nitrogen oxide emissions by province and territory, Canada, 1990, 2000 and 2014



[Data for Figure 9](#)

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Nitrogen oxide emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory (NPRI) provides detailed information on air pollutant emissions from industrial and commercial facilities. The Canadian Environmental Sustainability Indicators (CESI) program provides access to this information through an online interactive map.

With the [CESI interactive map](#), you can zoom in to local areas and obtain details on NO_x emissions specific to reporting facilities.

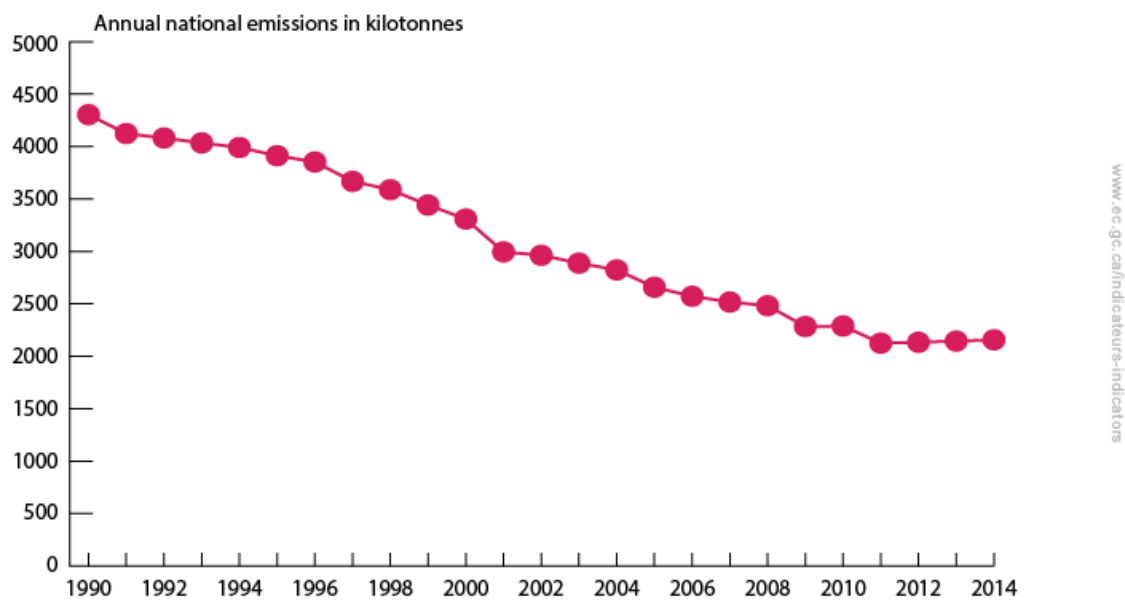
Volatile organic compound emissions

In 2014, volatile organic compound (VOC) emissions were 2157 kilotonnes (kt), an increase of 13 kt (1%) from 2013 levels.

Emissions of VOCs in 2014 were 2147 kt (50%) lower than in 1990. The long-term decline in VOC emissions is mainly attributable to reductions from three factors:

- the progressive introduction of cleaner technologies and fuels resulting in emission reductions from transportation and off-road vehicles;
- emission reductions from most industrial and non-industrial sources from improved emission controls; and
- lower levels of VOCs in products such as paints, solvents and cleaners.

Figure 10. Volatile organic compound emissions, Canada, 1990 to 2014



[Data for Figure 10](#)

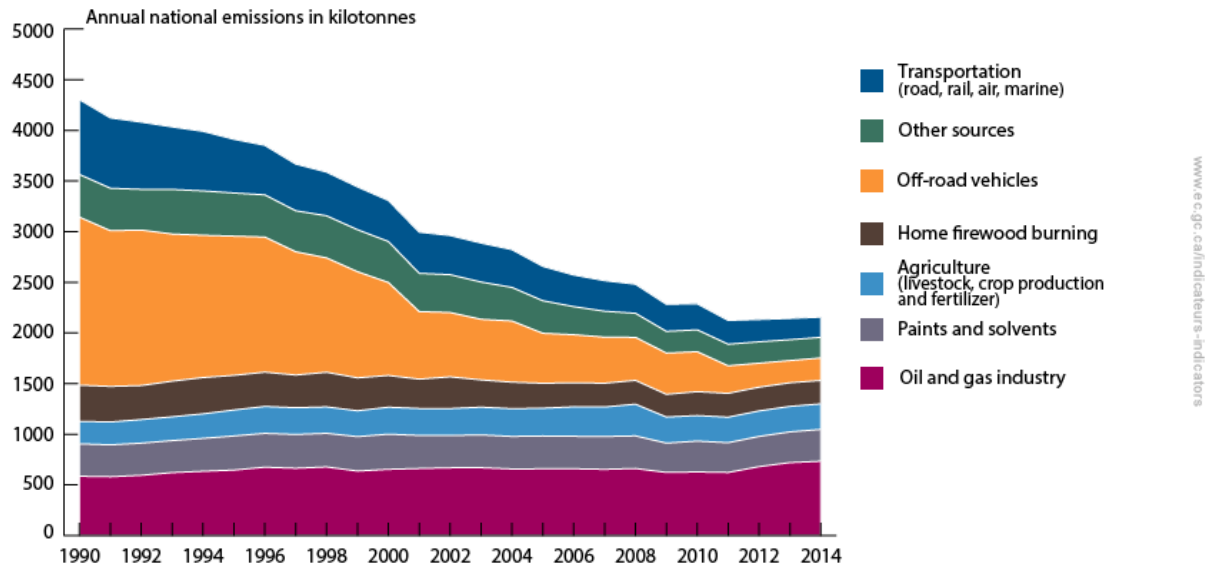
Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Sources of volatile organic compound emissions

In 2014, the oil and gas industry emitted the highest proportion of VOCs, representing 34% (734 kt) of national emissions. Other important sources of VOC emissions included the use of paints and solvents, representing 15% (314 kt) of national emissions, and agriculture (livestock and fertilizer), representing 12% (252 kt) of national emissions. The largest reduction in emissions between the years 1990 and 2014 occurred in off-road vehicles, with an emission reduction of 1437 kt.

Figure 11. Volatile organic compound emissions by source, Canada, 1990 to 2014



[Data for Figure 11](#)

Note: The indicator only reports air pollutant emissions from human-related sources. For the purpose of this chart "Agriculture", an open source, is being presented as a stand-alone source. "Other sources" include fuel for electricity and heating, incineration and miscellaneous, open sources (e.g., landfills), and other industries. Consult table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

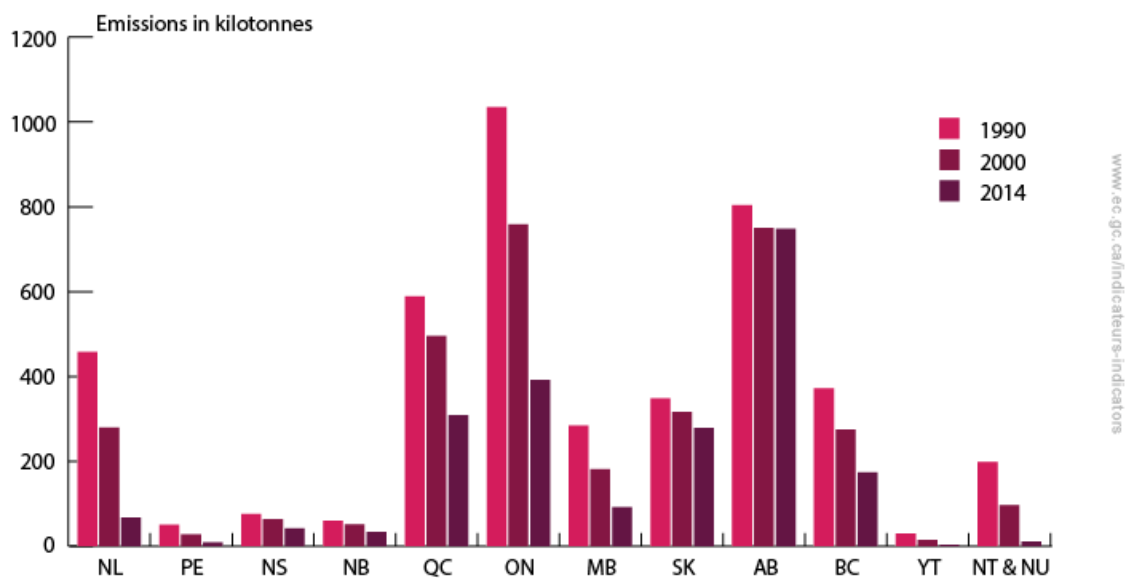
Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Volatile organic compound emissions by province and territory

Alberta emitted the highest proportion of VOCs in 2014, representing 35% (748 kt) of national emissions (2157 kt). The main source of VOCs in this province was the oil and gas industry. Ontario was responsible for 18% (391 kt) of national emissions, with paint and solvent use, off-road vehicles and home firewood burning as the most important sources. Quebec was the third largest emitter, with 14% (308 kt) of national emissions, where home firewood burning, paint and solvent use, transportation, and off-road vehicles accounted for 73% of the emissions in that province.

All provinces experienced reductions in emissions between 1990 and 2014. For most of them, the reductions were well above 40%. Ontario experienced the largest reductions in emissions between 1990 and 2014, mainly due to emission reductions from off-road vehicles.

Figure 12. Volatile organic compound emissions by province and territory, Canada, 1990, 2000 and 2014



[Data for Figure 12](#)

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Volatile organic compound emissions from facilities

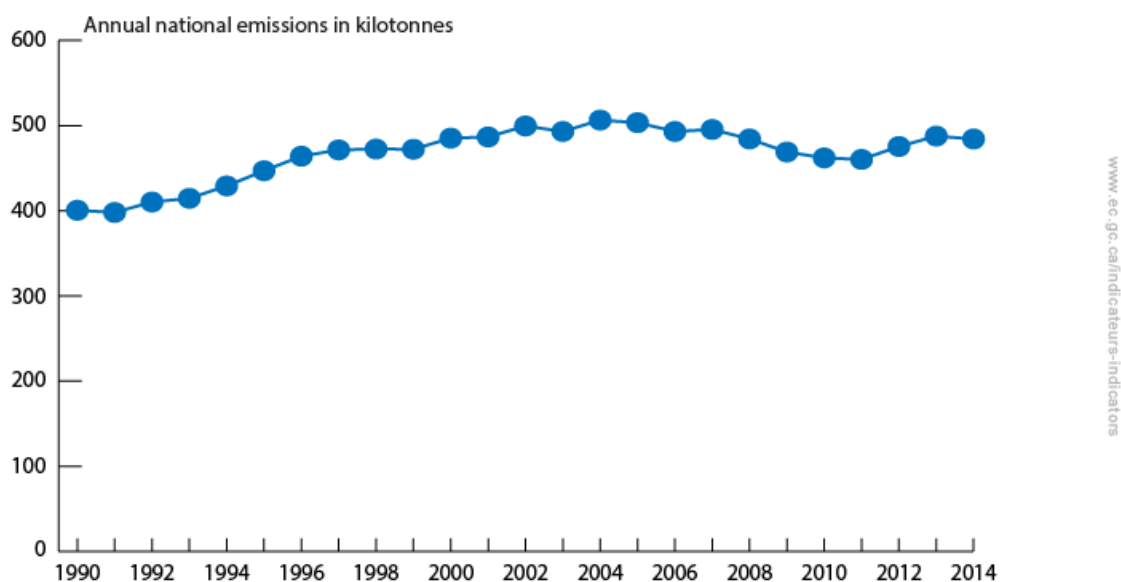
Environment and Climate Change Canada's National Pollutant Release Inventory (NPRI) provides detailed information on air pollutant emissions from industrial and commercial facilities. The Canadian Environmental Sustainability Indicators (CESI) program provides access to this information through an online interactive map.

With the [CESI interactive map](#), you can zoom in to local areas and obtain details on VOC emissions specific to reporting facilities.

Ammonia emissions

In 2014, ammonia (NH₃) emissions were 484 kilotonnes (kt), a decrease of 3 kt (1%) over 2013 levels. NH₃ emissions in 2014 were 84 kt (21%) higher than in 1990. The change in emission levels over the period is due to increased agricultural fertilizer use and larger livestock populations.

Figure 13. Ammonia emissions, Canada, 1990 to 2014



[Data for Figure 13](#)

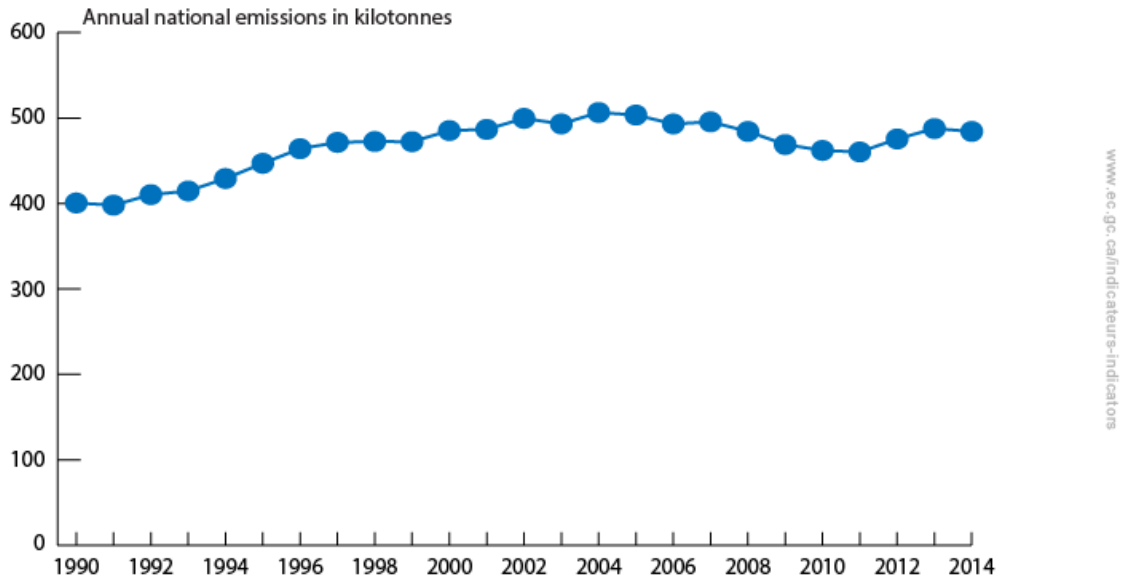
Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Sources of ammonia emissions

In 2014, agricultural activity accounted for 93% (452 kt) of the total NH₃ emissions in Canada (484 kt). Emissions from industrial sources represented 3% (15 kt) of national emissions, followed by transportation (road, rail, air and marine) and other sources, each representing 2% (8 kt and 9 kt) of national emissions. From 1990 to 2014, NH₃ emissions from agricultural sources increased by 93 kt.

Figure 14. Ammonia emissions by source, Canada, 1990 to 2014



[Data for Figure 14](#)

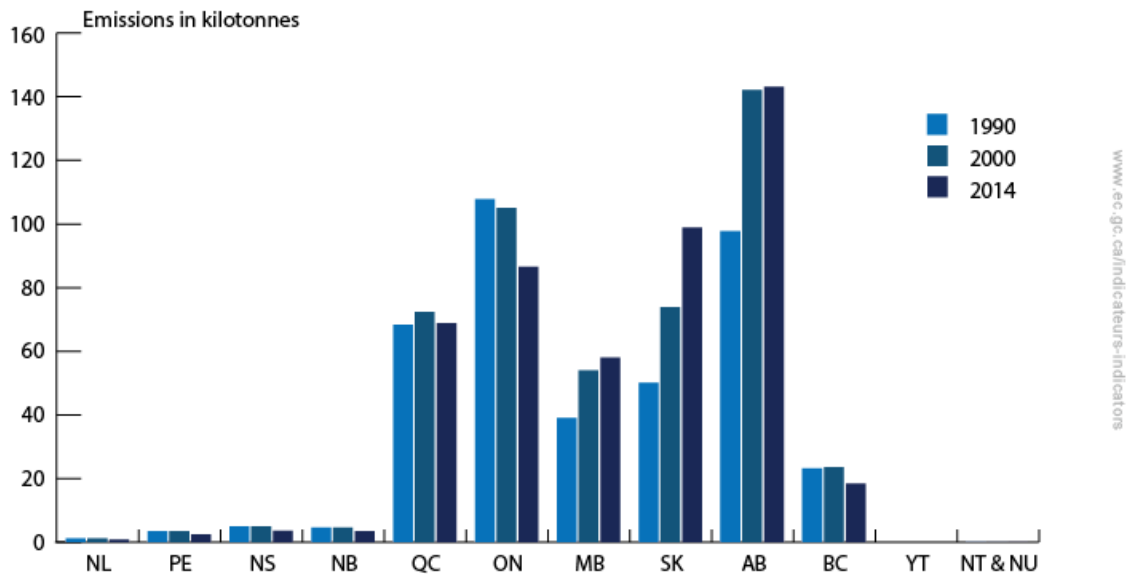
Note: The indicator only reports air pollutant emissions from human-related sources. The source "Other sources" does not include NH₃ emissions from agriculture, as it is presented for the purpose of this chart as a stand-alone source. "Other sources" include home firewood burning, off-road vehicles, fuel for electricity and heating, incineration and miscellaneous and other open sources (such as waste). Industry includes the oil and gas industry and other industries. Consult table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Ammonia emissions by province and territory

Alberta contributed the most to Canada's NH₃ emissions in 2014, with 30% (143 kt) of the national total (484 kt). Saskatchewan ranked second, with 20% (99 kt). Ontario and Quebec emitted the next highest proportions, with 18% and 14% (87 and 69 kt), respectively. For all provinces, livestock farms and the application of fertilizers were the most important sources of NH₃ emissions. Almost all of the increase in emissions between 1990 and 2014 took place in Manitoba, Saskatchewan and Alberta.

Figure 15. Ammonia emissions by province and territory, Canada, 1990, 2000 and 2014



[Data for Figure 15](#)

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Ammonia emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory (NPRI) provides detailed information on air pollutant emissions from industrial and commercial facilities. The Canadian Environmental Sustainability Indicators (CESI) program provides access to this information through an online interactive map.

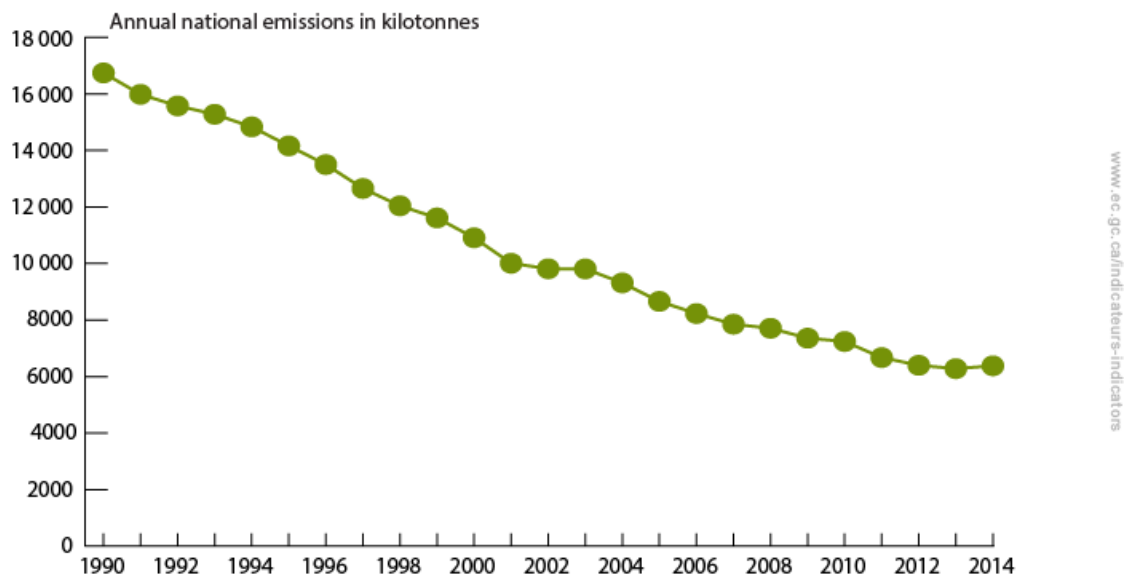
With the [CESI interactive map](#), you can zoom in to local areas and obtain details on NH₃ emissions specific to reporting facilities.

Carbon monoxide emissions

In 2014, carbon monoxide (CO) emissions reached 6381 kilotonnes (kt), an increase of 102 kt (2%) from 2013 levels. Emissions of CO in 2014 were 10 360 kt (62%) lower than in 1990.

The decline in CO emissions is mainly attributable to a reduction in emissions from transportation (road, rail, air and marine) and off-road vehicles due to the progressive introduction of cleaner and more efficient technology in vehicles.

Figure 16. Carbon monoxide emissions, Canada, 1990 to 2014



[Data for Figure 16](#)

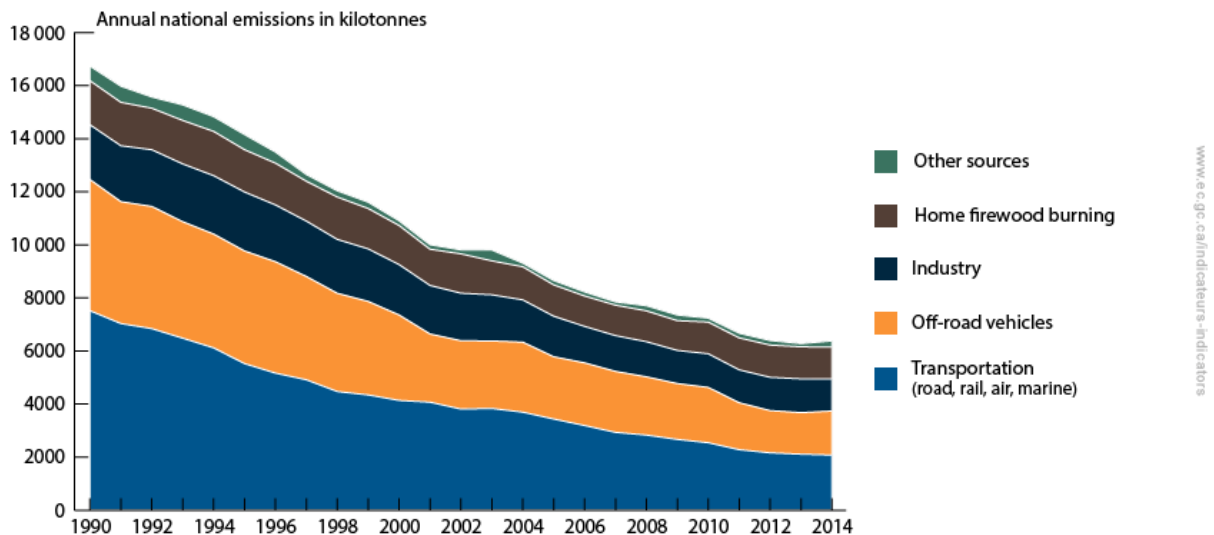
Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Sources of carbon monoxide emissions

Transportation (road, rail, air and marine) and off-road vehicles were the two most important sources of CO in 2014, representing 59% (3737 kt) of total national emissions (6381 kt). The largest reduction in emissions between the years 1990 and 2014 occurred in transportation (road, rail, air and marine) with an emission reduction of 5442 kt.

Figure 17. Carbon monoxide emissions by source, Canada, 1990 to 2014



[Data for Figure 17](#)

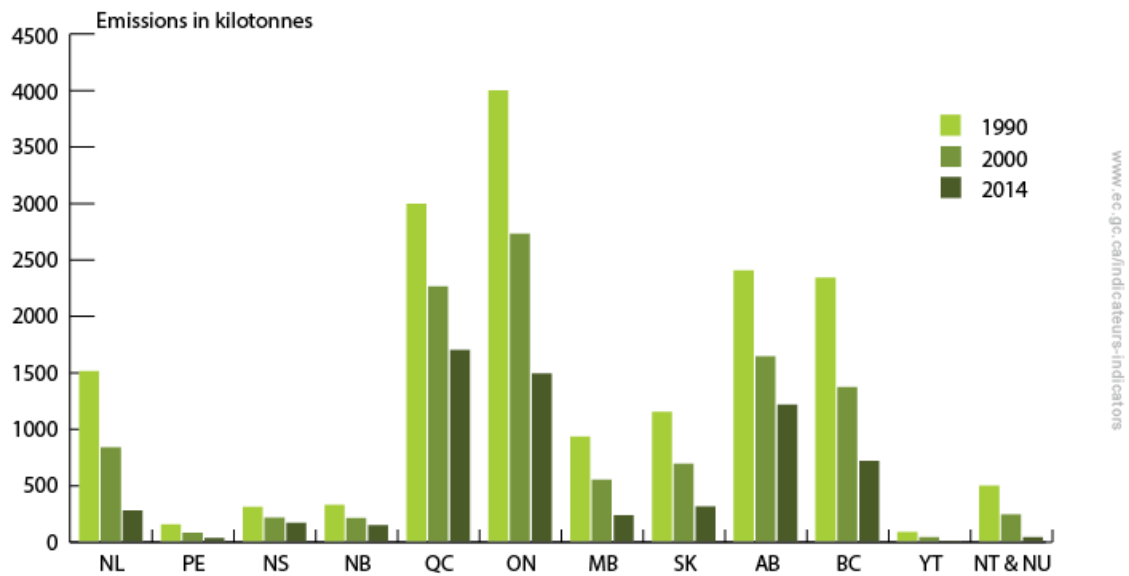
Note: The indicator only reports air pollutant emissions from human-related sources. "Other sources" include fuel for electricity and heating, incineration and miscellaneous and open sources (e.g., landfills). "Industry" includes the oil and gas industry and other industries. Consult table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Carbon monoxide emission by province and territory

In 2014, Quebec emitted the highest proportion of Canada's CO emissions, representing 27% (1701 kt) of the national total (6381 kt). Ontario contributed 23% (1494 kt) to national emissions and Alberta contributed 19% (1219 kt). Home firewood burning was the most important source of CO emissions for Quebec, off-road vehicles for Ontario and the oil and gas industry for Alberta. All provinces experienced sharp reductions in emissions between 1990 and 2014 mainly due to transportation (road, rail, air and marine) emissions reductions.

Figure 18. Carbon monoxide emissions by province and territory, Canada, 1990, 2000 and 2014



[Data for Figure 18](#)

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Carbon monoxide emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory (NPRI) provides detailed information on air pollutant emissions from industrial and commercial facilities. The Canadian Environmental Sustainability Indicators (CESI) program provides access to this information through an online interactive map.

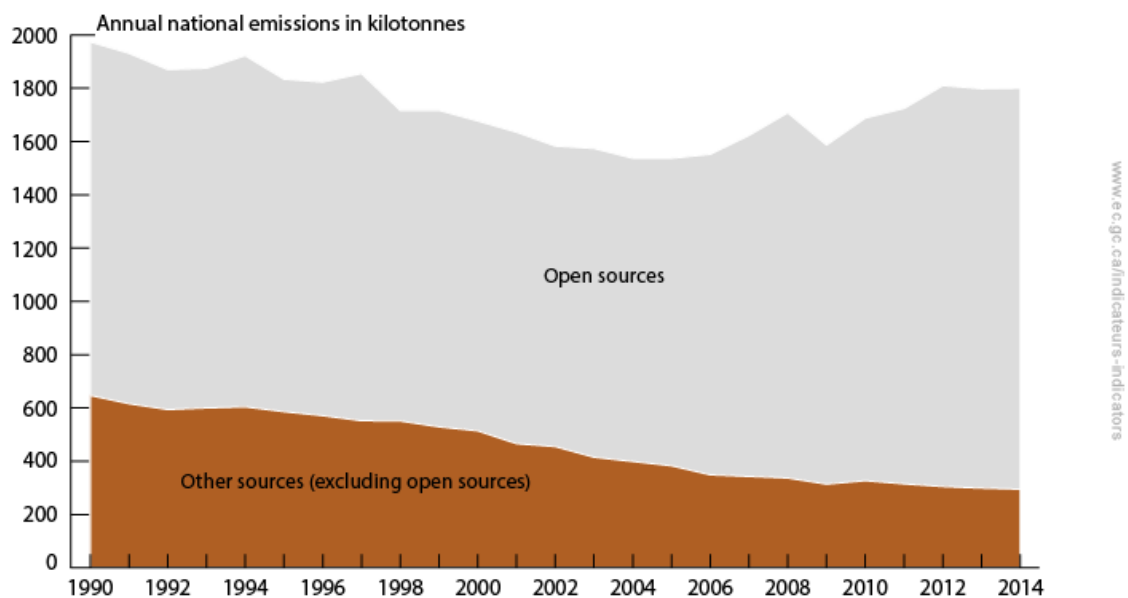
With the [CESI interactive map](#), you can zoom in to local areas and obtain CO emissions details specific to reporting facilities.

Fine particulate matter emissions

Emissions from open sources contribute the majority of fine particulate matter (PM_{2.5}). Open sources are diffused, occurring over large geographical areas. They are often located in areas outside of urban centers. In 2014, emissions from open sources (which includes emissions from agriculture) accounted for 84% of the national total of 1800 kilotonnes (kt) of PM_{2.5} and were largely emitted by activities associated with construction operations and dust from paved and unpaved roads.

The remaining 16% of PM_{2.5} emissions came from other sources such as home firewood burning and industrial activities. Between 1990 and 2014, emissions of PM_{2.5} from open sources increased by 177 kt (13%) while emissions from other sources declined by 54% (352 kt) over the period.

Figure 19. Fine particulate matter emissions, Canada, 1990 to 2014



[Data for Figure 19](#)

Note: The indicator only reports air pollutant emissions from human-related sources. Open sources are shown separately in the chart to provide a picture of their impact on national PM_{2.5} emissions.

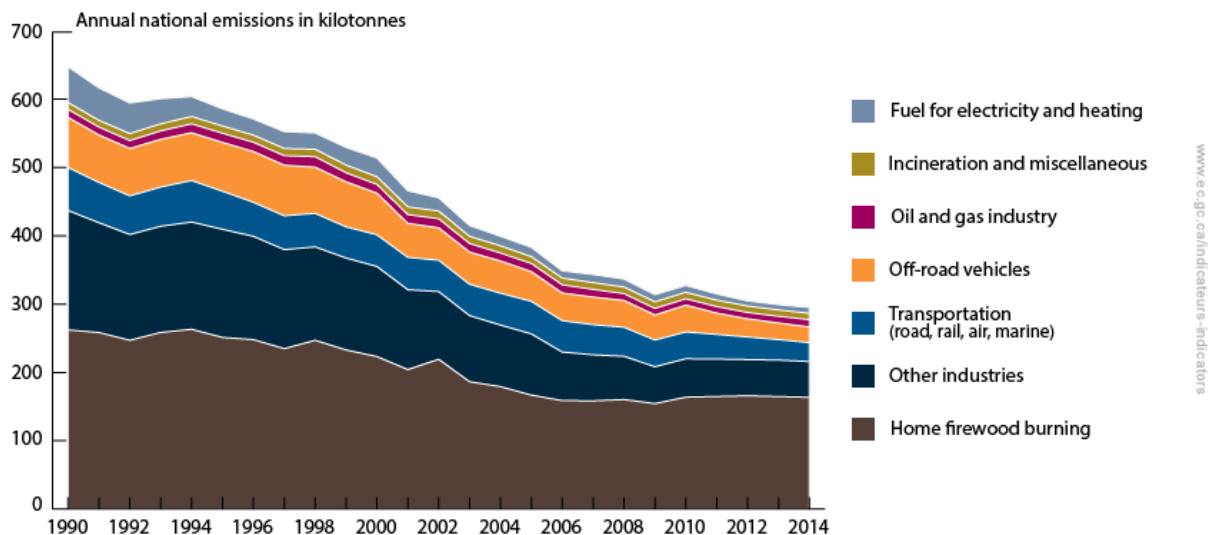
Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Fine particulate matter emissions excluding open sources

Excluding open sources shows the contribution of other sources that have more of an impact on the population given they are generally emitted in areas of high population.

Emissions from home firewood burning were the largest source of PM_{2.5} in 2014, representing 164 kt (55% of the national total excluding open sources = 295 kt). Industrial sources, excluding oil and gas industry (Other industries), emitted the next-largest proportion of national PM_{2.5} emissions, representing 18% (52 kt), followed by transportation (road, rail, air, marine) with 9% (28 kt). Between 1990 and 2014, industrial sources, excluding oil and gas industry, had the largest reduction (122 kt) in emissions.

Figure 20. Fine particulate matter emissions by source, excluding open sources, Canada, 1990 to 2014



[Data for Figure 20](#)

Note: The indicator only reports air pollutant emissions from human-related sources. Open sources of PM_{2.5}, which account for 84% of the PM_{2.5} emissions, have been removed from the analysis. Consult [the Data Sources and Methods](#) for more details.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

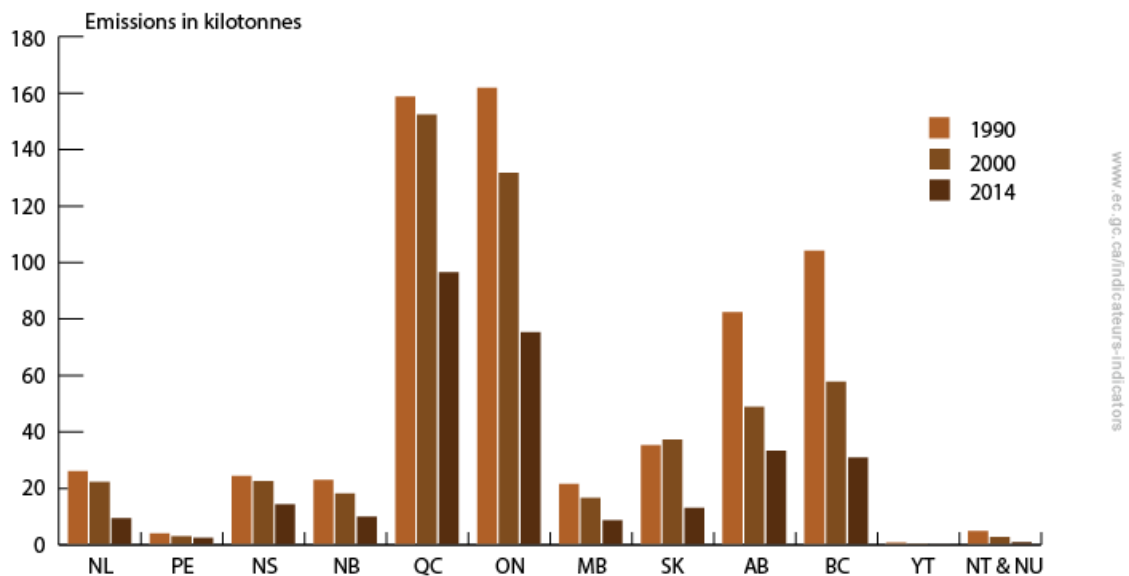
Fine particulate matter emissions by province and territory excluding open sources

In 2014, Quebec emitted the most PM_{2.5} with 33% (96 kt) of national emissions (295 kt). Ontario ranked second, with 26% (75 kt), and Alberta and British Columbia both ranked third, each representing 11% (33 kt and 31 kt) of PM_{2.5} emissions.

Home firewood burning (e.g., woodstoves, fireplaces) was the largest source of emissions in each of the four provinces for PM_{2.5}. The oil and gas industry was the second largest source in Alberta. Transportation was also an important source of PM_{2.5} for Quebec and British Columbia. In Ontario, off-road vehicles were the second largest source of emissions.

All provinces and territories experienced large declines in emissions between 1990 and 2014.

Figure 21. Fine particulate matter emissions, excluding open sources, by province and territory, Canada, 1990, 2000 and 2014



[Data for Figure 21](#)

Note: The indicator only reports air pollutant emissions from human-related sources. Open sources of PM_{2.5}, which account for 84% of the PM_{2.5} emissions, have been removed from the analysis. Consult the [Data Sources and Methods](#) for more details.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

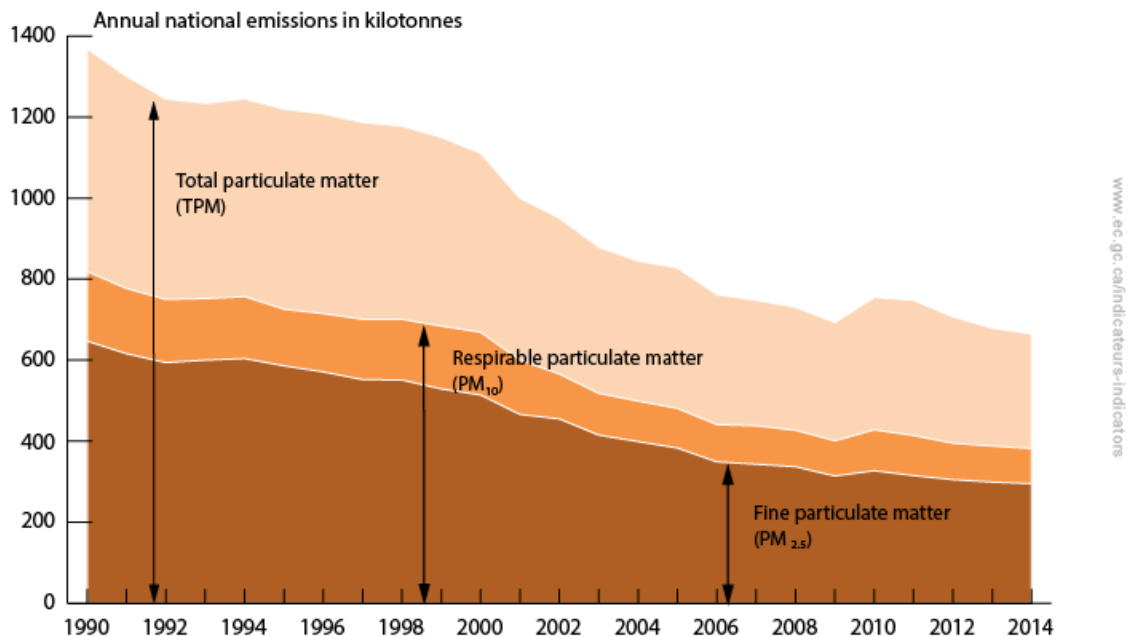
Particulate matter emissions excluding open sources

Particulate matter emissions are generally reported in three sizes: total particulate matter (TPM), respirable particulate matter (PM₁₀) and fine particulate matter (PM_{2.5}). The size of the particle emitted largely determines the extent of the environmental and health damage it causes. The smallest of the particles, PM_{2.5}, has been linked to serious health problems.⁵ The indicator shows the contribution of each size of particulate matter to Canada's emissions.

In 2014, emissions of TPM were 665 kt, a decrease of 14 kt (2%) from 2013 emission levels. Emissions of PM₁₀ decreased in 2014 by 6 kt (1%) from 2013 emission levels, to 382 kt. A decline of 4 kt (1%) was also observed for PM_{2.5}, to 295 kt. Overall, between 1990 and 2014, emissions of all three sizes of particulate matter decreased by more than 50%.

⁵ See the [Air Health Indicator](#) for more information on health problems related to PM_{2.5}.

Figure 22. Particulate matter emissions, Canada, 1990 to 2014



[Data for Figure 22](#)

Note: The indicator only reports air pollutant emissions from human-related sources. Total particulate matter (TPM) includes respirable particulate matter (PM₁₀) and fine particulate matter (PM_{2.5}) emissions. Respirable particulate matter includes PM_{2.5} emissions and refers to particulate matter with a diameter of 10 micrometres (µm) or less, while PM_{2.5} refers to particulate matter with a diameter of 2.5 µm or less. Open sources of PM_{2.5}, which account for 84% of the total national PM_{2.5} emissions, have been removed from the analysis. Consult the [Data Sources and Methods](#) for more details.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Black carbon emissions by source⁶

Black carbon is a component of PM_{2.5} emitted directly into the air from the incomplete combustion of fossil fuels, biofuels and biomass. Black carbon can cause adverse health effects. Considered a short-lived climate pollutant (SLCP),⁷ black carbon has the ability to absorb solar radiation contributing to warming of the Earth's surface.

The use of small diesel engines in three sectors accounted for 89% of Canada's national black carbon emissions (43 kt) in 2014. Off-road vehicles emitted the largest proportion, representing 32% (14 kt) of national emissions, followed by transportation (road, rail, air and marine) representing 29% (12 kt) and home firewood burning, representing 28% (12 kt). The remaining 11% of emissions came from the oil and gas industry, the use of fuel for electricity and heating, and other industries.⁸

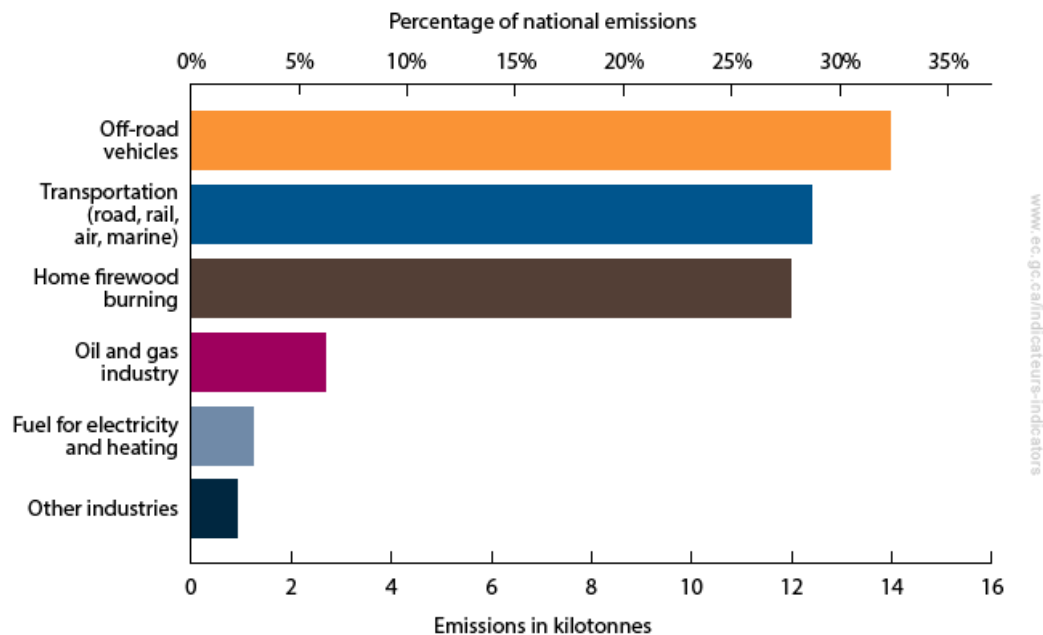
⁶ Emissions of black carbon are calculated by applying specific black carbon ratios to PM_{2.5} emissions from combustion related sources, with the exception of mobile sources, where models are used. Consult [the Data Sources and Methods](#) for more details.

⁷ Short-lived climate pollutants (SLCPs) are substances that have a relatively short lifespan in the atmosphere compared to carbon dioxide and other longer-lived greenhouse gases. Although their life-spans are short, SLCPs are potent global warmers. Environment and Climate Change Canada (2016) [Climate and Clean Air Coalition \(CCAC\) to Reduce Short-Lived Climate Pollutants \(SLCPs\)](#). Retrieved on January 4, 2016.

⁸ "Other industries" includes the aluminum industry, the cement and concrete industry, foundries, mining and rock quarrying, the pulp and paper industry, and the wood industry.

For both off-road vehicles (e.g., lawn and garden equipment, recreational vehicles) and transportation, the use of diesel engines accounted for the majority of black carbon emissions. The same was true of the oil and gas industry where the use of stationary diesel engines for fuel extraction accounted for the largest share of emissions. Emissions from other industries are low because a large portion of the particulate matter produced is not from combustion sources.

Figure 23. Black carbon emissions by source, Canada, 2014



[Data for Figure 23](#)

Note: The chart includes emissions from the most significant sources of black carbon. Consult [the Data Sources and Methods](#) for more details.

Source: Environment and Climate Change Canada (2016) [Canada's Black Carbon Emission Inventory](#).

Particulate matter emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory (NPRI) provides detailed information on air pollutant emissions from industrial and commercial facilities. The Canadian Environmental Sustainability Indicators (CESI) program provides access to this information through an online interactive map.

With the CESI interactive map, you can zoom in to local areas and obtain details on [TPM](#), [PM₁₀](#) and [PM_{2.5}](#) emissions specific to reporting facilities.



These indicators are used to measure progress toward [Target 2.1: Outdoor Air Pollutants – Improve outdoor air quality by ensuring compliance with new or amended regulated emission limits by 2020 and thus reducing emissions of air pollutants in support of AQMS objectives](#) of the [Federal Sustainable Development Strategy 2013–2016](#).

Part 2. Data Sources and Methods for the Air Pollutant Emissions Indicators

Introduction

The [Air Pollutant Emissions](#) indicators are part of the [Canadian Environmental Sustainability Indicators](#) (CESI) program, which provides data and information to track Canada's performance on key environmental sustainability issues. These indicators are also used to measure progress towards the goals and targets of the [Federal Sustainable Development Strategy 2013–2016](#).

Description and rationale of the Air Pollutant Emissions indicators

Description

The Air Pollutant Emissions indicators track emissions of six key air pollutants from anthropogenic (human-related) sources. These air pollutants are sulphur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOC), ammonia (NH₃), carbon monoxide (CO) and fine particulate matter (PM_{2.5}). Black carbon, which is a component of PM_{2.5}, is also reported.⁹

For each air pollutant, the indicators are provided at the national and provincial/territorial levels. They also identify the major sources of emissions and provide links to detailed information on air pollutant emissions from facilities.¹⁰

Rationale

Canadians are exposed to air pollutants on a daily basis and that can cause adverse health and environmental effects. Ground-level ozone (O₃) and PM_{2.5} are key components of smog and have been associated with pulmonary and cardiovascular health issues. While causing effects of their own, NO_x (such as nitrogen dioxide) and VOC are the main contributors to the formation of O₃. Nitrogen oxides, SO_x (such as sulphur dioxide), NH₃ and VOC also lead to the formation of PM_{2.5} in the air, while PM_{2.5} is also emitted directly. Sulphur oxides and NO_x can also lead to the formation of acid deposition that can harm the environment, materials, living organisms, and humans. Black carbon is estimated to be the third largest contributor to current climate warming. Black carbon is of particular significance in polar regions such as the Arctic, where the deposition of particles on ice and snow darken the surface and accelerate melting. Additionally, black carbon has been linked to adverse health effects.

These indicators are intended to inform decision-makers and the public about progress made toward reducing emissions of key air pollutants and about the effectiveness of emission reduction measures implemented to improve ambient air quality in Canada.

⁹ Black carbon is emitted from combustion processes in the form of PM_{2.5}. It is not emitted on its own, but as a component of PM_{2.5} along with other components, such as organic carbon (OC) and inorganic compounds like sulfates. PM_{2.5} emissions from non-combustion sources, such as dust raised by traffic on paved and unpaved roads or by wind and machinery on open fields or mine sites, are not considered sources of black carbon. Environment and Climate Change Canada (2016) [Canada's Black Carbon Emission Inventory](#). Retrieved on February 15, 2016.

¹⁰ Only facilities that had air pollutant emissions over a certain reporting threshold were included in the National Pollutant Releases Inventory (NPRI) reported data.

Recent changes to the indicators

The Air Pollutant Emissions indicators report emission estimates that have been recalculated or updated for many different sources using improved emission estimation methods or refinements which can result in changes to historical estimates. The emission estimates reported in the 2016 Air Pollutant Emission Inventory (APEI) have undergone a number of significant recalculations. Emissions from industrial, non-industrial, mobile, incineration, miscellaneous, and open sources were recalculated for the 2016 edition of the APEI. The term significant refers to changes in emission levels greater than +/-10%. For more information about the recent changes, consult Annex 2 of the [APEI report](#).

The black carbon emissions indicator has been expanded to include emissions from the use of "fuels for electricity and heating" resulting from power-generating utilities, commercial and residential establishments, and from agriculture and construction activities. Emissions from the wood product industry have also been added to "other industries."¹¹ Methodological improvements have also been made to all sources to improve the accuracy of emission estimates. Consult section 2.5 of [Canada's Black Carbon Emission Inventory](#) for more information.

Data

Data source

The Air Pollutant Emissions indicators used in the Canadian Environmental Sustainability Indicators (CESI) program are based on Canada's Air Pollutant Emission Inventory (APEI) data. The [APEI report](#) includes emissions reported by facilities to the National Pollutant Release Inventory (NPRI), as well as emissions estimated by Environment and Climate Change Canada using the latest estimation methods, published statistics or other sources of information such as surveys and reports. The APEI summaries and trends are compiled in collaboration with provincial, territorial and regional environmental agencies. For the [interactive maps](#), emissions reported by facilities are directly retrieved from the [NPRI database](#).

Canada also submits its emissions to the European Monitoring and Evaluation Programme Centre on Emission Inventories and Projections pursuant to the Convention on Long-range Transboundary Air Pollution and its associated protocols.

Data for the black carbon indicator come from Canada's [Black Carbon Emission Inventory](#). As a member country of the Arctic Council's Task Force for Action on Black Carbon, Canada has committed to voluntarily submitting an inventory of its black carbon emissions to the United Nations Economic Commission for Europe by February 2016. Black carbon estimates are published separately from the APEI.

Spatial coverage

The indicators are calculated at the national and provincial/territorial levels except for black carbon, which is only available at the national level. Air pollutant emissions are also available at the facility level in the CESI interactive maps, except for black carbon.

¹¹ "Other industries" includes the aluminum industry, the cement and concrete industry, foundries, mining and rock quarrying, and the pulp and paper industry.

Temporal coverage

The latest year available for the Air Pollutant Emissions indicators is 2014. Past years (1990–2013) are also available. Emissions by province and territory are reported for the years 1990, 2000 and 2014. Black carbon emissions are only reported for 2014. For facility emissions, information on key air pollutants is available for 2002 to 2014. All emissions used for the Air Pollutant Emissions indicators are annual values.

Data completeness

The APEI report is compiled to provide the best information available on all significant sources of key air pollutants. As such, improvements to data completeness are made periodically as new emission estimation methodologies are adopted and additional information is made available. Historical emissions are also updated on the basis of these improvements.

Data timeliness

The data are current as of December 1, 2015 for the years 1990 to 2014. Emissions data are reported in Canada's APEI approximately one year after data collection, validation, calculation and interpretation have been completed. The CESI Air Pollutant Emissions indicators are reported following the release of the APEI.

Methods

Emissions calculation and compilation

Emissions are estimated or measured through one of the following methods:

- Continuous emission monitoring systems (CEMS)
- Predictive emission monitoring (PEM)
- Source testing
- Mass balance
- Site-specific emission factors
- Published emission factors
- Engineering estimates
- Special studies

The methodologies used to estimate emissions are reviewed, updated and improved on a periodic basis. Collaborative work with sector experts from within and outside Environment and Climate Change Canada is undertaken to incorporate available expertise and the latest advancements in scientific knowledge. Further information on these methods is available through Environment and Climate Change Canada's [Air Pollutant Emission Inventory](#) (APEI) website, as well as through the 2016 edition of the [Air Pollutant Emission Inventory Report](#).

In the comprehensive emissions tables, the APEI includes four emissions sources: area, open, mobile, and point (stationary) sources which are classified in the following six sectors according to the nature of their activities: industrial, non-industrial, mobile, incineration, miscellaneous and open. Emissions are compiled using top-down and bottom-up approaches, which are described below. The Canadian Environmental Sustainability Indicators (CESI) program groups the APEI sectors in order to report on the key sources that contribute the majority of emissions for each air pollutant. See table 1 in section [Source Classification](#) for a complete list of the APEI sectors allocated to each CESI source.

Area and open source emissions are sources too small or too numerous to be reported individually as point sources (e.g., dry cleaning, saw mills). They are usually compiled through a top-down approach using activity-level statistics and emission factors that are

specific to the source. Activity levels are multiplied by emission factors to estimate the emissions for the specific source.

Mobile source (transportation) emissions are compiled using a combination of bottom-up and top-down approaches. Emissions are estimated using an emissions estimation model (MOVES) developed by the United States Environmental Protection Agency (U.S. EPA) that consider the number of vehicles, fuel consumed, distance travelled, technology used and many other parameters.

Point source emissions are compiled through a bottom-up approach starting with emissions from facilities. The facility information reported to the National Pollutant Release Inventory (NPRI) is used in combination with some provincial information to compile the emissions from point sources.

The comprehensive emissions tables contain all four emissions sources (area, open, mobile and point sources). Care is taken to avoid double counting of emissions for the same source. A reconciliation of the emissions is conducted when point source emissions are already accounted for in the area source estimates. In these cases, the area source estimates are modified (reduced or removed) to avoid double counting. A data quality control process is also in place to avoid discrepancies in the database, both in data compilation and in the production of summary tables.

Emissions of black carbon are calculated by applying specific black carbon ratios to PM_{2.5} emissions from combustion related sources, with the exception of mobile sources, where models were used. The ratios primarily come from the U.S. EPA [SPECIATE database](#). SPECIATE is the EPA's repository of particulate matter speciation profiles¹² of air pollution sources. Annex C of [Canada's Black Carbon Emission Inventory](#) lists all the ratios used for each source.

Source classification

Emissions are classified in CESI by summarizing emissions from multiple sources as defined in the APEI sectors. Table 1 shows the allocation of air pollutant emission sources reported by CESI compared with those reported by APEI.

Table 1. Alignment of sources reported in the Canadian Environmental Sustainability Indicators (CESI) and the Air Pollutant Emissions Inventory (APEI)

Sources in CESI	Sectors in APEI
Agriculture (livestock, crop production and fertilizer) ^[A]	Agriculture
Fuel for electricity and heating	Electric power generation (utilities)
	Commercial fuel combustion
	Residential fuel combustion
Home firewood burning	Residential fuel wood combustion
Incineration and miscellaneous	Crematorium
	Industrial and commercial incineration

¹² A speciation profile is the dataset that breaks down PM_{2.5} emitted from a particular source into its different components (black carbon and organic carbon). Environment and Climate Change Canada (2016) [Canada's Black Carbon Emission Inventory](#). Retrieved on February 15, 2016.

Sources in CESI	Sectors in APEI
	Municipal incineration
	Other incineration and utilities
	Cigarette smoking
	Dry cleaning
	Marine cargo handling industry
	Meat cooking
	Refined petroleum products retail
	Printing
	Structural fires
	Human
	Other miscellaneous sources
Off-road vehicles	Off-road use of diesel
	Off-road use of gasoline/liquefied petroleum gas (LPG)/compressed natural gas (CNG)
Oil and gas industry	Upstream petroleum industry
	Downstream petroleum industry
Open sources	Agriculture ^[A]
	Construction operations
	Dust from paved roads
	Dust from unpaved roads
	Dust from coal mining
	Waste
	Mine tailings
	Prescribed burning
Other industries	Aluminum industry
	Asphalt paving industry
	Cement and concrete industry
	Chemicals industry
	Mineral products industry
	Foundries
	Grain industries
	Iron and steel industries
	Iron ore mining industry
	Mining and rock quarrying

Sources in CESI	Sectors in APEI
	Non-ferrous smelting and refining industry ^[B]
	Pulp and paper industry
	Wood industry
	Petroleum product transportation and distribution
	Other industries
	Abrasives manufacture
	Bakeries
	Metal fabrication
	Glass manufacture
	Vehicle manufacture (engines, parts, assembly, painting)
	Electronics
	Plastics manufacture
	Food preparation
	Paint and varnish formulation
	Textiles
	Miscellaneous industrial sectors
	Biofuel production
Paints and solvents	General solvent use
	Surface coatings
Transportation (road, rail, air, marine)	Air transportation
	Heavy-duty diesel vehicles
	Heavy-duty gasoline trucks
	Light-duty diesel trucks
	Light-duty diesel vehicles
	Light-duty gasoline trucks
	Light-duty gasoline vehicles
	Marine transportation
	Motorcycles
	Rail transportation
	Tire wear and brake linings
Industry	A combination of APEI sources listed under the CESI "Oil and gas industry", and "Other industries"

^[A] Agriculture is also shown as an individual source for the ammonia pollutant.

^[B] Non-ferrous smelting and refining is shown as an individual source for the sulphur oxides pollutant.

For display purposes, smaller emitting sources are sometimes grouped together under the title "Other sources" in the charts of air pollutant emissions by source. The names of the sources used are listed in the notes of each chart.

Caveats and limitations

Open sources have been included in the national summary charts and are also reported separately in the indicators of fine particulate matter (PM_{2.5}). In general, open sources for PM_{2.5} are highly dependent on weather (e.g., wind, rain), and some sources are difficult to control. Also, for open sources such as road dust, fine particulate matter tends to quickly redeposit near the emission source. Open sources have been excluded in order to show the contribution of other sources that have more of an impact on the population. For more analysis with open sources, please consult the [Air Pollutant Emissions Inventory Report 1990–2014](#).

The Air Pollutant Emissions indicators continue to evolve. Improvements are made every year to methodologies for estimating and compiling emissions summaries and analyzing trends. As a result of these improvements, emissions for a given year may be different from those previously published by Environment and Climate Change Canada, other governmental agencies and international organizations. Caution is advised when comparing different reports and different sources.

Some area source emissions were not updated for 2014 due to the unavailability of activity level statistics at the time of compilation. In these cases, the emission estimates from the most recent year available (2013) were used.

Canada's Air Pollutant Emission Inventory (APEI) uses point source information from the National Pollutant Release Inventory (NPRI) and other sources. The version of the data published by the NPRI may not be identical to that used in the APEI because of additions and corrections to point source data for inventory reporting.

Only the most significant sources of black carbon have been reported, representing approximately 90% of the anthropogenic black carbon emissions in Canada. Expected improvements to the inventory include the development of estimation methods for prescribed burning, and the inclusion of diesel engine use for electricity in remote locations. For more information planned improvements to the inventory, consult section 2.4 of [Canada's Black Carbon Emission Inventory](#).

Part 3. Annexes

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

Table A.1. Data for Figure 1. Air pollutant emissions, Canada, 1990 to 2014

Year	Sulphur oxides (annual emissions as percent of 1990 levels)	Nitrogen oxides (annual emissions as percent of 1990 levels)	Volatile organic compounds (annual emissions as percent of 1990 levels)	Ammonia (annual emissions as percent of 1990 levels)	Carbon monoxide (annual emissions as percent of 1990 levels)	Fine particulate matter (annual emissions as percent of 1990 levels)
1990	0	0	0	0	0	0
1991	-7	-4	-4	-1	-5	-2
1992	-11	-4	-5	2	-7	-5
1993	-14	-4	-6	4	-9	-5
1994	-20	-1	-7	7	-11	-3
1995	-17	-2	-9	12	-15	-7
1996	-16	-2	-10	16	-19	-8
1997	-18	0	-15	18	-24	-6
1998	-20	0	-17	18	-28	-13
1999	-23	-1	-20	18	-31	-13
2000	-22	-3	-23	21	-35	-15
2001	-23	-6	-30	21	-40	-17
2002	-25	-7	-31	25	-41	-20
2003	-26	-8	-33	23	-41	-20
2004	-27	-12	-34	26	-44	-19
2005	-29	-14	-38	26	-48	-22
2006	-36	-18	-40	23	-51	-21
2007	-38	-18	-42	24	-53	-18
2008	-44	-21	-42	21	-54	-14
2009	-52	-27	-47	17	-56	-20
2010	-56	-24	-47	15	-57	-15
2011	-59	-26	-51	15	-60	-13
2012	-60	-30	-50	19	-62	-8
2013	-61	-32	-50	22	-62	-9
2014	-63	-33	-50	21	-62	-9

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.2. Data for Figure 2. Distribution of air pollutant emissions by source, Canada, 201

Source	Sulfur oxides (percentage of national emissions)	Nitrogen oxides (percentage of national emissions)	Volatile organic compounds (percentage of national emissions)	Ammonia (percentage of national emissions)	Carbon monoxide (percentage of national emissions)	Fine particulate matter (percentage of national emissions)
Oil and gas industry	23.8	23.2	34.0	0.6	8.2	0.6
Other industries	47.3	8.9	5.7	2.6	10.7	2.9
Transportation (road, rail, air, marine)	3.2	42.1	9.3	1.6	32.6	1.5
Off-road vehicles	<0.1	12.6	10.3	0.1	26.0	1.3
Fuel for electricity and heating	24.4	11.6	0.2	0.3	1.1	0.5
Home firewood burning	0.2	1.0	10.7	0.4	18.8	9.1
Incineration and miscellaneous	0.2	0.1	2.5	0.2	0.1	0.5
Paints and solvents	n/a	n/a	14.6	0.9	n/a	<0.1
Agriculture (livestock, crop production and fertilizer)	0.8	0.2	11.7	93.4	<0.1	19.8
Open sources	0.2	0.4	1.0	0.9	2.6	63.8

Note: The indicator only reports air pollutant emissions from human-related sources. n/a = not available.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.3. Data for Figure 3. Distribution of air pollutant emissions by province and territory, Canada, 2014

Province or territory	Sulphur oxides (percent of national emissions)	Nitrogen oxides (percent of national emissions)	Volatile organic compounds (percent of national emissions)	Ammonia (percent of national emissions)	Carbon monoxide (percent of national emissions)	Fine particulate matter (percent of national emissions)
Newfoundland and Labrador	2.2	3.3	3.1	0.2	4.4	1.2

Province or territory	Sulphur oxides (percent of national emissions)	Nitrogen oxides (percent of national emissions)	Volatile organic compounds (percent of national emissions)	Ammonia (percent of national emissions)	Carbon monoxide (percent of national emissions)	Fine particulate matter (percent of national emissions)
Prince Edward Island	0.1	0.3	0.4	0.5	0.6	0.4
Nova Scotia	6.6	3.8	2.0	0.7	2.7	1.7
New Brunswick	1.9	1.9	1.5	0.7	2.4	1.5
Quebec	10.8	12.0	14.3	14.2	26.7	12.6
Ontario	22.7	16.4	18.1	17.9	23.4	16.9
Manitoba	13.9	3.1	4.2	12.0	3.7	5.0
Saskatchewan	9.3	8.2	12.9	20.4	4.9	19.3
Alberta	25.5	35.3	34.7	29.5	19.1	36.3
British Columbia	6.9	14.3	8.1	3.8	11.2	4.9
Yukon	<0.1	0.1	0.1	<0.1	0.2	0.1
Northwest Territories and Nunavut	0.1	1.0	0.5	<0.1	0.7	0.2

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.4. Data for Figure 4. Sulphur oxide emissions, Canada, 1990 to 2014

Year	Sulphur oxides (annual national emissions in kilotonnes)
1990	3105.5
1991	2884.1
1992	2761.6
1993	2682.8
1994	2474.7
1995	2589.9
1996	2596.0
1997	2550.6
1998	2497.8
1999	2403.8
2000	2409.7
2001	2396.1

Year	Sulphur oxides (annual national emissions in kilotonnes)
2002	2344.3
2003	2291.7
2004	2262.6
2005	2192.7
2006	1999.0
2007	1938.5
2008	1751.9
2009	1481.0
2010	1373.0
2011	1277.7
2012	1242.0
2013	1206.3
2014	1142.5

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.5. Data for Figure 5. Sulphur oxide emissions by source, Canada, 1990 to 2014

Year	Non-ferrous smelting and refining (emissions in kilotonnes)	Fuel for electricity and heating (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Other industries (emissions in kilotonnes)	Other sources (emissions in kilotonnes)
1990	1272.1	664.8	533.8	437.5	197.0
1991	1119.4	627.7	535.5	410.2	191.4
1992	973.9	646.5	574.7	374.1	192.3
1993	895.1	586.6	604.9	393.3	202.9
1994	681.3	593.4	598.3	390.0	211.6
1995	888.9	557.0	593.7	366.3	184.0
1996	878.3	569.7	590.6	372.9	184.4
1997	821.1	618.8	547.1	373.7	189.9
1998	830.8	631.4	513.1	346.8	175.8
1999	770.1	628.6	509.2	318.7	177.2
2000	763.5	649.7	504.4	311.3	180.8
2001	757.7	656.0	489.0	306.8	186.6

Year	Non-ferrous smelting and refining (emissions in kilotonnes)	Fuel for electricity and heating (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Other industries (emissions in kilotonnes)	Other sources (emissions in kilotonnes)
2002	754.8	644.0	453.3	306.7	185.4
2003	655.6	670.6	475.0	321.3	169.3
2004	703.0	591.0	468.1	335.1	165.3
2005	683.1	557.8	464.6	321.5	165.7
2006	668.9	483.3	437.5	261.1	148.2
2007	623.7	519.7	406.9	247.5	140.7
2008	570.1	445.9	382.3	219.6	134.0
2009	401.3	399.1	372.1	179.3	129.1
2010	372.6	347.7	339.4	186.2	127.1
2011	333.4	309.3	333.1	191.2	110.7
2012	342.3	300.4	321.6	186.7	91.0
2013	370.0	287.1	305.3	171.8	72.0
2014	373.0	277.8	271.3	167.5	52.7

Note: The indicator only reports air pollutant emissions from human-related sources. The source "Other industries" does not include SO_x emissions from non-ferrous smelting and refining, as it is presented for the purpose of this chart as a stand-alone source. "Other sources" include off-road vehicles, home firewood burning, incineration and miscellaneous, transportation (road, rail, air and marine), and open sources (e.g., landfills). Consult Table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.6. Data for Figure 6. Sulphur oxide emissions by province and territory, Canada, 1990, 2000 and 2014

Province or territory	1990 (emissions in kilotonnes)	2000 (emissions in kilotonnes)	2014 (emissions in kilotonnes)
Newfoundland and Labrador	79.5	65.6	25.5
Prince Edward Island	4.1	2.5	0.7
Nova Scotia	214.0	201.7	75.5
New Brunswick	109.9	123.4	22.0
Quebec	266.4	324.0	123.7
Ontario	1149.9	594.3	259.1
Manitoba	510.4	362.7	158.4
Saskatchewan	100.6	121.5	106.2
Alberta	522.5	492.3	291.1

Province or territory	1990 (emissions in kilotonnes)	2000 (emissions in kilotonnes)	2014 (emissions in kilotonnes)
British Columbia	127.9	117.4	78.5
Yukon	1.1	0.6	<0.1
Northwest Territories and Nunavut	19.3	3.5	1.7

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.7. Data for Figure 7. Nitrogen oxide emissions, Canada, 1990 to 2014

Year	Nitrogen oxides (annual national emissions in kilotonnes)
1990	2852.1
1991	2727.4
1992	2742.0
1993	2737.4
1994	2811.8
1995	2800.3
1996	2785.9
1997	2859.1
1998	2838.3
1999	2828.8
2000	2778.6
2001	2687.6
2002	2644.2
2003	2637.0
2004	2506.3
2005	2450.4
2006	2351.1
2007	2341.3
2008	2258.7
2009	2086.4
2010	2162.4
2011	2106.0
2012	1988.6

Year	Nitrogen oxides (annual national emissions in kilotonnes)
2013	1938.4
2014	1922.5

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.8. Data for Figure 8. Nitrogen oxide emissions by source, Canada, 1990 to 2014

Year	Transportation (road, rail, air, marine) (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Off-road vehicles (emissions in kilotonnes)	Fuel for electricity and heating (emissions in kilotonnes)	Other sources (emissions in kilotonnes)
1990	1420.2	320.9	436.1	310.8	364.1
1991	1337.4	312.7	421.2	304.7	351.4
1992	1331.5	325.6	423.6	315.9	345.4
1993	1300.5	348.6	436.7	297.6	353.9
1994	1333.2	378.7	443.5	293.9	362.5
1995	1275.1	393.4	466.0	303.8	362.1
1996	1202.2	403.9	492.7	329.0	358.2
1997	1206.9	445.9	501.3	344.6	360.4
1998	1218.5	455.6	450.8	358.3	355.1
1999	1197.5	472.9	445.4	356.5	356.4
2000	1212.0	418.0	423.5	371.8	353.4
2001	1217.4	412.0	361.1	357.7	339.4
2002	1158.3	410.4	352.2	364.8	358.5
2003	1109.2	463.3	364.0	353.0	347.6
2004	1081.3	397.1	372.0	321.6	334.2
2005	1067.3	396.4	363.0	309.3	314.4
2006	1035.5	417.2	339.2	283.7	275.4
2007	1008.4	429.4	345.1	302.2	256.2
2008	965.5	439.1	336.8	287.2	230.1
2009	870.4	440.6	314.8	258.2	202.4
2010	881.9	434.2	346.0	290.2	210.1
2011	872.4	448.7	313.2	260.5	211.1
2012	853.0	440.0	270.3	222.2	203

Year	Transportation (road, rail, air, marine) (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Off-road vehicles (emissions in kilotonnes)	Fuel for electricity and heating (emissions in kilotonnes)	Other sources (emissions in kilotonnes)
2013	826.5	437.1	254.2	218.7	201.8
2014	807.3	445.9	241.9	223.4	203.9

Note: The indicator only reports air pollutant emissions from human-related sources. "Other sources" include home firewood burning, incineration and miscellaneous, other industries, and open sources (e.g., landfills). Consult table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.9. Data for Figure 9. Nitrogen oxide emissions by province and territory, Canada, 1990, 2000 and 2014

Province or territory	1990 (emissions in kilotonnes)	2000 (emissions in kilotonnes)	2014 (emissions in kilotonnes)
Newfoundland and Labrador	100.7	80.2	63.8
Prince Edward Island	12.5	9.7	5.6
Nova Scotia	98.8	101.3	72.4
New Brunswick	80.2	75.3	36.2
Quebec	402.4	367.5	229.8
Ontario	748.2	670.0	315.7
Manitoba	110.8	95.2	58.8
Saskatchewan	248.2	241.0	158.2
Alberta	721.9	788.4	685.0
British Columbia	299.6	324.6	275.8
Yukon	5.3	3.2	1.9
Northwest Territories and Nunavut	23.4	22.2	19.1

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.10. Data for Figure 10. Volatile organic compound emissions, Canada, 1990 to 2014

Year	Volatile organic compounds (annual national emissions in kilotonnes)
1990	4303.9
1991	4123.6

Year	Volatile organic compounds (annual national emissions in kilotonnes)
1992	4081.6
1993	4034.5
1994	3990.9
1995	3912.4
1996	3852.8
1997	3667.8
1998	3588.4
1999	3442.3
2000	3308.7
2001	2995.2
2002	2962.5
2003	2887.8
2004	2823.4
2005	2657.9
2006	2572.4
2007	2516.8
2008	2481.7
2009	2283.4
2010	2288.5
2011	2124.4
2012	2133.4
2013	2144.2
2014	2156.7

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.11. Data for Figure 11. Volatile organic compound emissions by source, Canada, 1990 to 2014

Year	Oil and gas industry (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Off-road vehicles (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Transportation (road, rail, air, marine) (emissions in kilotonnes)
1990	585.7	319.9	222.4	356.5	1658.8	421.1	739.5

Year	Oil and gas industry (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Off-road vehicles (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Transportation (road, rail, air, marine) (emissions in kilotonnes)
1991	580.8	314.7	225.7	351.4	1537.0	419.1	694.8
1992	595.1	317.5	232.7	335.9	1534.7	401.9	663.9
1993	621.7	316.0	234.7	352.1	1452.4	440.0	617.6
1994	634.9	324.7	242.1	358.4	1404.5	437.8	588.5
1995	647.0	336.3	256.5	342.1	1374.0	425.9	530.6
1996	674.9	334.3	265.5	338.4	1334.0	416.3	489.3
1997	664.9	333.4	264.2	322.6	1216.6	404.7	461.5
1998	677.5	332.0	260.7	342.0	1128.7	415.8	431.8
1999	637.2	339.6	255.4	325.0	1047.7	414.6	422.9
2000	654.2	346.7	266.2	313.6	917.6	404.7	405.7
2001	662.4	326.1	266.2	289.7	666.7	377.7	406.4
2002	669.2	318.6	266.2	313.2	634.6	373.6	387.0
2003	670.0	323.3	274.1	269.5	598.1	367.8	385.1
2004	657.7	321.1	274.1	261.5	603.8	331.7	373.6
2005	659.0	324.4	274.0	246.3	493.3	321.1	339.8
2006	659.8	320.2	291.1	237.7	474.0	277.3	312.3
2007	654.0	324.0	291.2	234.9	454.9	255.7	302.2
2008	662.2	321.8	312.8	235.3	424.8	237.5	287.4
2009	623.6	289.2	257.3	224.3	407.2	214.3	267.6
2010	628.2	304.7	251.8	235.9	394.5	215.9	257.5
2011	623.0	293.9	251.8	235.2	271.8	213.4	235.3
2012	680.7	297.9	251.8	234.4	236.9	210.9	220.7
2013	720.5	303.1	251.8	233.0	219.3	206.0	210.3
2014	734.1	314.0	251.8	231.5	222.0	203.1	200.3

Note: The indicator only reports air pollutant emissions from human-related sources. For the purpose of this chart "Agriculture", an open source, is being presented as a stand-alone source. "Other sources" include fuel for electricity and heating, incineration and miscellaneous, open sources (e.g., landfills), and other industries. Consult table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.12. Data for Figure 12. Volatile organic compound emissions by province and territory, Canada, 1990, 2000 and 2014

Province or territory	1990 (emissions in kilotonnes)	2000 (emissions in kilotonnes)	2014 (emissions in kilotonnes)
Newfoundland and Labrador	457.8	279.5	67.2
Prince Edward Island	50.5	27.7	8.8
Nova Scotia	75.9	63.3	42.3
New Brunswick	60.1	51.0	33.3
Quebec	588.8	495.1	308.3
Ontario	1034.6	758.1	391.4
Manitoba	283.9	181.3	91.4
Saskatchewan	348.1	316.0	278.5
Alberta	803.6	750.0	747.9
British Columbia	371.9	275.1	174.1
Yukon	30.1	14.7	2.8
Northwest Territories and Nunavut	198.6	96.9	10.8

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.13. Data for Figure 13. Ammonia emissions, Canada, 1990 to 2014

Year	Ammonia (annual national emissions in kilotonnes)
1990	400.6
1991	398.0
1992	410.3
1993	414.6
1994	429.2
1995	447.0
1996	464.1
1997	471.5
1998	472.5
1999	472.3
2000	485.3
2001	486.7
2002	499.6

Year	Ammonia (annual national emissions in kilotonnes)
2003	493.1
2004	506.5
2005	503.5
2006	493.1
2007	495.5
2008	484.3
2009	469.0
2010	462.1
2011	460.3
2012	475.5
2013	487.7
2014	484.3

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.14. Data for Figure 14. Ammonia emissions by source, Canada, 1990 to 2014

Year	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Industry (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Transportation (road, rail, air, marine) (emissions in kilotonnes)
1990	358.8	22.6	12.1	7.1
1991	356.6	21.7	12.0	7.7
1992	368.8	21.9	11.7	7.9
1993	371.7	21.5	12.3	9.1
1994	384.1	23.1	12.2	9.7
1995	402.8	22.1	12.0	10.1
1996	418.2	23.9	11.7	10.3
1997	424.6	24.4	11.5	11.0
1998	425.1	24.4	11.5	11.6
1999	423.8	25.1	11.2	12.3
2000	434.4	27.1	11.4	12.4
2001	439.2	24.2	10.3	13.0

Year	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Industry (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Transportation (road, rail, air, marine) (emissions in kilotonnes)
2002	443.3	32.5	11.1	12.7
2003	449.6	22.0	9.2	12.2
2004	464.6	21.7	8.4	11.8
2005	462.0	21.5	8.9	11.1
2006	454.4	20.4	7.7	10.6
2007	458.1	18.9	8.1	10.3
2008	448.7	17.4	8.5	9.7
2009	435.4	16.0	8.3	9.3
2010	428.7	15.5	8.8	9.2
2011	427.3	15.4	9	8.7
2012	443.7	15.2	8.3	8.4
2013	457.1	13.8	8.8	8.1
2014	452.2	15.4	8.8	7.9

Note: The indicator only reports air pollutant emissions from human-related sources. The source "Other sources" does not include NH₃ emissions from agriculture, as it is presented for the purpose of this chart as a stand-alone source. "Other sources" include home firewood burning, off-road vehicles, fuel for electricity and heating, incineration and miscellaneous and other open sources (such as waste). Industry includes the oil and gas industry and other industries. Consult table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.15. Data for Figure 15. Ammonia emissions by province and territory, Canada, 1990, 2000 and 2014

Province or territory	1990 (emissions in kilotonnes)	2000 (emissions in kilotonnes)	2014 (emissions in kilotonnes)
Newfoundland and Labrador	1.2	1.2	0.8
Prince Edward Island	3.5	3.5	2.5
Nova Scotia	5.0	4.9	3.6
New Brunswick	4.6	4.6	3.5
Quebec	68.3	72.4	68.8
Ontario	107.8	105.0	86.6
Manitoba	39.0	54.0	58.0
Saskatchewan	50.1	73.8	98.9
Alberta	97.8	142.1	143.1

British Columbia	23.2	23.6	18.4
Yukon	<0.1	<0.1	<0.1
Northwest Territories and Nunavut	0.1	0.1	<0.1

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.16. Data for Figure 16. Carbon monoxide emissions, Canada, 1990 to 2014

Year	Carbon monoxide (annual national emissions in kilotonnes)
1990	16 740.4
1991	15 981.6
1992	15 573.6
1993	15 277.7
1994	14 833.0
1995	14 159.1
1996	13 500.0
1997	12 653.8
1998	12 039.6
1999	11 611.2
2000	10 909.0
2001	10 007.8
2002	9813.0
2003	9808.6
2004	9314.3
2005	8658.9
2006	8228.5
2007	7851.6
2008	7708.6
2009	7358.5
2010	7240.3
2011	6671.8
2012	6398.6
2013	6279.3
2014	6380.8

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.17. Data for Figure 17. Carbon monoxide emissions by source, Canada, 1990 to 2014

Year	Transportation (road, rail, air, marine) (emissions in kilotonnes)	Off-road vehicles (emissions in kilotonnes)	Industry (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Other sources (emissions in kilotonnes)
1990	7519.8	4941.2	2064.2	1660.4	554.7
1991	7034.1	4593.4	2107.7	1636.4	610.0
1992	6843.4	4603.9	2138.0	1564.8	423.6
1993	6482.5	4389.8	2178.8	1637.9	588.8
1994	6118.4	4288.7	2201.3	1668.5	556.1
1995	5524.6	4245.3	2223.3	1593.1	572.9
1996	5166.7	4197.9	2140.8	1573.8	420.8
1997	4914.9	3893.0	2088.2	1502.7	255.0
1998	4473.0	3701.7	2031.1	1597.0	236.9
1999	4344.7	3523.0	1981.3	1521.8	240.4
2000	4137.6	3219.8	1900.1	1472.7	178.9
2001	4071.3	2569.1	1830.8	1364.1	172.4
2002	3812.2	2575.0	1791.5	1482.7	151.6
2003	3834.0	2544.1	1740.4	1278.9	411.2
2004	3695.1	2639.1	1592.8	1247.9	139.5
2005	3437.2	2345.8	1529.2	1180.0	166.7
2006	3191.3	2361.6	1374.8	1144.8	156.0
2007	2933.6	2297.3	1349.2	1146.8	124.8
2008	2831.5	2194.4	1325.3	1161.2	196.3
2009	2668.0	2104.5	1249.5	1121.1	215.4
2010	2543.2	2084.7	1268.2	1193.9	150.2
2011	2280.6	1768.4	1241.5	1204.2	177.1
2012	2162.9	1591.2	1255.4	1213.9	175.2
2013	2111.5	1566.2	1273.1	1206.3	122.1
2014	2078.2	1658.5	1206.4	1198.2	239.5

Note: The indicator only reports air pollutant emissions from human-related sources. "Other sources" include fuel for electricity and heating, incineration and miscellaneous and open sources (e.g., landfills). "Industry" includes the oil and gas industry and other industries. Consult table 1 in the [Source classification section](#) for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.18. Data for Figure 18. Carbon monoxide emissions by province and territory, Canada, 1990, 2000 and 2014

Province or territory	1990 (emissions in kilotonnes)	2000 (emissions in kilotonnes)	2014 (emissions in kilotonnes)
Newfoundland and Labrador	1514.4	839.0	279.4
Prince Edward Island	155.4	83.3	35.8
Nova Scotia	314.4	216.8	172.6
New Brunswick	329.3	214.9	150.8
Quebec	2998.0	2265.1	1701.2
Ontario	4001.6	2730.1	1494.0
Manitoba	933.6	553.5	238.1
Saskatchewan	1155.3	695.0	314.9
Alberta	2404.8	1646.9	1219.3
British Columbia	2343.0	1375.2	717.7
Yukon	90.0	43.3	12.8
Northwest Territories and Nunavut	500.4	245.9	44.1

Note: The indicator only reports air pollutant emissions from human-related sources.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.19. Data for Figure 19. Fine particulate matter emissions, Canada, 1990 to 2014

Year	Open sources (annual national emissions in kilotonnes)	Other sources (excluding open sources) (annual national emissions in kilotonnes)
1990	1327.4	647.3
1991	1314.7	616.2
1992	1276.4	594.3
1993	1274.7	600.4
1994	1318.4	603.6
1995	1248.0	585.9
1996	1251.6	571.0
1997	1303.1	552.4
1998	1166.0	550.5
1999	1188.0	529.3
2000	1162.5	513.8

Year	Open sources (annual national emissions in kilotonnes)	Other sources (excluding open sources) (annual national emissions in kilotonnes)
2001	1168.5	465.8
2002	1128.0	455.5
2003	1158.8	415.0
2004	1137.6	399.3
2005	1154.5	383.2
2006	1203.2	348.7
2007	1279.6	343.3
2008	1370.8	336.9
2009	1272.8	314.0
2010	1360.6	327.3
2011	1409.0	314.9
2012	1505.1	304.8
2013	1498.7	299.2
2014	1504.5	295.0

Note: The indicator only reports air pollutant emissions from human-related sources. Open sources are shown separately in the chart to provide a picture of their impact on national PM_{2.5} emissions.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.20. Data for Figure 20. Fine particulate matter emissions by source, excluding open sources, Canada, 1990 to 2014

Year	Home firewood burning (emissions in kilotonnes)	Other industries (emissions in kilotonnes)	Transportation (road,rail, air, marine) (emissions in kilotonnes)	Off-road vehicles (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Incineration and miscellaneous (emissions in kilotonnes)	Fuel for electricity and heating (emissions in kilotonnes)
1990	262.1	174.8	62.8	73.4	11.8	9.9	52.6
1991	258.4	160.6	59.0	69.3	11.6	9.9	47.6
1992	247.0	154.8	56.5	69.2	11.7	10.2	44.8
1993	258.5	155.3	57.4	69.8	12.3	10.4	36.8
1994	263.1	156.9	60.7	69.9	13.0	10.8	29.2
1995	251.2	158.2	55.7	71.3	13.5	10.6	25.2
1996	248.0	151.1	49.8	74.2	13.6	10.4	23.8
1997	234.8	144.9	49.4	74.0	14.0	10.5	24.7
1998	247.0	136.6	49.1	67.5	15.4	10.9	23.9

Year	Home firewood burning (emissions in kilotonnes)	Other industries (emissions in kilotonnes)	Transportation (road,rail, air, marine) (emissions in kilotonnes)	Off-road vehicles (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Incineration and miscellaneous (emissions in kilotonnes)	Fuel for electricity and heating (emissions in kilotonnes)
1999	232.9	134.5	45.6	65.8	13.3	11.3	25.9
2000	223.2	131.8	46.4	60.8	12.9	11.2	27.5
2001	204.2	116.8	47.3	49.7	12.9	11.3	23.6
2002	219.2	99.1	45.9	47.3	13.3	11.3	19.4
2003	186.4	96.7	45.9	47.0	12.6	10.5	15.9
2004	179.2	90.1	46.6	47.1	11.7	10.5	14.1
2005	166.8	89.5	47.7	43.4	12.0	10.0	13.7
2006	158.8	71.0	45.9	40.4	12.1	9.8	10.7
2007	158.5	67.3	44.1	40.3	11.2	10.0	11.9
2008	160.3	63.3	42.5	39.1	10.1	9.6	11.8
2009	154.4	53.9	39.1	36.6	9.6	9.7	10.6
2010	163.8	56.2	39.2	39.2	9.3	9.5	10.2
2011	164.8	54.8	36.1	31.1	9.5	9.4	9.2
2012	165.8	53.0	33.0	26.5	9.4	9.4	7.7
2013	164.7	53.3	30.0	24.3	9.8	9.3	7.8
2014	163.6	52.4	27.6	22.9	10.7	9.3	8.6

Note: The indicator only reports air pollutant emissions from human-related sources. Open sources of PM_{2.5}, which account for 84% of the PM_{2.5} emissions, have been removed from the analysis. Consult [the Data Sources and Methods](#) for more details.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.21. Data for Figure 21. Fine particulate matter emissions, excluding open sources, by province and territory, Canada, 1990, 2000 and 2014

Province or territory	1990 (emissions in kilotonnes)	2000 (emissions in kilotonnes)	2014 (emissions in kilotonnes)
Newfoundland and Labrador	26.1	22.3	9.4
Prince Edward Island	4.0	3.0	2.5
Nova Scotia	24.4	22.5	14.4
New Brunswick	23.0	18.1	9.9
Quebec	158.8	152.4	96.5
Ontario	161.9	131.8	75.3
Manitoba	21.5	16.6	8.7

Province or territory	1990 (emissions in kilotonnes)	2000 (emissions in kilotonnes)	2014 (emissions in kilotonnes)
Saskatchewan	35.3	37.2	13.1
Alberta	82.4	48.9	33.3
British Columbia	104.2	57.8	30.9
Yukon	0.8	0.4	0.1
Northwest Territories and Nunavut	4.9	2.8	0.9

Note: The indicator only reports air pollutant emissions from human-related sources. Open sources of PM_{2.5}, which account for 84% of the PM_{2.5} emissions, have been removed from the analysis. Consult the [Data Sources and Methods](#) for more details.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.22. Data for Figure 22. Particulate matter emissions, Canada, 1990 to 2014

Year	Total particulate matter (emissions in kilotonnes)	Respirable particulate matter (emissions in kilotonnes)	Fine particulate matter (emissions in kilotonnes)
1990	1368.9	818.9	647.3
1991	1301.0	777.4	616.2
1992	1245.5	750.4	594.3
1993	1234.6	752.6	600.4
1994	1244.7	756.6	603.6
1995	1220.0	726.3	585.9
1996	1208.7	715.3	571.0
1997	1187.4	701.3	552.4
1998	1177.4	700.3	550.5
1999	1151.1	684.7	529.3
2000	1111.3	669.2	513.8
2001	999.5	599.6	465.8
2002	951.4	566.6	455.5
2003	878.6	517.6	415.0
2004	844.8	499.2	399.3
2005	829.1	481.6	383.2
2006	761.2	440.7	348.7
2007	747.9	438.0	343.3
2008	730.1	426.5	336.9

Year	Total particulate matter (emissions in kilotonnes)	Respirable particulate matter (emissions in kilotonnes)	Fine particulate matter (emissions in kilotonnes)
2009	692.9	400.7	314.0
2010	754.7	428.0	327.3
2011	748.6	414.3	314.9
2012	707.1	395.1	304.8
2013	679.3	387.9	299.2
2014	664.8	382.2	295.0

Note: The indicator only reports air pollutant emissions from human-related sources. Open sources of PM_{2.5}, which account for 84% of the PM_{2.5} emissions, have been removed from the analysis. Consult the [Data Sources and Methods](#) for more details.

Source: Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory](#).

Table A.23. Data for Figure 23. Black carbon emissions by source, Canada, 2014

Source	2014 (emissions in kilotonnes)
Off-road vehicles	14.0
Transportation (road, rail, air, marine)	12.4
Home firewood burning	12.0
Oil and gas industry	2.7
Fuel for electricity and heating	1.2
Other industries	0.9

Note: The chart includes emissions from the most significant sources of black carbon. Consult [the Data Sources and Methods](#) for more details.

Source: Environment and Climate Change Canada (2016) [Canada's Black Carbon Emission Inventory](#).

Annex B. References and additional information

References and further reading

Environment and Climate Change Canada (2016) [Air Pollutant Emission Inventory Report 1990–2014](#). Retrieved on February 15, 2016.

Environment and Climate Change Canada (2016) [Canada's Black Carbon Emission Inventory](#). Retrieved on February 15, 2016.

Environment and Climate Change Canada (2016) [Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants \(SLCPs\)](#). Retrieved on January 4, 2016

Environment and Climate Change Canada (2016) [Guide for Using and Interpreting National Pollutant Release Inventory Data](#). Retrieved on January 4, 2016.

Environment and Climate Change Canada (2014) [National Pollutant Release Inventory Database](#). Retrieved on February 15, 2016.

Environment and Climate Change Canada (2015) [National Pollutant Release Inventory – Pollution Data and Reports](#). Retrieved on January 4, 2016.

Related information

[Air Pollutant Emissions Data Online Data Search](#)

[Air Pollutant Emissions from the Transportation Sector](#)

[Air Pollutant Emissions from the Electricity Sector](#)

[Air Pollutant Emissions from the Oil and Gas Sector](#)

[Drivers and Impacts of Air Pollution](#)

[International Comparison of Air Pollutant Emissions](#)

www.ec.gc.ca

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