



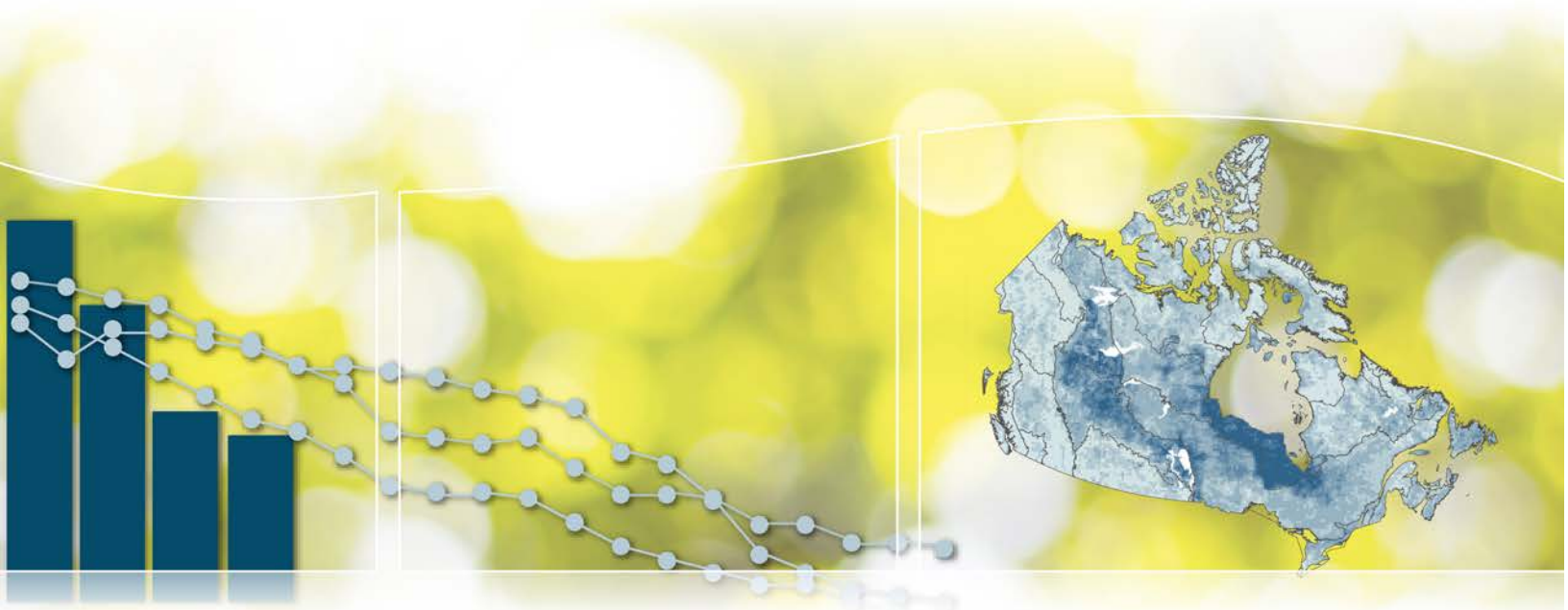
Environment and
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Canadian Environmental Sustainability Indicators

Air pollutant emissions



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Canadian Environmental Sustainability Indicators

Air pollutant emissions

August 2017

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Air pollutant emissions indicator

Air pollution problems, such as smog and acid rain, result from the release of pollutants into the atmosphere. The majority of these pollutants come from human activities, such as transportation, the burning of fuels for electricity and heating, and industry. They are also released from natural sources, such as forest fires and from vegetation.

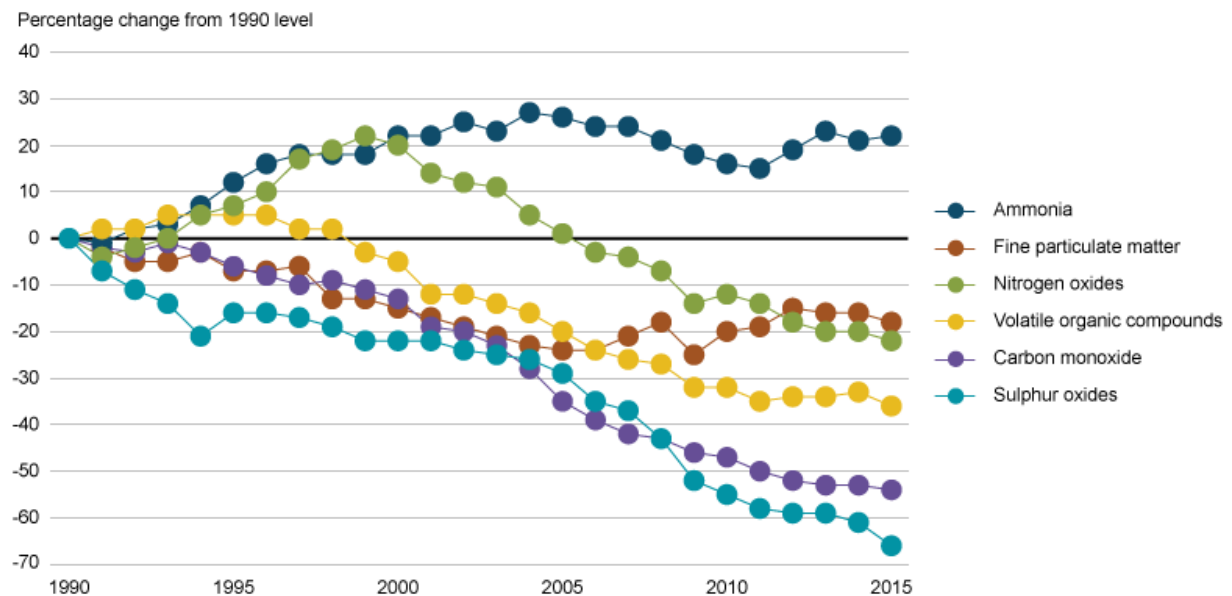
Summary

The indicators report emissions released through human activities for 6 key air pollutants. For each pollutant, indicators are provided at the national and regional level, and by source. Facility-level emissions are also provided through an [interactive map](#).

Key results

- In 2015, emissions of 5 key air pollutants (sulphur oxides [SO_x], nitrogen oxides [NO_x], volatile organic compounds [VOCs], carbon monoxide [CO] and fine particulate matter [PM_{2.5}]) were 66% to 18% lower than in 1990.
- Emission levels of ammonia (NH₃) were 22% higher than in 1990.

Figure 1. Air pollutant emissions, Canada, 1990 to 2015



[Data for Figure 1](#)

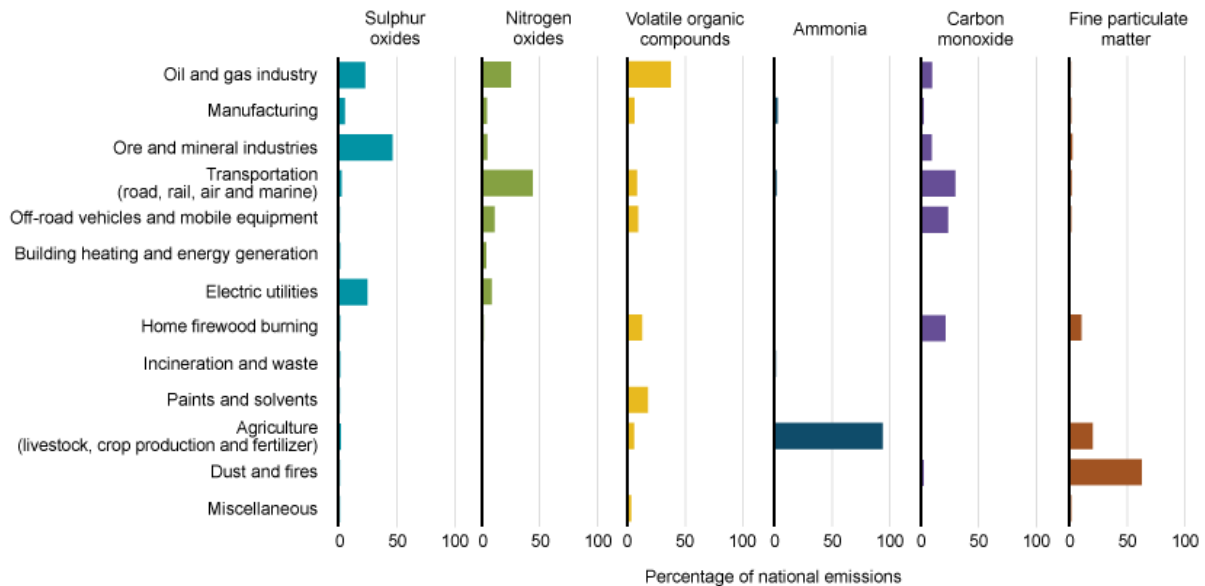
Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Between 1990 and 2015, the largest emissions reductions were observed for SO_x, which decreased by 66%. It was followed by CO emissions (54% reduction), VOCs (36%), NO_x (22%) and PM_{2.5} (18%). These reductions since 1990 are due in part to government actions and voluntary initiatives from key industrial emitters that were put in place to restrict or eliminate the release of air pollutants in Canada. These actions have achieved reductions in air pollution through various regulations, industry actions and technical improvements for key sources.

In 2015, the majority of emissions of the 6 key air pollutants in Canada came from ore and mineral industries, [transportation](#), the [oil and gas industry](#), agriculture, and dust and fires (for example, road dust, prescribed forest burning).

Figure 2. Distribution of air pollutant emissions by source, Canada, 2015



[Data for Figure 2](#)

Note: The indicator reports air pollutant emissions from human activities only.

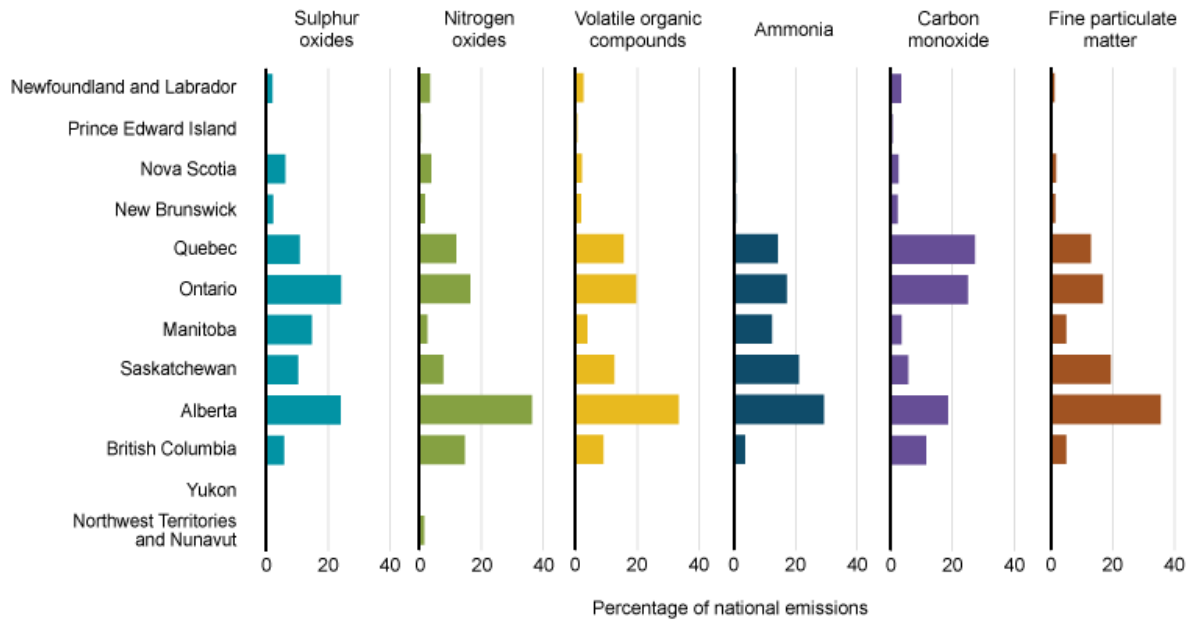
Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

The sources responsible for the majority of Canada's air pollutant emissions in 2015 were the following:

- ore and mineral industries were responsible for the majority of SO_x emissions
- transportation (road, rail, air and marine) was the main source of NO_x and CO emissions (off-road vehicles and mobile equipment were also important sources of NO_x and CO emissions)
- most of the VOC emissions came from the oil and gas industry and from the use of paints and solvents
- agriculture (livestock, crop production and fertilizer) accounted for the majority of NH₃ emissions
- dust (for example, from unpaved roads and construction operations) and fires were the most important sources of for PM_{2.5} emissions

The provinces of Quebec, Ontario and Alberta accounted for more than 55% of Canada's total emissions of the 6 key air pollutants in 2015.

Figure 3. Distribution of air pollutant emissions by province and territory, Canada, 2015



[Data for Figure 3](#)

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

In 2015, emissions of the 6 key air pollutants were highest in Alberta, Ontario and Quebec.

- Alberta had the highest NO_x (36% of Canadian emissions), VOCs (33%), NH₃ (29%) and PM_{2.5} (36%) emissions
- Ontario had the highest SO_x emissions (24%)
- Quebec had the highest CO emissions (27%)

Saskatchewan was also an important emitter of NH₃ and PM_{2.5}, accounting for about 20% of Canadian emissions of these pollutants.

Consult [Air pollution: drivers and impacts](#) for information on the impacts of air pollution on health, the economy and the environment, as well as information on the federal regulations administered under the Canadian Environmental Protection Act (1999) addressing air pollution.

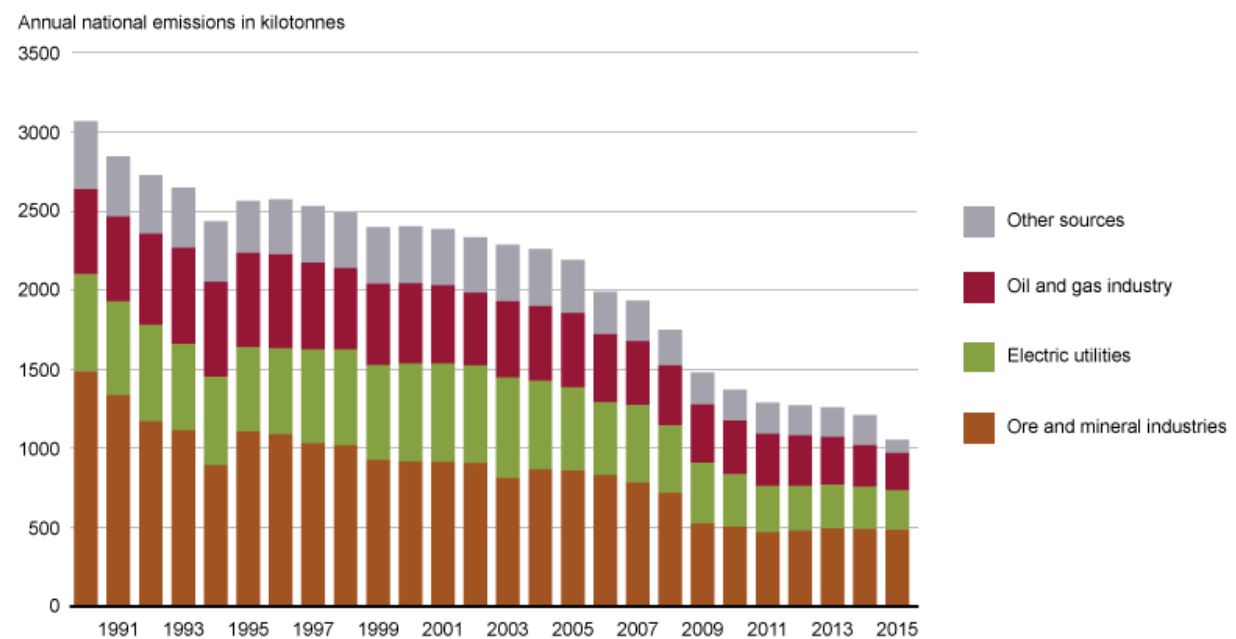
Sulphur oxides

Emissions of [sulphur oxides](#) (SO_x) in the atmosphere can have adverse effects on human health and the environment. The SO_x emissions released by human activities consist mostly of sulphur dioxides (SO₂). Sulphur dioxide can affect respiratory systems of humans and animals and cause damage to vegetation, buildings and materials. It is also a precursor to fine particulate matter (PM_{2.5}) and acid rain.

Key results

- Between 1990 and 2015, SO_x emissions decreased by 66% to 1054 kilotonnes (kt) in 2015.
- In 2015, the largest proportion of SO_x emissions came from ore and mineral industries. The source represented 46% of total emissions.

Figure 4. Total sulphur oxide emissions by source, Canada, 1990 to 2015



[Data for Figure 4](#)

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from transportation (road, rail, air and marine), off-road vehicles and mobile equipment, home firewood burning, incineration and waste, agriculture (livestock, crop production and fertilizer), dust and fires, paints and solvents, building heating and energy generation, manufacturing, and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

In 2015, the non-ferrous smelting and refining industry accounted for 76% (365 kt) of SO_x emissions from the ore and mineral industries, the main contributor to total national emissions. Emissions from [electric utilities](#) and the [oil and gas industry](#) emitted the next largest proportions of total national emissions, representing 24% (252 kt) and 22% (234 kt).

The largest reduction in emissions between 1990 and 2015 was from ore and mineral industries (the largest driver of the reduction was from the non-ferrous smelting and refining industry), with an emissions reduction of 1001 kt.

This significant decrease in SO_x emissions from 1990 to 2015 is due in large part to government actions to fight acid rain and related federal-provincial and United States agreements^{1,2} on capping SO_x emissions by 1994. Further reductions were also realized through:

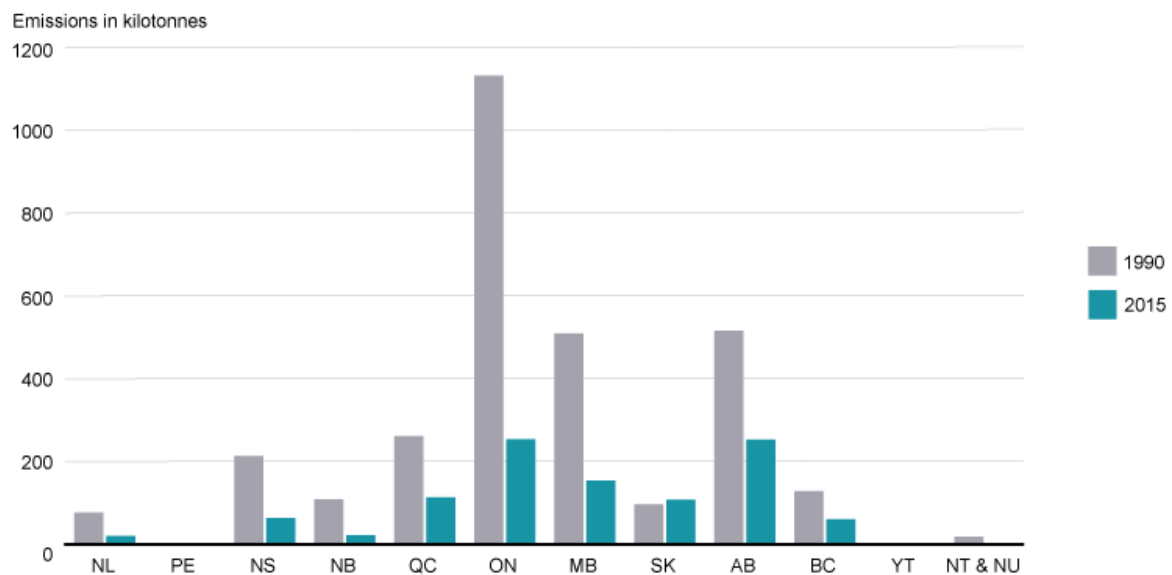
- technological upgrades, new air pollution controls for non-ferrous metal smelters and the closure of three major smelters in Manitoba, Ontario and Quebec
- lower emissions from fossil-fuel-fired (for example, coal-fired) power-generating utilities as a result of better removal technologies and plant closures (for example, the phase-out of coal electricity generation in Ontario)
- improved emission controls for the petroleum refining sector
- implementation of regulations on low-sulphur fuels³

Sulphur oxide emissions by province and territory

Key results

- In 2015, Ontario and Alberta accounted for about 50% (508 kt) of national SO_x emissions.
- Between 1990 and 2015, the largest reduction was observed in Ontario. Emissions in the province decreased by 78% (878 kt).

Figure 5. Sulphur oxide emissions by province and territory, Canada, 1990 and 2015



[Data for Figure 5](#)

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Ontario had the highest SO_x emissions level in 2015, representing 24% (254 kt) of total national emissions. Emissions in the province mainly came from ore and mineral industries, accounting for

¹ Environment and Climate Change Canada (1991) [Canada-United States Air Quality Agreement](#). Retrieved on January 5, 2017.

² Canadian Council of Ministers of the Environment (1998) [The Canada-Wide Acid Rain Strategy for Post-2000](#). Retrieved on January 5, 2017.

³ Environment and Climate Change Canada (2015) [Sulphur in Gasoline Regulations](#). Environment and Climate Change Canada (2012) [Sulphur in Diesel Fuel Regulations](#). Retrieved on January 5, 2017.

83% of the emissions. The sharp reduction in SO_x emissions in Ontario between 1990 and 2015 was mainly due to emission reductions from ore and mineral industries (notably the non-ferrous mining and smelting industry) and electric utilities.

Alberta had the second-highest SO_x emissions in 2015, also contributing 24% (253 kt) of national emissions. The oil and gas industry and electric utilities were the largest contributor to SO_x emissions in that year. Manitoba ranked third, with 15% (154 kt) of national emissions; ore and mineral industries was the most important source of emissions in that province.

Sulphur oxide emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory 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.

Source: Environment and Climate Change Canada (2016) [National Pollutant Release Inventory Data search – facility reported data](#).

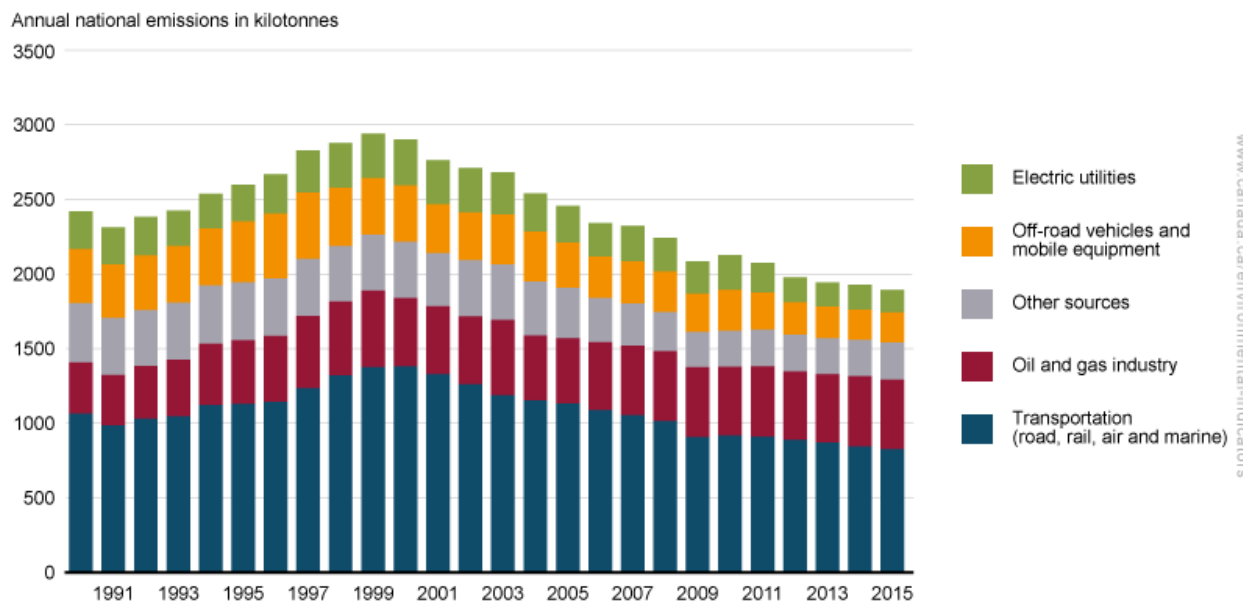
Nitrogen oxides

[Nitrogen oxides](#) (NO_x) include emissions of nitric oxide (NO) and nitrogen dioxide (NO₂). Nitrogen dioxide can have adverse effects on human health and the environment. Nitrogen oxides contribute to acid rain, which can lead to the acidification of aquatic and terrestrial ecosystems. It also contributes to the [eutrophication of lakes](#) and to the formation of ground-level ozone and fine particulate matter.

Key results

- In 2015, NO_x emissions were 1894 kilotonnes (kt). This is 22% lower than in 1990.
- Transportation (road, rail, air and marine) was a major source of NO_x representing 44% (825 kt) of emissions in 2015.

Figure 6. Total nitrogen oxide emissions by source, Canada, 1990 to 2015



[Data for Figure 6](#)

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from ore and mineral industries, manufacturing, building heating and energy generation, home firewood burning, incineration and waste, agriculture (livestock, crop production and fertilizer), dust and fires, paints and solvents, and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

While transportation (road, rail, air and marine) was the main contributor of NO_x, it was also the sector that experienced the largest reduction between 1990 and 2015. Emissions of NO_x from this sector decreased by 22% from 1063 kt to 825 kt.

The [oil and gas industry](#) emitted the next largest proportions of NO_x emissions in 2015, representing 25% of total national emissions. This sector also experienced the largest increase (123 kt) in emissions between 1990 and 2015, partly offsetting reductions from other sectors.

The decline in NO_x emissions between 1990 and 2015 is mostly attributable to two factors:

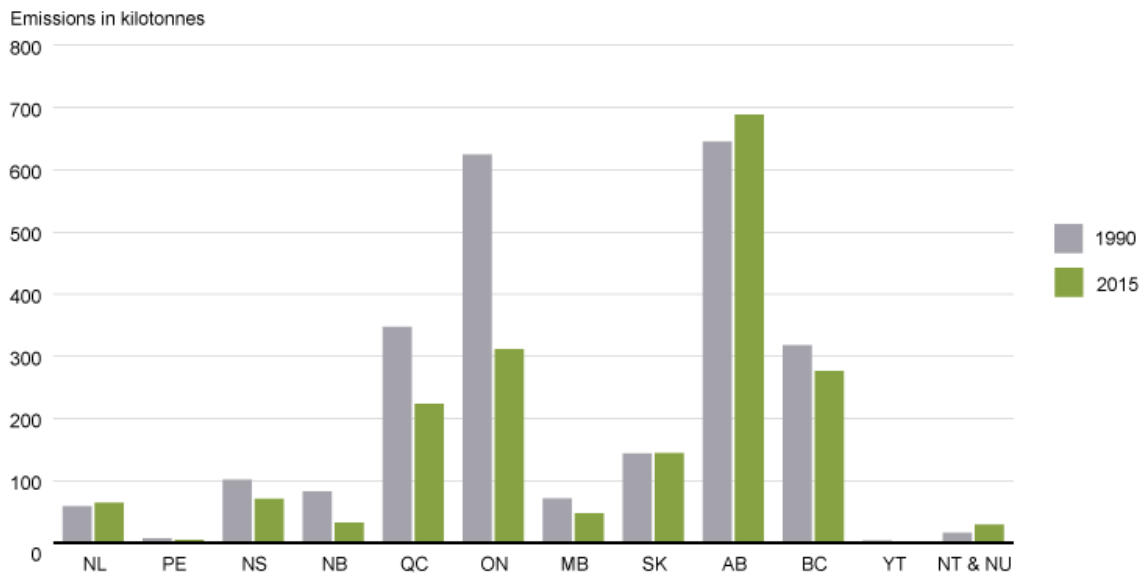
- the reduction in emissions from [transportation](#) after 2000, given the progressive introduction of cleaner technology and fuels for vehicles
- a reduction in emissions from [electric utilities](#) as a result of regulations and domestic and international agreements

Nitrogen oxide emissions by province and territory

Key results

- Alberta emitted the majority of Canada's NO_x in 2015. The province accounted for 36% (688 kt) of national emissions.
- Between 1990 and 2015, the largest reduction was observed in Ontario. Emissions decreased by 50% (313 kt) in the province.

Figure 7. Nitrogen oxide emissions by province and territory, Canada, 1990 and 2015



www.canada.ca/environmental-indicators

[Data for Figure 7](#)

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

The oil and gas industry is an important source of NO_x emissions in Alberta, accounting for 54% (369 kt) of the province's NO_x emissions in 2015. This sector is also responsible for the increase in emissions in this province between 1990 and 2015.

Ontario contributed the second-largest proportion of NO_x emissions in 2015, with 16% (312 kt) of national emissions, with transportation (road, rail, air and marine) being the most important source followed by off-road vehicles and mobile equipment. Ontario experienced the largest decrease in emissions levels (313 kt) between 1990 and 2015 in large part due to emission reductions from transportation and electric utilities.

British Columbia ranked third, with 15% (276 kt) of national emissions. Transportation (road, rail, air and marine) was the most important source of NO_x in this province as well.

Nitrogen oxide emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory 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.

Source: Environment and Climate Change Canada (2016) [National Pollutant Release Inventory Data search – facility reported data](#).

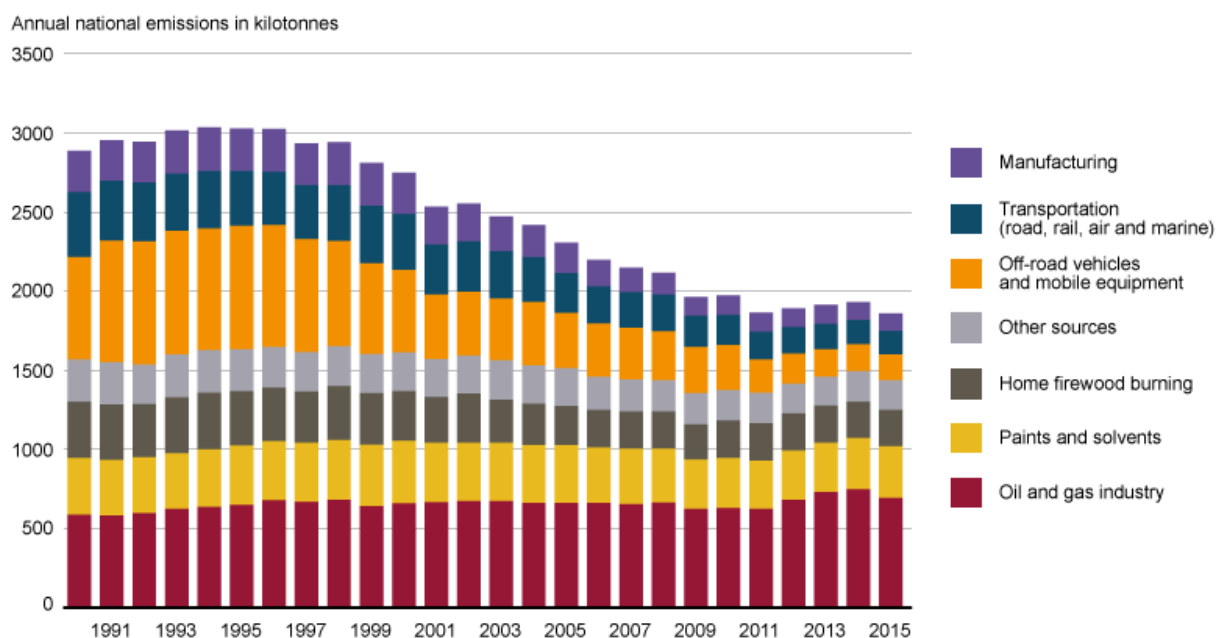
Volatile organic compounds

[Volatile organic compounds](#) (VOCs) are carbon-containing gases and vapours released into the atmosphere by natural sources and human activities.⁴ There are hundreds of VOCs that are emitted and that affect the health of Canadians and the environment. VOCs are primary precursors to the formation of ground-level ozone and particulate matter which are the main pollutants contributing to the formation of smog.

Key results

- In 2015, VOC emissions in Canada were 1859 kilotonnes (kt). This is a 36% decrease from 1990 levels.
- Since 1998, the oil and gas industry has been the highest contributor to VOC emissions. In 2015, the sector accounted for 37% (693 kt) of total emissions.

Figure 8. Total volatile organic compound emissions by source, Canada, 1990 to 2015



[Data for Figure 8](#)

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from incineration and waste, ore and mineral industries, dust and fires, building heating and energy generation, electric utilities, agriculture (livestock, crop production and fertilizer) and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

The [oil and gas industry](#) was the main source of VOC emissions in 2015 with 693 kt emitted (37% of total emissions). Paints and solvents and home firewood burning were also important sources contributing 18% (326 kt) and 12% (230 kt) of total emissions.

The source with the largest emissions reduction between 1990 and 2015 was off-road vehicles and mobile equipment, with emissions reductions of 483 kt (75%).

The long-term decrease in VOC emissions is mainly attributable to 3 factors:

⁴ Under the Canadian Environmental Protection Act, carbon dioxide, carbon monoxide, methane and chlorofluorocarbons are not considered volatile organic compounds.

- the progressive introduction of cleaner technologies and fuels resulting in emission reductions from [transportation, off-road vehicles and mobile equipment](#)
- emission reductions from most industrial and non-industrial sources from improved emission controls
- lower levels of VOCs in products such as paints, solvents and cleaners

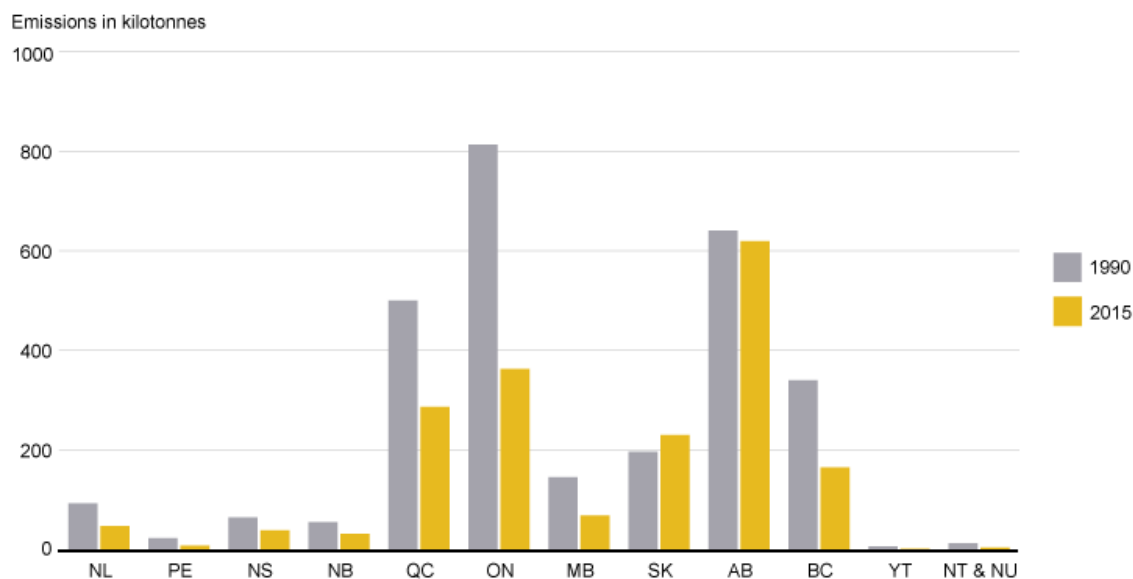
The only source with significant emissions growth over the 1990 to 2015 period was the oil and gas industry with an increase of 106 kt (18%).

Volatile organic compound emissions by province and territory

Key results

- Alberta emitted the highest proportion of VOCs in 2015. The province represented 33% (620 kt) of national emissions.
- Between 1990 and 2015, Ontario experienced the largest reduction in VOC emissions. Emissions in the province decreased by 55% (451 kt).
- Saskatchewan is the only province that experienced an increase in VOC emissions (34 kt) between 1990 and 2015.

Figure 9. Volatile organic compound emissions by province and territory, Canada, 1990 and 2015



[Data for Figure 9](#)

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Alberta was the highest emitting province of VOCs in 2015, with the oil and gas industry as the main source, contributing 74% (461 kt) of the province's emissions.

Ontario was the second-highest emitter responsible for 20% (363 kt) of total national emissions in 2015, with paints and solvents, home firewood burning and off-road vehicles and mobile equipment as the most important sources. Ontario also experienced the largest reduction in emissions of 55% (451 kt) between 1990 and 2015, mainly as a result of emission reductions from off-road vehicles and mobile equipment.

Quebec was the third largest emitter, with 15% (287 kt) of national emissions, where home firewood burning, paints and solvents, off-road vehicles and mobile equipment, and transportation (road, rail, air and marine) accounted for 78% of the emissions in that province.

Most provinces and territories experienced reductions in emissions well above 40% between 1990 and 2015 with the exception of Alberta (only a 3% reduction in emissions due to an increase in the oil and gas industry) and Saskatchewan, where emissions increased 17% over the period. The oil and gas industry is responsible for the increase in emissions in that province.

Volatile organic compound emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory 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.

Source: Environment and Climate Change Canada (2016) [National Pollutant Release Inventory Data search – facility reported data](#).

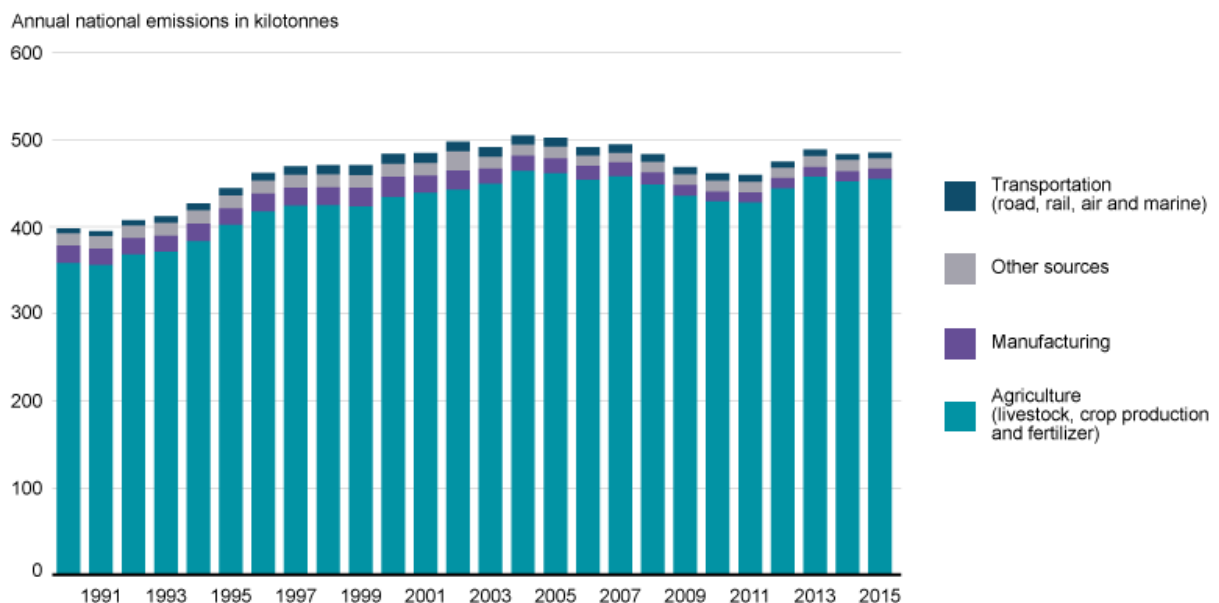
Ammonia

[Ammonia](#) (NH₃) is a colourless gas with a noticeable odour at high concentrations. It can be poisonous if inhaled in great quantities and is irritating to the eyes, nose, and throat. It can also contribute to the nitrification and eutrophication of aquatic systems. In the air, the gas combines with sulphates and nitrates to form secondary fine particulate matter (PM_{2.5}).

Key results

- In 2015, NH₃ emissions were 485 kilotonnes (kt). This is 22% higher than in 1990.
- Agriculture (livestock, crop production and fertilizer) was the main source of NH₃ emissions in 2015. Emissions from this source accounted for more than 90% (455 kt) of total national emissions.

Figure 10. Total ammonia emissions by source, Canada, 1990 to 2015



[Data for Figure 10](#)

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from incineration and waste, the oil and gas industry, home firewood burning, ore and mineral industries, electric utilities, building heating and energy generation, off-road vehicles and mobile equipment, dust and fires, paints and solvents, and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Between 1990 and 2015, agriculture (livestock, crop production and fertilizer) experienced the largest increase (27% or 97 kt) in NH₃ emissions. It also remained the key source of NH₃ emissions throughout that period. Emissions from manufacturing and other sources each represented 2% (12 kt) of national emissions in 2015. Transportation (road, rail, air and marine) followed representing 1% (7 kt) of national emissions.

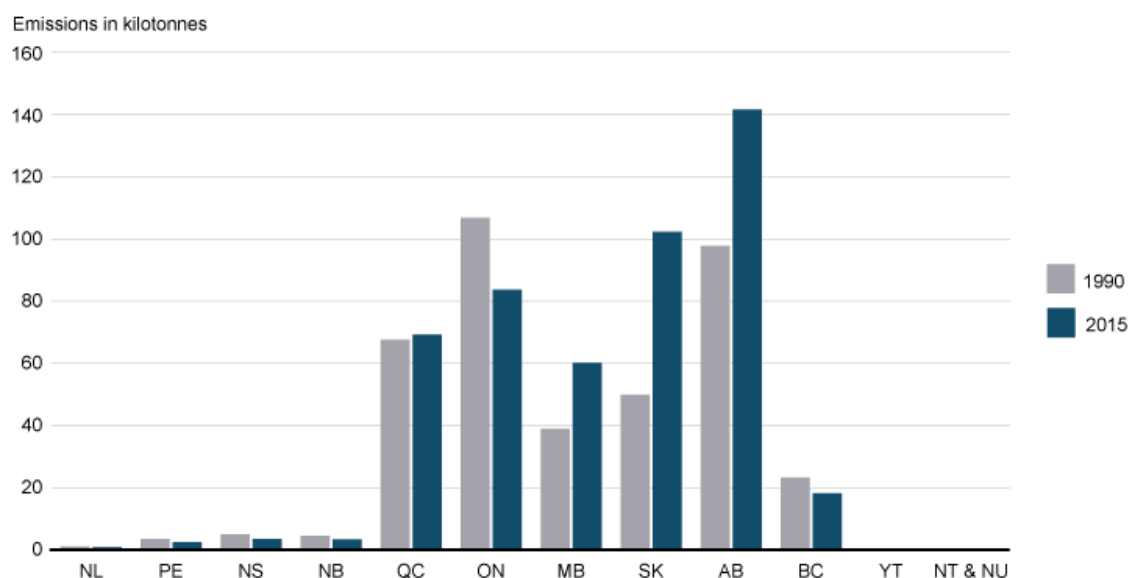
The growth in NH₃ emissions from agriculture (livestock, crop production and fertilizer) between 1990 and 2015 is mainly due to the increased use of synthetic nitrogen fertilizers and, up to 2005, larger livestock populations.

Ammonia emissions by province and territory

Key results

- In 2015, Alberta and Saskatchewan accounted for half (244 kt) of national NH₃ emissions.
- Between 1990 and 2015, Ontario experienced the largest emissions reduction. Emissions in the province decreased by 22% (23 kt).

Figure 11. Ammonia emissions by province and territory, Canada, 1990 and 2015



www.canada.ca/environmental-indicators

[Data for Figure 11](#)

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

In 2015, Alberta emitted the most NH₃ of all the provinces and territories, representing 29% (142 kt) of total national emissions. Saskatchewan contributed the second-largest proportion of NH₃, representing 21% (102 kt).

Ontario and Quebec emitted the next highest proportions, with 17% and 14% (84 kt 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 2015 took place in Saskatchewan, Manitoba and Alberta.

Ammonia emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory 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.

Source: Environment and Climate Change Canada (2016) [National Pollutant Release Inventory Data search – facility reported data](#).

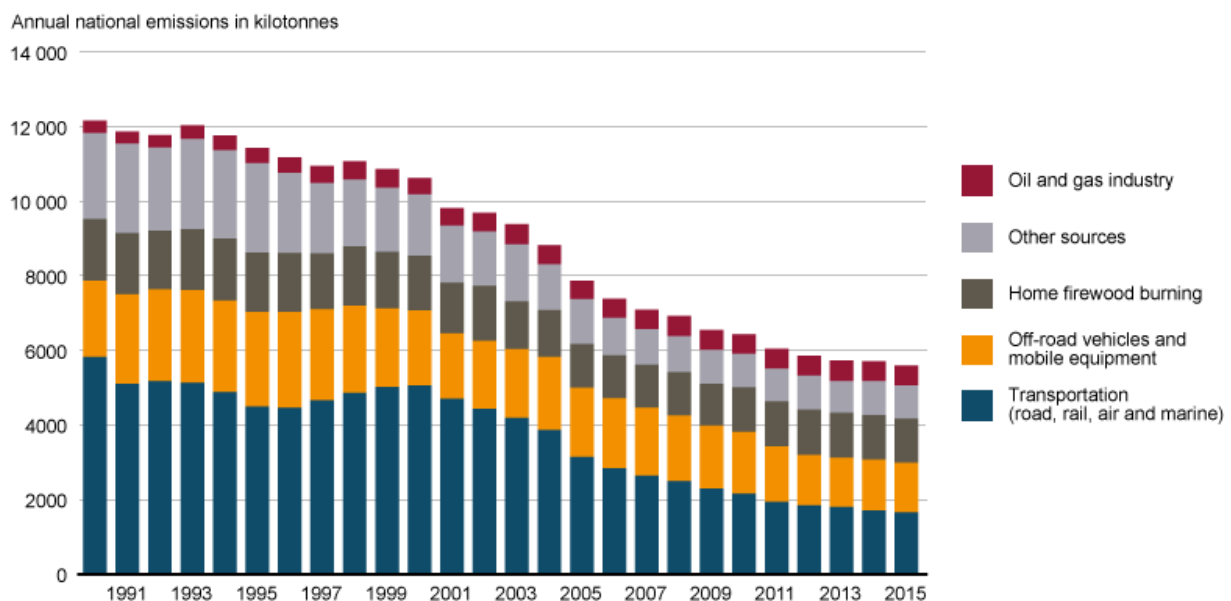
Carbon monoxide

[Carbon monoxide](#) (CO) is a colourless, odourless, tasteless and poisonous gas. Once inhaled into the bloodstream, it can inhibit the blood's capacity to carry oxygen to organs and tissues, affecting human health.

Key results

- In 2015, CO emissions in Canada were 5595 kilotonnes (kt), a decrease of 54% from 1990 levels.
- Transportation (road, rail air and marine) was the largest source of CO emissions in Canada. In 2015, the sector represented 30% (1659 kt) of total emissions.

Figure 12. Total carbon monoxide emissions by source, Canada, 1990 to 2015



[Data for Figure 12](#)

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from dust and fires, electric utilities, building heating and energy generation, incineration and waste, agriculture (livestock, crop production and fertilizer), paints and solvents, ore and mineral industries, manufacturing and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

In 2015, [transportation, off-road vehicles and mobile equipment](#), and home firewood burning were the 3 most important sources of CO. The sources combined represented 75% (4173 kt) of national emissions. Off-road vehicles and mobile equipment represented 24% (1323 kt) and home firewood burning represented 21% (1190 kt).

The largest reduction in emissions between 1990 and 2015 occurred in transportation (road, rail, air and marine) with an emission decrease of 4162 kt (71%).

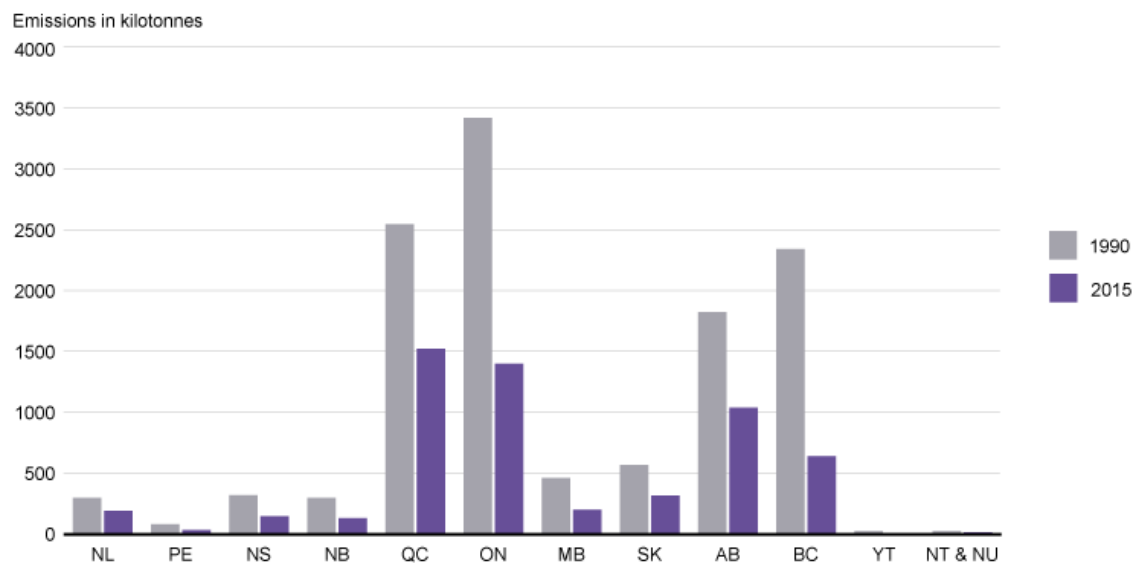
The decline in CO emissions between 1990 and 2015 is mainly due to the progressive introduction of cleaner and more efficient technology in vehicles (for example, catalytic converters).

Carbon monoxide emissions by province and territory

Key results

- In 2015, Ontario and Quebec accounted for more than 50% (2915 kt) of national CO emissions.
- Between 1990 and 2015, all provinces and territories experienced significant reductions in emissions. The reductions ranged from 36% in Newfoundland and Labrador to 88% in the Yukon.

Figure 13. Carbon monoxide emissions by province and territory, Canada, 1990 and 2015



[Data for Figure 13](#)

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

In 2015, Quebec emitted the most CO of all the provinces and territories, representing 27% (1520 kt) of the total national emissions. Home firewood burning was the most important source of CO emissions for Quebec.

The province of Ontario ranked second, with 24% (1396 kt) of total national emissions in 2015, with 34% of those emissions from off-road vehicles and mobile equipment.

Alberta, the third largest CO emitter, accounted for 19% (1037 kt) of national emissions. The oil and gas industry accounted for 41% of the province's CO emissions.

The sharp decrease in emissions between 1990 and 2015 in all provinces is mainly attributable to emission reductions from transportation (road, rail, air and marine).

Carbon monoxide emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory 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 CO emissions specific to reporting facilities.

Source: Environment and Climate Change Canada (2016) [National Pollutant Release Inventory Data search – facility reported data](#).

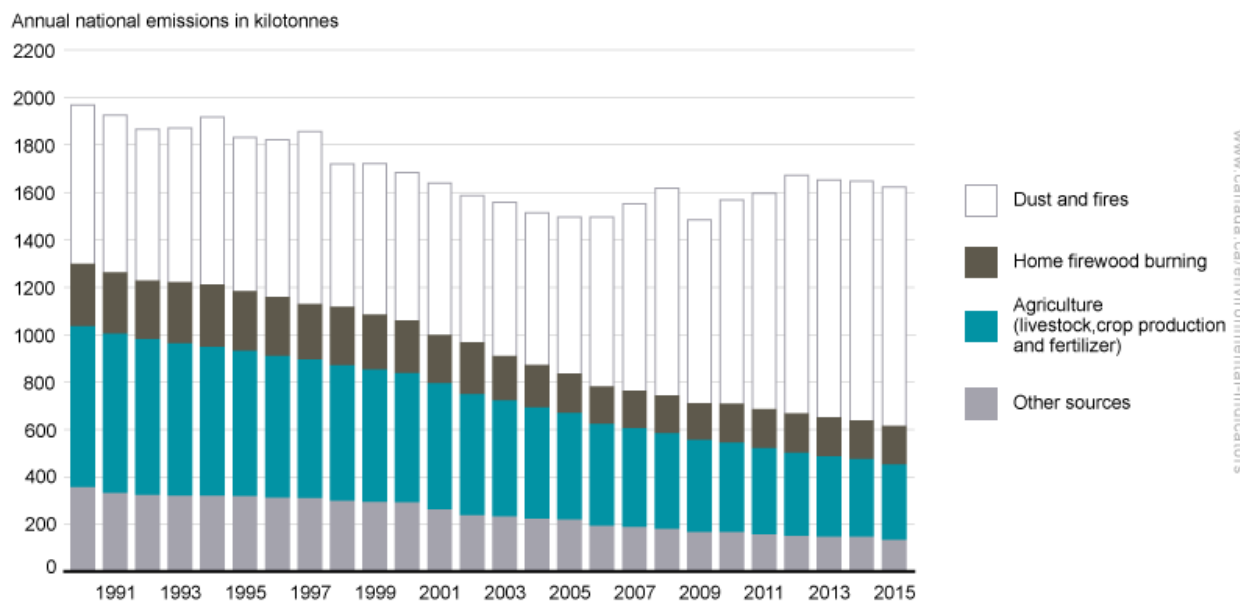
Fine particulate matter

[Particulate matter](#) (PM) is directly emitted into the air in solid or liquid form. It is also formed in the air from precursor substances such as sulphur oxides, nitrogen oxides, volatile organic compounds and ammonia. Fine particulate matter (PM_{2.5}) refers to particulate matter with a size of less than 2.5 microns. It is one of the major components of smog. When inhaled deeply into the lungs, even small amounts of PM_{2.5} can cause serious health problems. It can also damage vegetation and structures, contribute to haze and reduce visibility.

Key results

- In 2015, PM_{2.5} emissions were 1621 kilotonnes (kt). This is 18% lower than in 1990.
- Emissions from dust and fires (for example, road dust and prescribed forest burning) accounted for an increasing proportion of PM_{2.5}. Emissions from these sources reached 62% (1010 kt) of total national emissions.

Figure 14. Total fine particulate matter emissions by source, Canada, 1990 to 2015



[Data for Figure 14](#)

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from ore and mineral industries, transportation (road, rail, air and marine), manufacturing, off-road vehicles and mobile equipment, the oil and gas industry, building heating and energy generation, electric utilities, incineration and wastes, paints and solvents, and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

In 2015, 82% of PM_{2.5} emissions came from open source emissions, such as dust and fires, and agriculture (livestock, crop production and fertilizer). In general, these emissions are spread over large geographical areas, are highly dependent on weather conditions (for example, wind, rain) and are located outside of urban areas.

The remaining 18% of PM_{2.5} emissions in 2015 came from home firewood burning (163 kt) and other sources (130 kt) including industry.⁵ Specifically, other sources include emissions from:

⁵ Industrial sources generally are equipped with highly effective PM_{2.5} controls on boiler emissions, with PM-control efficiencies often in the 90% range.

- ore and mineral industries, representing 25% (33 kt) of the emissions from other sources in 2015
- transportation (road, rail, air and marine), representing 17% (22 kt)
- manufacturing (19 kt) and off-road vehicles and mobile equipment (18 kt), both representing 14% of emissions
- miscellaneous sources, such as emissions from cigarette smoking, representing 13% (17 kt)
- the oil and gas industry, representing 8% (10 kt)
- the remaining 9% (12 kt) of emissions coming from building heating and energy generation, electric utilities, incineration and wastes, and the use of paints and solvents

These other sources can have more of an impact on the population because they are generally emitted in populated areas.

Between 1990 and 2015, emissions of PM_{2.5} from dust and fires (specifically dust) increased by 50% (337 kt), while emissions from all the remaining sources declined.

The decreases in PM_{2.5} emissions between 1990 and 2015 are mainly attributable to emission reductions from agriculture (livestock, crop production and fertilizer) and home firewood burning. These reductions outweigh the increase in emissions from dust and fires over the period. The adoption of conservation tillage practices in crop production and the use of new fireplace inserts, furnaces and stoves in homes that control emissions and burn more efficiently were the main drivers leading to the reductions.

Table 1. Source emissions changes between 1990 and 2015

Source	PM _{2.5} (change in kilotonnes from 1990 to 2015)	PM _{2.5} (percentage change from 1990 to 2015)
Dust and fires	336.8	50
Miscellaneous	1.7	11
Building heating and energy generation	0.4	10
Paints and solvents	0.009	234
Oil and gas industry	-2.0	-16
Incineration and waste	-2.3	-46
Transportation (road, rail, air, marine)	-20.2	-48
Ore and mineral industries	-26.5	-45
Off-road vehicles	-32.4	-64
Electric utilities	-44.5	-92
Manufacturing	-97.5	-84
Home firewood burning	-99.6	-38
Agriculture	-359.7	-53
Total	-345.8	-18

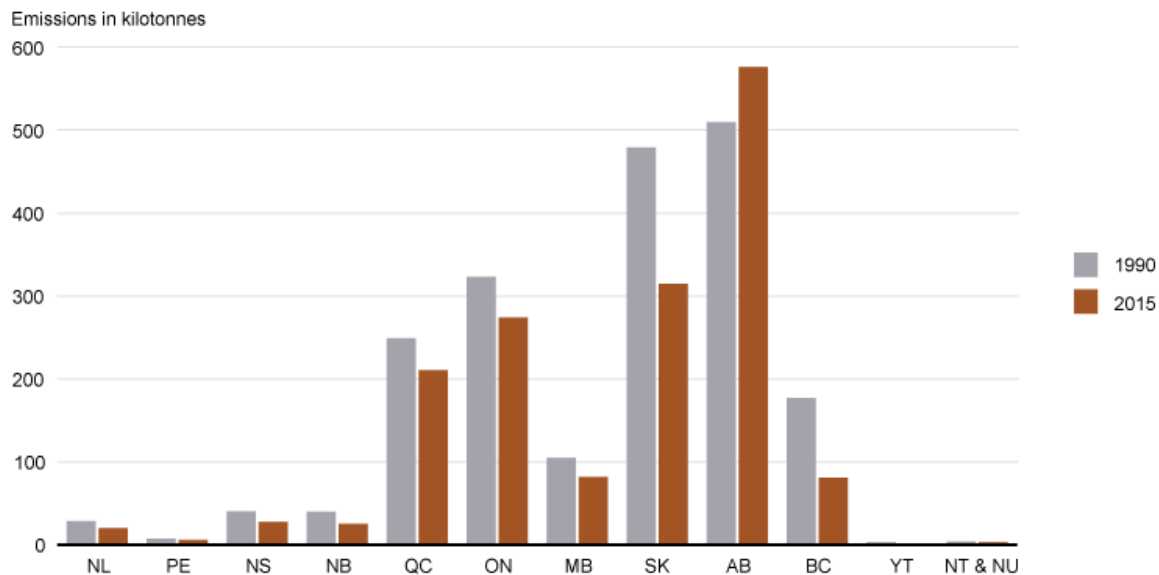
Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Fine particulate matter emissions by province and territory

Key results

- In 2015, Alberta emitted the most PM_{2.5}. The province represented 36% (577 kt) of Canadian emissions.
- Between 1990 and 2015, all provinces, with the exception of Alberta, decreased their emissions. The largest decrease was observed in Saskatchewan with a 34% reduction (164 kt).

Figure 15. Fine particulate matter emissions by province and territory, Canada, 1990 and 2015



www.canada.ca/environmental-indicators

[Data for Figure 15](#)

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Dust and fires (for example, road dust and prescribed forest burning) were the largest sources of PM_{2.5} emissions in Alberta, the highest emitting province in 2015, accounting for 79% (455 kt) of total emissions in 2015 in this province.

Saskatchewan ranked second in 2015, with 19% (315 kt) of national PM_{2.5} emissions. Agriculture (livestock, crop production and fertilizer) was the largest source, with dust and fires being the second-largest source of PM_{2.5}.

Ontario ranked third, with 17% (274 kt), and Quebec ranked fourth with 13% (211 kt). For both provinces, dust and fires were the largest sources of emissions, with home firewood burning (for example, woodstoves and fireplaces) being the second-largest source.

The increase in emissions in Alberta between 1990 and 2015 can be attributed to growth in construction operations for the oil and gas industries.

Removing emissions from dust and fires and agriculture (livestock, crop production and fertilizer) provides a different breakdown of PM_{2.5} emissions in each province and territory. With these emissions removed, Quebec becomes the largest emitting province of PM_{2.5} in 2015, representing 33% (97 kt) of total emissions (293 kt). Ontario ranks second with 26% (75 kt) of emissions. Alberta and British Columbia both rank third, each representing 11% (33 kt and 31 kt, respectively) of emissions. Between 1990 and 2015, all of the provinces and territories experienced emissions reductions between 84% (Yukon) and 28% (Prince Edward Island).

Particulate matter emissions from facilities

Environment and Climate Change Canada's National Pollutant Release Inventory 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 [total particulate matter](#) (TPM), [respirable particulate matter](#) (PM₁₀) and [fine particulate matter](#) (PM_{2.5}) emissions specific to reporting facilities.

Source: Environment and Climate Change Canada (2016) [National Pollutant Release Inventory Data search – facility reported data](#).

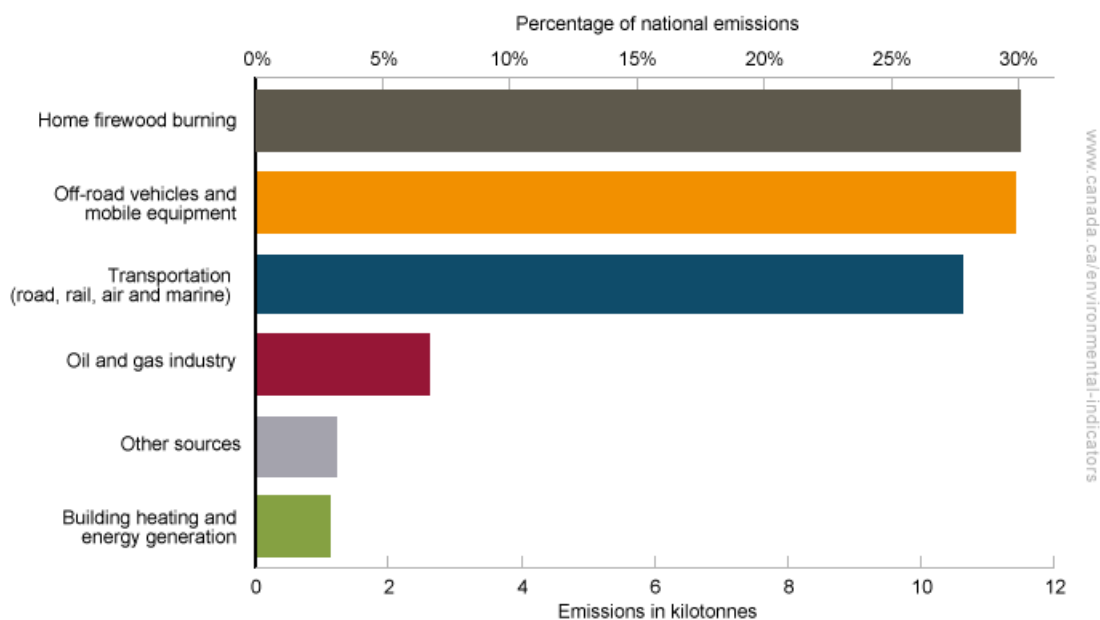
Black carbon emissions by source⁶

Black carbon is a component of PM_{2.5}. It is emitted directly into the air from the incomplete combustion of fossil fuels, biofuels and biomass.

Key results

- Emissions of black carbon were 38 kt in 2015 and represented 2.4% of PM_{2.5} emissions
- In 2015, 3 sectors accounted for 87% of national black carbon emissions:
 - home firewood burning
 - off-road vehicles and mobile equipment
 - transportation (road, rail, air and marine)

Figure 16. Black carbon emissions by source, Canada, 2015



[Data for Figure 16](#)

Note: The indicator reports air pollutant emissions from human activities only. The chart includes emissions from the most significant sources of black carbon. "Other sources" includes emissions from ore and mineral industries, manufacturing, electric

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](#) section for more details.

utilities and agriculture. Consult the [Data sources and methods](#) section for more details.

Source: Environment and Climate Change Canada (2017) [Canada's Black Carbon Emission Inventory](#).

In 2015, home firewood burning, and off-road vehicles and mobile equipment (for example, lawn and garden equipment, recreational vehicles, excavators, graders) accounted for the largest proportions of national emissions, representing approximately 30% each (11.5 kt and 11.4 kt, respectively). Transportation (road, rail, air and marine) was also a large contributor, representing about 28% (10.6 kt) of national emissions. The remaining 13% of emissions came from the oil and gas industry, other sources (such as ore and mineral industries) and building heating and energy generation.

For both transportation and off-road vehicles and mobile equipment, 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.

Canada has only recently started to report black carbon emissions from human activities and time series data are not available at this time.

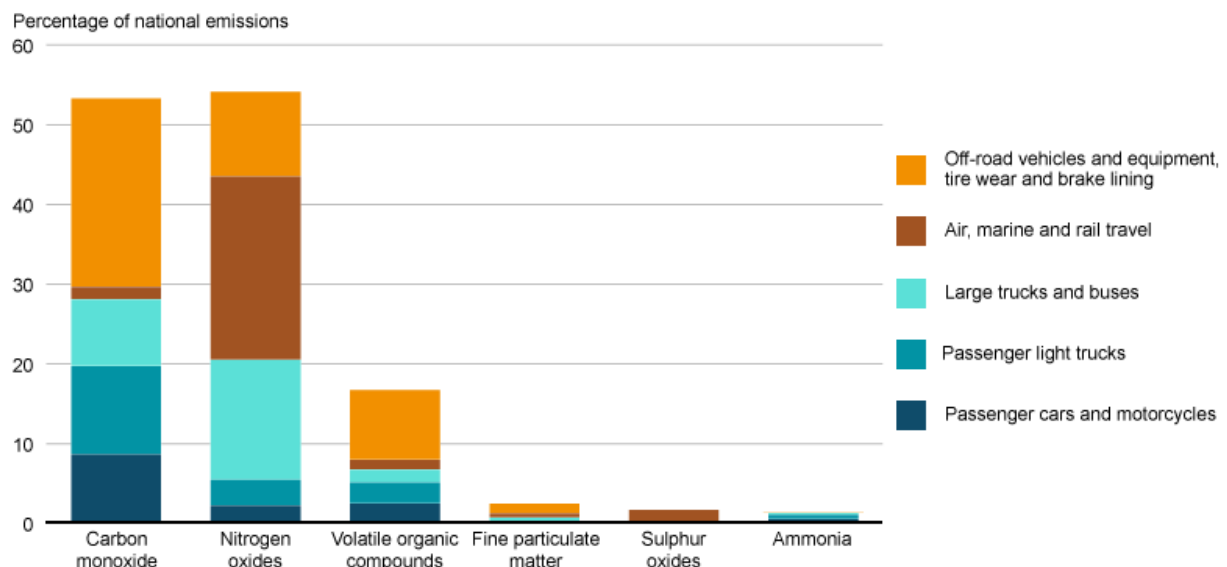
Air pollutant emissions from transportation, off-road vehicles and mobile equipment

Transportation, off-road vehicles and mobile equipment are one of the largest sources of air pollutants in Canada. Burning fossil fuels to power vehicles and engines causes emissions of many air pollutants. Air pollutants are responsible for the formation of fine particulate matter, ozone, smog and acid rain. They also adversely affect human health, the environment and the economy.

Key results

- In 2015, transportation, off-road vehicles and mobile equipment accounted for more than half of total national emissions of [carbon monoxide](#) (CO) and [nitrogen oxides](#) (NO_x). It also accounted for 17% of total emissions of [volatile organic compounds](#) (VOCs).
- While also a source of emissions of other pollutants, the sectors represent less than 5% of total national emissions of these other pollutants.

Figure 17. Contribution of transportation, off-road vehicles and mobile equipment to national air pollutant emissions by transportation mode, Canada, 2015



[Data for Figure 17](#)

Note: "Passenger cars and motorcycles" include light-duty vehicles powered by motor gasoline, diesel, liquefied petroleum gas and compressed natural gas engines as well as all types of motorcycles. "Passenger light trucks" include light-duty trucks powered by motor gasoline, diesel, liquefied petroleum gas and compressed natural gas engines. "Large trucks and buses" include heavy-duty trucks powered by motor gasoline, diesel, liquefied petroleum gas and compressed natural gas engines.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

The mix of fuels used explains in large part the contribution of each transportation mode to emissions of different air pollutants.

[Large trucks and buses](#), and [rail and marine](#) mostly rely on diesel fuel. Aviation relies on aviation turbo fuel. These sources are the largest source of NO_x transportation-related emissions accounting for 70% (721 kilotonnes [kt]) of transportation NO_x emissions.

Passenger [cars and trucks](#) mostly use gasoline and are a main source of pollutants, especially in urban centres. In 2015, emissions from passenger cars and trucks amounted to 1105 kt of CO, 96 kt of VOCs, and 5 kt of NH₃. This represented 37%, 31% and 75% of all emissions of these pollutants, respectively, from transportation, off-road vehicles and mobile equipment.

Other sources (mainly composed of off-road vehicles and equipment)⁷ are also a significant source of pollution. Their combined emissions make up 20%, 44% and 52% of the sector's total emissions of NO_x, CO and VOCs, respectively. Emissions mostly come from household use of gasoline- or diesel-powered recreational and lawn and garden equipment and from the operation of agricultural, construction and mining equipment.

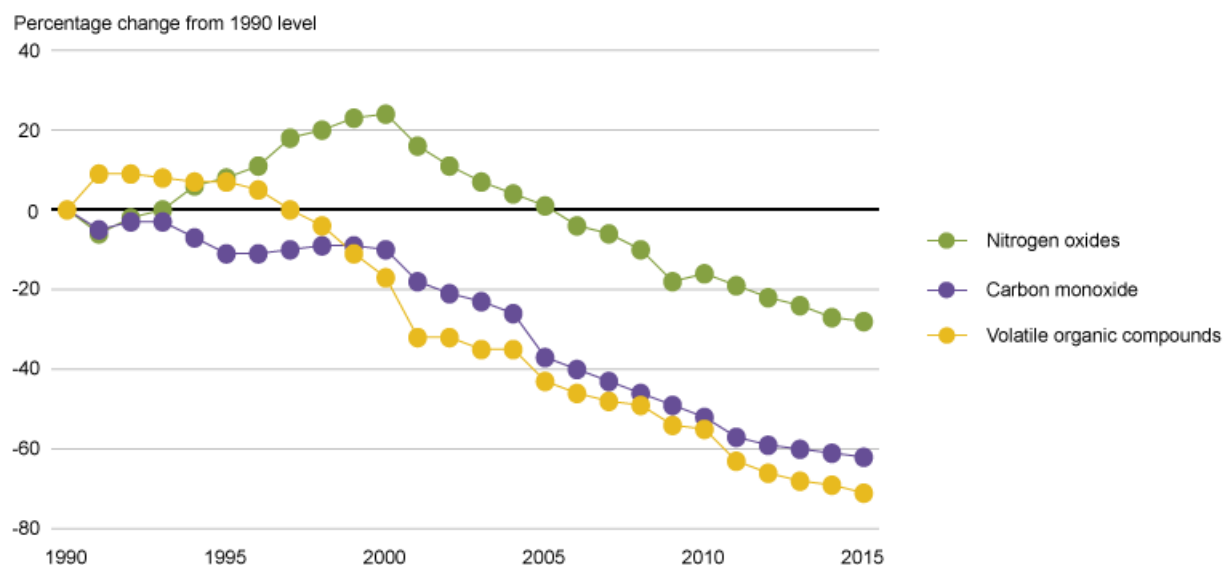
The largest source of sulphur oxide (SO_x) emissions in the transportation sector is marine vessels. Emissions of SO_x from marine vessels decreased by almost 90% between 2014 and 2015 due to the introduction of more stringent regulations.

Changes in emissions from transportation, off-road vehicles and mobile equipment

Key results

- Between 1990 and 2015, emissions of NO_x, CO and VOCs from transportation, off-road vehicles and mobile equipment decreased by 28%, 62% and 71%, respectively.
- Since 2000, all pollutants demonstrated the same downward trend in their emissions level.

Figure 18. Changes in emissions of key air pollutants from transportation, off-road vehicles and mobile equipment, Canada, 1990 to 2015



[Data for Figure 18](#)

Note: Fine particulate matter, sulphur oxides and ammonia are not shown in the chart due to their low share ($\leq 5\%$) of total emissions in 2015.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Between 1990 and 2015, NO_x emissions reductions were lower than those observed for VOCs and CO.

NO_x emissions increased between 1990 and 2000 (24%) due to an increase in air, marine and rail travel and road freight transportation. Emissions from air, marine and rail travel represented 42% of transportation-related emissions of NO_x in 2015. Changes in air, marine and rail travel thus have a

⁷ Off-road vehicles and mobile equipment include airport ground support equipment, commercial equipment (such as [forklifts and ice resurfacers](#)), [farming, construction, forestry and mining equipment](#), industrial equipment, lawn and garden equipment, railway maintenance equipment, and [recreational equipment and recreational marine equipment](#).

large impact on changes in emissions of NO_x. After 2000, new regulations contributed to a decrease in emissions from road freight, while emissions from air travel continued to increase.

Passenger and freight travel emissions are influenced by a variety of factors. These include population and economic growth, volume of passenger and freight travel, vehicle type, emission control technologies, fuel efficiency and fuel type.

The gradual introduction of cleaner technology and fuels for vehicles as a result of regulations was the leading cause of reductions in transportation emissions, despite the economic growth and increase in population and [transportation activity](#) that also occurred during that time.

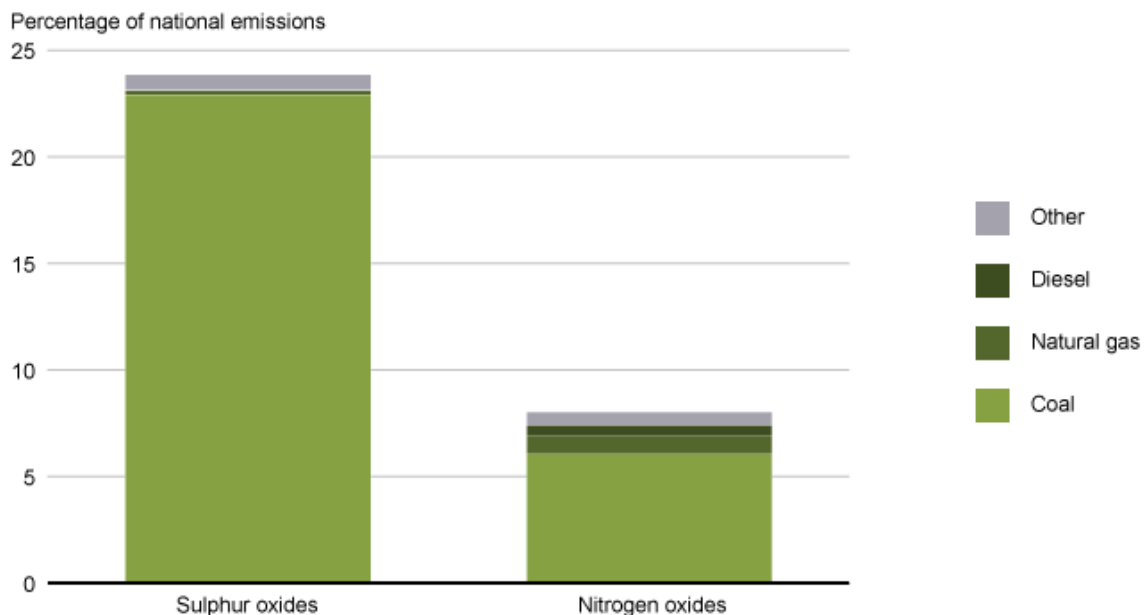
Air pollutant emissions from electric utilities

Electricity generation produces a large share of total national sulphur oxides (SO_x) and nitrogen oxides (NO_x). Sulphur oxides and NO_x are mostly emitted from power plants burning [fossil fuels](#) such as coal and, to a lesser extent, natural gas and diesel. These air pollutants are responsible for the formation of fine particulate matter, ozone, smog and acid rain. They also adversely affect human health and the economy.

Key results

- In 2015, electric utilities were the source of 24% and 8% of total Canadian emissions of SO_x and NO_x.
- Most of the air pollutant emissions from electric utilities come from burning coal.
- Electric utilities are also a source of [carbon monoxide](#) (CO), [volatile organic compounds](#) (VOCs), [fine particulate matter](#) (PM_{2.5}) and [ammonia](#) (NH₃) emissions. However, they account for less than 1% of the total national emissions of these pollutants.

Figure 19. Contribution of electric utilities to national air pollutant emissions by fuel source, Canada, 2015



[Data for Figure 19](#)

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown in the chart due to their low share ($\leq 1\%$) of total emissions in 2015. Excludes emissions from industries that generate electricity and heat as a supporting activity rather than as their primary purpose. "Other" fuel sources include waste material and other uncategorized sources of electricity generation.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

In 2015, 96% of SO_x and 76% of NO_x emissions from electric utilities came from burning coal.

While generating electricity by burning fossil fuels causes air pollutant emissions, the use of non-fossil energy sources, such as hydro-electricity, nuclear power and other renewable sources to generate electricity does not emit air pollutants. A large share of the electricity generated in Canada comes from sources that do not emit air pollutants:

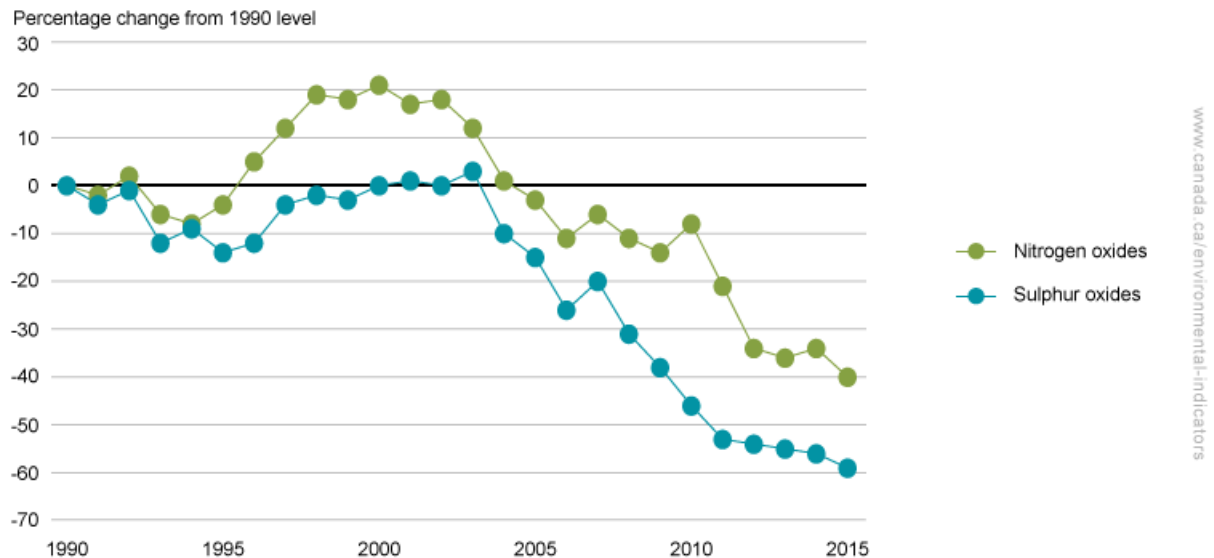
- 59% of electricity comes from hydro
- 16% comes from nuclear power plants
- 5% comes from non-hydro renewable sources, such as wind, solar, tidal power and biomass⁸

Changes in emissions from electric utilities

Key results

- Emissions of SO_x and NO_x from electric utilities declined by 59% and 40%, respectively, between 1990 and 2015
- Most of that decline occurred from 2005 onward

Figure 20. Changes in emissions of key air pollutants from electric utilities, Canada, 1990 to 2015



[Data for Figure 20](#)

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown in the chart due to their low share ($\leq 1\%$) of total emissions in 2015. Excludes emissions from industries that generate electricity and heat as a supporting activity rather than as their primary purpose.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Between 2005 and 2015, emissions of NO_x and SO_x decreased by 38% and 52%, respectively. Over the same period, the share of electricity that came from burning fossil fuels fell from 25% to 19%. This decline was mostly the result of a gradual drop in electricity generation from coal power plants.⁹

⁸ Natural Resources Canada (2016) [About electricity](#). Retrieved on December 20, 2016.

⁹ Statistics Canada (2016) [CANSIM Table 127-0007 – Electric power generation, by class of electricity producer, annual \(megawatt hour\)](#). Retrieved on December 20, 2016.

The emissions reductions since 2005 are mainly due to:

- the change in the mix of energy sources used to generate electricity
- the introduction of regulations
- domestic and international agreements
- better removal technologies
- plant closures

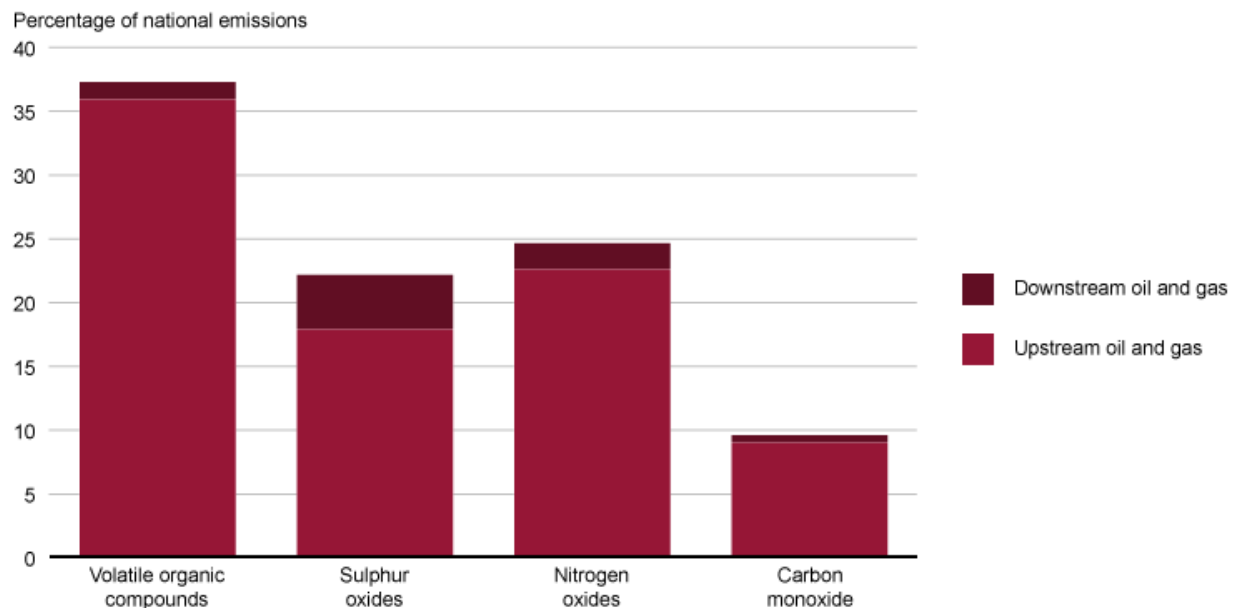
Air pollutant emissions from the oil and gas industry

The oil and gas sector is an important contributor to air pollutant emissions. Air pollutants are responsible for the formation of fine particulate matter (PM_{2.5}), ozone (O₃), smog and acid rain. They also adversely affect human health and the economy. Most emissions from the oil and gas sector come from activities such as exploration, drilling, production and field processing.

Key results

- In 2015, the oil and gas industry was a major contributor to total national emissions of [volatile organic compounds](#) (VOCs) (37%), [sulphur oxides](#) (SO_x) (22%), [nitrogen oxides](#) (NO_x) (25%) and [carbon monoxide](#) (CO) (10%).
- Emissions from the oil and gas industry mostly come from upstream activities (exploration, drilling, production and field processing). Downstream activities (refining, storage and distribution) made up no more than a fifth of air pollutant emissions from the oil and gas industry in 2015.
- The oil and gas industry is also a source of emissions of [PM_{2.5}](#) and [ammonia](#) (NH₃). However, in 2015, it made up less than 1% of the total emissions of these pollutants.

Figure 21. Contribution of the oil and gas industry to national air pollutant emissions, Canada, 2015



[Data for Figure 21](#)

Note: Fine particulate matter and ammonia are not shown in the chart due to their low share ($\leq 1\%$) of total emissions in 2015.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

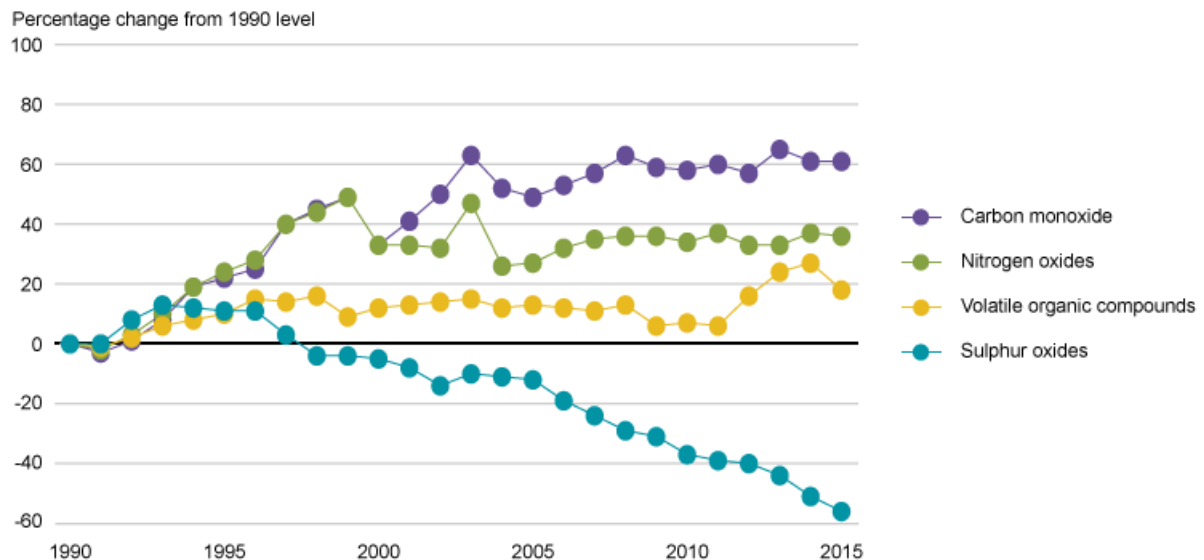
In 2015, the oil and gas industry was the sector contributing the most to total national emissions of VOCs. It was also the second-largest contributor to emissions of NO_x and the third-largest contributor to emissions of SO_x and CO.

Changes in emissions from oil and gas industry

Key results

- Emissions of CO, NO_x and VOCs increased by 61%, 36% and 18%, respectively, between 1990 and 2015.
- Sulphur oxides were the only pollutants whose emissions decreased over that period.

Figure 22. Changes in emissions of key air pollutants from the oil and gas industry, Canada, 1990 to 2015



[Data for Figure 22](#)

Note: Fine particulate matter and ammonia are not shown in the chart due to their low share ($\leq 1\%$) of total emissions in 2015.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

The increases in CO, NO_x and VOC emissions were due to growth in oil and gas production (the upstream sector of the industry), as emissions from the downstream sector declined during that period. This increase is in part explained by the fact that crude oil production had more than doubled in Canada since 1990. The growth was mostly driven by a rapid increase in oil sands production. During the same period, production of natural gas from unconventional sources, such as those requiring the use of multi-stage fracturing techniques, also increased significantly.

The decrease in SO_x emissions was mostly the result of a decrease in emissions from bitumen and heavy oil upgrading and natural gas processing, attributed to better emission control technologies.

About the indicators

What do the indicators measure

Air pollutant emissions indicators track emissions from human activities of 6 key air pollutants: sulphur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), 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.¹⁰ Sectoral indicators on air pollutant emissions from transportation, off-road vehicles and mobile equipment, electric utilities and the oil and gas industry provide additional analysis on the largest sources of Canada's air pollutant emissions.

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.¹¹

Why are these indicators important

Canadians are exposed to air pollutants on a daily basis, which can cause adverse health and environmental effects. Fine particulate matter (PM_{2.5}) and ground-level ozone (O₃) are key components of smog and have been associated with pulmonary and cardiovascular health issues even at very low levels. While causing effects of their own, NO_x (such as nitrogen dioxide [NO₂]) and VOCs are the main contributors to the formation of O₃. Nitrogen oxides, SO_x (such as sulphur dioxide [SO₂]), NH₃ and VOCs also lead to the formation of PM_{2.5} in the air, in addition to the PM_{2.5} that is emitted directly. Sulphur oxides and NO_x can also lead to the formation of acid deposition (acid rain) that can harm the environment, materials, living organisms, and humans.

Consult the [Air pollution: drivers and impacts](#) web page for information on the human health, environmental and economic impacts of air pollution.

Black carbon is estimated to be the third largest contributor in the world to current global warming. Black carbon is of particular significance in polar regions, where the deposition of particles on ice and snow darken the surface, increasing the absorption of sunlight and accelerate melting.

The Air pollutant emissions indicators are intended to inform Canadians and decision makers about progress made towards reducing emissions from human-related sources of air pollutants and about the effectiveness of emission reduction measures implemented to improve ambient air quality in Canada. The indicators are also used to assess progress towards the [2016–2019 Federal Sustainable Development Strategy](#).

What are the related indicators

The [International comparison of air pollutant emissions](#) indicators track air pollutant emissions for Canada and other member countries of the Organisation for Economic Co-operation and Development for which emissions data are available.

The [Air quality](#) indicators track ambient concentrations of PM_{2.5}, O₃, SO₂, NO₂, and VOCs at the national and regional level and at local monitoring stations.

¹⁰ 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 and inorganic compounds like sulfates. Fine particulate matter 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 (2017) [Canada's Black Carbon Emission Inventory](#). Retrieved on July 21, 2017.

¹¹ Only facilities that had air pollutant emissions over a certain reporting threshold were included in the National Pollutant Releases Inventory (NPRI) reported data.

The [Greenhouse gas \(GHG\) emissions](#) indicators report trends on Canada's GHG emissions nationally, [per person and per unit gross domestic product](#), by [province and territory](#), by [economic sector](#) and from [large facilities](#).



Safe and healthy communities

The indicators support the measurement of progress towards the long-term goal of the [2016–2019 Federal Sustainable Development Strategy](#): All Canadians live in clean, sustainable communities that contribute to their health and well-being.

Data sources and methods

What are the data sources

The Air pollutant emissions indicators track emissions of 6 key air pollutants: 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 data used are from Canada's [Air Pollutant Emission Inventory](#) for the years 1990 to 2015.

Data for the black carbon indicator, a component of PM_{2.5}, come from Canada's [Black Carbon Emission Inventory](#) and are reported for 2015 at the national level.

Facility data for local air pollutant emissions reported in [interactive maps](#) come from the [National Pollutant Release Inventory](#) and are available for the years 2006 to 2015.

Activity data for the transportation sector come from Natural Resources Canada's [Energy Use Data Handbook Tables](#) and are available for the years 1990 to 2014.

More information

The Air Pollutant Emission Inventory and the Black Carbon Emission Inventory provide data and estimates on releases from human activities of the air pollutants contributing to the issues of smog, acid rain, reduced air quality and climate change. Improvements to data 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.

Air pollutant emission inventory

The Air Pollutant Emission Inventory fulfills many of Canada's international pollution levels reporting obligations. It is a comprehensive inventory of 17 air pollutants,¹² combining emissions reported by facilities to the National Pollutant Release Inventory, with emissions estimated by Environment and Climate Change Canada. Estimates are developed using the latest estimation methods and are based on published statistics or other sources of information such as surveys and reports. The Air Pollutant Emission Inventory summaries and trends are compiled in collaboration with provincial, territorial and regional environmental agencies providing a comprehensive overview of pollutant emissions across Canada.

The national and provincial/territorial inventory data are current as of February 15, 2017, and cover the period from 1990 to 2015. Emissions data are reported in the inventory approximately one year after data collection, validation, calculation and interpretation have been completed. The Canadian Environmental Sustainability Indicators (CESI) Air pollutant emissions indicators are reported following the public release of the inventory data.

Black carbon emission inventory

As a member of the Arctic Council, Canada committed under the [Framework for Action on Enhanced Black Carbon and Methane Emissions Reductions](#) to submit annual inventories of its black carbon emissions to the United Nations Economic Commission for Europe beginning in 2015. The Black Carbon Emission Inventory is compiled using PM_{2.5} emissions data from combustion-related sources from the Air Pollutant Emission Inventory. Black carbon estimates are published separately from the Air Pollutant Emission Inventory. The data are current as of July 21, 2017.

¹² Includes the 6 key air pollutants along with cadmium, lead, mercury, dioxins and furans, 4 types of polycyclic aromatic hydrocarbons, hexachlorobenzene, coarse particulate matter and total particulate matter.

Black carbon is considered a short-lived climate pollutant, meaning it has a relatively short lifespan in the atmosphere (from a few days to a few weeks) compared to carbon dioxide (CO₂) and other longer-lived greenhouse gases (GHGs). Although their life spans are short, short-lived climate pollutants are potent global warmers contributing to warming of the Earth's surface.¹³ For black carbon, the pollutant has the ability to absorb solar radiation 460 to 1500 times more than CO₂.¹⁴ Short-lived climate pollutants, including black carbon, are important pollutants to consider when addressing climate change because they can respond relatively quickly to efforts to control their releases and thus impact near-term warming, which is particularly important in the Arctic.

National pollutant release inventory

The National Pollutant Release Inventory is a database of pollutant releases (to air, water and land), disposals and transfers for recycling from industrial, commercial and institutional facilities. The data from these facilities is provided by the operators of the facilities as mandated by the Canadian Environmental Protection Act (the Act). Under the Act, owners or operators of facilities that manufacture, process or otherwise use or release one or more of the substances tracked by the inventory, and meet substance-specific reporting thresholds and other requirements, must report their pollutant releases annually to Environment and Climate Change Canada. The inventory data from 1990 to 2015 are current as of December 1, 2016

How are these indicators calculated

Emissions data from Canada's national inventories are used to produce the indicators for the 6 key air pollutants. Data are grouped to report on the sources that contribute the majority of emissions for each pollutant. Canada's national inventories use the latest advancements in scientific knowledge to estimate or measure emissions for the various air pollutant sources.

More information

Calculation of emissions

Emissions of air pollutants are measured or estimated using one of the following methods:

- continuous emission monitoring systems (CEMS) (mostly for facilities)
- 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

¹³ Other short-lived climate pollutants include tropospheric ozone, methane and some hydrofluorocarbons (HFCs). Environment and Climate Change Canada (2017) [Climate and Clean Air Coalition \(CCAC\) to Reduce Short-Lived Climate Pollutants \(SLCPs\)](#). Retrieved on January 5, 2017.

¹⁴ Climate and Clean Air Coalition (2017) [Science & Resources: Black carbon](#). Retrieved on January 5, 2017.

through Environment and Climate Change Canada's [Air Pollutant Emission Inventory](#) and [National Pollutant Release Inventory](#).

Emissions of black carbon are calculated by applying factors to estimate the fraction of black carbon in PM_{2.5} emissions from combustion-related sources, with the exception of mobile sources, where models are used. The factors primarily come from the United States Environmental Protection Agency's [SPECIATE database](#). SPECIATE is a repository of particulate matter speciation profiles¹⁵ of air pollution sources. [Annex B](#) of Canada's Black Carbon Emission Inventory lists all the ratios used for each source.

Compilation of emissions

The process of compiling emission estimates consists of developing estimates for many different emissions sources. These estimates are grouped into 3 main classes:

1. point sources
2. area and open sources
3. mobile sources

Emissions for each of the 3 main classes of sources are compiled using top-down (few details, mostly at the national or regional level) and bottom-up (with a lot of specific details at the facility level) approaches.

Point sources

Point sources are stationary sources that emit pollutants through stacks or other equipment at specific geographical locations. They are compiled through a bottom-up approach starting with emissions from facilities. The facility information reported to the National Pollutant Release Inventory is used in combination with some provincial information to compile the emissions from point sources.

Area and open sources

Area and open source emissions are sources too small or too numerous to be reported individually as point sources. They are usually compiled through a top-down approach using activity-level statistics such as production data or fuel-use data, 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 sources

Mobile source emissions, such as those from transportation, are compiled using a combination of bottom-up and top-down approaches. As an example, road transportation emissions are estimated using an emissions estimation model (MOVES) developed by the United States Environmental Protection Agency that considers the number of vehicles, fuel consumed, distance travelled, technology used and many other parameters. This model has been adapted for Canadian conditions.

Emissions reconciliation and data quality

Care is taken to avoid double counting of emissions in the Air Pollutant Emission Inventory 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.

¹⁵ 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 (2017) [Canada's Black Carbon Emission Inventory](#). Retrieved on July 21, 2017.

Air pollutant emissions by source classification

For the purpose of reporting the indicators, calculated emissions data from the Air Pollutant Emission Inventory and Black Carbon Emission Inventory are grouped into the following 13 sources:

1. agriculture (livestock, crop production and fertilizer)
2. building heating and energy generation
3. dust and fires
4. electric utilities
5. home firewood burning
6. incineration and waste
7. manufacturing
8. miscellaneous
9. off-road vehicles and mobile equipment
10. oil and gas industry
11. ore and mineral industries
12. paints and solvents
13. transportation (road, rail, air and marine)

Table 2 shows the allocation of air pollutant emission sources reported in the Air pollutant emissions indicators compared with those reported by the inventories.

Table 2. Allocation of Air Pollutant Emission Inventory / Black Carbon Emissions Inventory to sources reported in the Air pollutant emissions indicators

Sources in the Air pollutant emissions indicators	Sources in the Air Pollutant Emission Inventory and Black Carbon Emission Inventory
Agriculture (livestock, crop production and fertilizer)	Animal production
Agriculture (livestock, crop production and fertilizer)	Crop production
Agriculture (livestock, crop production and fertilizer)	Fuel use
Building heating and energy generation	Commercial and institutional fuel combustion
Building heating and energy generation	Construction fuel combustion
Building heating and energy generation	Residential fuel combustion
Dust and fires	Dust – coal transportation
Dust and fires	Dust – construction operations
Dust and fires	Dust – mine tailings

Sources in the Air pollutant emissions indicators	Sources in the Air Pollutant Emission Inventory and Black Carbon Emission Inventory
Dust and fires	Dust – paved roads
Dust and fires	Dust – unpaved roads
Dust and fires	Fires – prescribed forest burning
Dust and fires	Fires – structural fires
Electric utilities	Coal
Electric utilities	Diesel
Electric utilities	Natural gas
Electric utilities	Waste materials
Electric utilities	Other electric power generation
Home firewood burning	Home firewood burning
Incineration and waste	Crematoriums
Incineration and waste	Industrial and commercial incineration
Incineration and waste	Municipal incineration
Incineration and waste	Waste (landfills, residential waste burning, treatment and disposal, water and sewage treatment)
Incineration and waste	Other incineration and utilities
Manufacturing	Abrasives manufacture
Manufacturing	Bakeries
Manufacturing	Biofuel production
Manufacturing	Chemicals industry
Manufacturing	Electronics
Manufacturing	Food preparation
Manufacturing	Glass manufacture
Manufacturing	Grain processing
Manufacturing	Metal fabrication

Sources in the Air pollutant emissions indicators	Sources in the Air Pollutant Emission Inventory and Black Carbon Emission Inventory
Manufacturing	Plastics manufacture
Manufacturing	Pulp and paper industry
Manufacturing	Textiles
Manufacturing	Vehicle manufacture (engines, parts, assembly, painting)
Manufacturing	Wood products
Manufacturing	Other manufacturing industries
Miscellaneous	Cigarette smoking
Miscellaneous	Commercial cooking
Miscellaneous	Human
Miscellaneous	Marine cargo handling
Miscellaneous	Other miscellaneous sources
Miscellaneous	Service stations
Off-road vehicles and mobile equipment	Off-road diesel vehicles and equipment
Off-road vehicles and mobile equipment	Off-road gasoline / liquefied petroleum gas / compressed natural gas vehicles and equipment
Oil and gas industry	Downstream petroleum industry
Oil and gas industry	Petroleum product transportation and distribution
Oil and gas industry	Upstream petroleum industry
Ore and mineral industries	Ore and mineral industries
Ore and mineral industries	Aluminum industry
Ore and mineral industries	Asphalt paving industry
Ore and mineral industries	Cement and concrete industry
Ore and mineral industries	Foundries
Ore and mineral industries	Iron and steel industries

Sources in the Air pollutant emissions indicators	Sources in the Air Pollutant Emission Inventory and Black Carbon Emission Inventory
Ore and mineral industries	Iron ore industry
Ore and mineral industries	Mineral products industry
Ore and mineral industries	Mining and rock quarrying
Ore and mineral industries	Non-ferrous mining and smelting industry
Paints and solvents	Dry cleaning
Paints and solvents	General solvent use
Paints and solvents	Printing
Paints and solvents	Surface coatings
Transportation (road, rail, air and marine)	Air transportation
Transportation (road, rail, air and marine)	Heavy-duty diesel vehicles
Transportation (road, rail, air and marine)	Heavy-duty gasoline vehicles
Transportation (road, rail, air and marine)	Heavy-duty liquefied petroleum gas / natural gas vehicles
Transportation (road, rail, air and marine)	Light-duty diesel trucks
Transportation (road, rail, air and marine)	Light-duty diesel vehicles
Transportation (road, rail, air and marine)	Light-duty gasoline trucks
Transportation (road, rail, air and marine)	Light-duty gasoline vehicles
Transportation (road, rail, air and marine)	Light-duty liquefied petroleum gas / natural gas trucks
Transportation (road, rail, air and marine)	Light-duty liquefied petroleum gas / natural gas vehicles
Transportation (road, rail, air and marine)	Marine transportation

Sources in the Air pollutant emissions indicators	Sources in the Air Pollutant Emission Inventory and Black Carbon Emission Inventory
Transportation (road, rail, air and marine)	Motorcycles
Transportation (road, rail, air and marine)	Rail transportation
Transportation (road, rail, air and marine)	Tire wear and brake lining

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 grouped as such are listed in the notes of each chart.

Sectoral indicators

Sectoral indicators on air pollutant emissions from transportation, off-road vehicles and mobile equipment, electric utilities and the oil and gas industry provide additional analysis on the largest sources of Canada's air pollutant emissions. These indicators also rely on calculated emissions data from the Air Pollutant Emission Inventory.

These indicators are provided at the national level. They identify the contribution of each sector to the national emissions of air pollutants for the year 2015. They also provide information about emissions of selected pollutant, by sector, for the period from 1990 to 2015.

Tables 3 through 5 below show the allocation of air pollutant emission sources reported in the Air pollutant emissions indicators compared with those reported by the sectoral indicators.

Table 3. Allocation of sources reported in the Air Pollutant Emission Inventory / Black Carbon Emission Inventory to sources reported in the Air pollutant emissions from transportation, off-road vehicles and mobile equipment indicator

Air pollutant emissions from transportation, off-road vehicles and mobile equipment	Sources in the Air Pollutant Emission Inventory and Black Carbon Emission Inventory
Air, marine and rail travel	Air transportation
Air, marine and rail travel	Marine transportation
Air, marine and rail travel	Rail transportation
Large trucks and buses	Heavy-duty diesel vehicles
Large trucks and buses	Heavy-duty gasoline vehicles
Large trucks and buses	Heavy-duty liquefied petroleum gas / natural gas vehicles
Off-road vehicles and equipment, tire wear and brake lining	Off-road diesel vehicles and equipment

Air pollutant emissions from transportation, off-road vehicles and mobile equipment	Sources in the Air Pollutant Emission Inventory and Black Carbon Emission Inventory
Off-road vehicles and equipment, tire wear and brake lining	Off-road gasoline / liquefied petroleum gas / compressed natural gas vehicles and equipment
Off-road vehicles and equipment, tire wear and brake lining	Tire wear and brake lining
Passenger cars and motorcycles	Light-duty diesel vehicles
Passenger cars and motorcycles	Light-duty gasoline vehicles
Passenger cars and motorcycles	Light-duty liquefied petroleum gas / natural gas vehicles
Passenger cars and motorcycles	Motorcycles
Passenger light trucks	Light-duty diesel trucks
Passenger light trucks	Light-duty gasoline trucks
Passenger light trucks	Light-duty liquefied petroleum gas / natural gas trucks

Table 4. Allocation of sources reported in the Air Pollutant Emission Inventory / Black Carbon Emission Inventory to sources reported in the Air pollutant emissions from electric utilities indicator

Air pollutant emissions from electric utilities	Sources in the Air Pollutant Emission Inventory and Black Carbon Emission Inventory
Coal	Coal
Diesel	Diesel
Natural gas	Natural gas
Other	Waste materials
Other	Other electric power generation

Table 5. Allocation of sources reported in the Air Pollutant Emission Inventory / Black Carbon Emission Inventory to sources reported in the Air pollutant emissions from the oil and gas industry indicator

Air pollutant emissions from the oil and gas industry	Sources in the Air Pollutant Emission Inventory and Black Carbon Emission Inventory
Downstream oil and gas	Downstream petroleum industry
Downstream oil and gas	Petroleum product transportation and distribution
Upstream oil and gas	Upstream petroleum industry

What has recently changed

Since the last reporting of the Air pollutant emissions indicators in 2016, the classification of emissions by source for each of the 6 key air pollutants was revised to align with changes made to source classifications in Canada's Air Pollutant Emission Inventory. Specifically, emissions formerly reported under the inventory's high-level source category (industrial, non-industrial, mobile, incineration, miscellaneous and open sources) have been reorganized into 11 new source categories: ore and mineral industries, oil and gas industry, electric power generation (utilities), manufacturing, transportation and mobile equipment, agriculture, commercial/residential/institutional, incineration and waste, paints and solvents, dust, and fires.

The emission estimates reported in the Air Pollutant Emission Inventory used in the indicators have undergone a number of significant recalculations. Specifically, the sector emissions for on-road and off-road vehicles (reported within the transportation and mobile equipment source category of the inventory) and dust from unpaved roads (dust source category) following the implementation of improved quantification methods. For more information about these recent changes, consult [Annex 2](#) of the Air Pollutant Emission Inventory Report.

Canada's Black Carbon Emission Inventory has undergone a number of recalculations of emissions estimates. Specifically, methodological improvements have been made to all sources to improve the accuracy of estimates. Consult section 2.9 of [Canada's Black Carbon Emission Inventory](#) for more information.

What are the caveats and limitations

The methodologies for compiling air pollutant emissions generally improve over time, and revisions are made to the Air Pollution Emission Inventory. As a result of this, the emissions and trends reported for the indicators may be different from those previously published.

Some area source emissions were not updated for 2015 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 (2014) were used.

The Air Pollutant Emission Inventory uses facility information from the National Pollutant Release Inventory and other sources. The version of the data published by the National Pollutant Release Inventory may not be identical to that used in the Air Pollutant Emission Inventory at a given time because of updates to point source data from National Pollutant Release Inventory reporting.

Only the most significant sources of black carbon have been reported. It is estimated that emissions from these sources represent approximately 90% of the anthropogenic black carbon emissions in Canada.

Resources

References

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Environment and Climate Change Canada (2017) [Canada's Black Carbon Emission Inventory](#). Retrieved on July 21, 2017.

Related information

[Air Pollutant Emission Inventory](#)

[Air Pollutant Emission Inventory – online data search](#)

[Air pollution: drivers and impacts](#)

Annex

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

Table A.1. Data for Figure 1. Air pollutant emissions, Canada, 1990 to 2015

Year	Sulphur oxides (annual emissions as a percentage of 1990 levels)	Nitrogen oxides (annual emissions as a percentage of 1990 levels)	Volatile organic compounds (annual emissions as a percentage of 1990 levels)	Ammonia (annual emissions as a percentage of 1990 levels)	Carbon monoxide (annual emissions as a percentage of 1990 levels)	Fine particulate matter (annual emissions as a percentage of 1990 levels)
1990	0	0	0	0	0	0
1991	-7	-4	2	-1	-2	-2
1992	-11	-2	2	2	-3	-5
1993	-14	0	5	3	-1	-5
1994	-21	5	5	7	-3	-3
1995	-16	7	5	12	-6	-7
1996	-16	10	5	16	-8	-7
1997	-17	17	2	18	-10	-6
1998	-19	19	2	18	-9	-13
1999	-22	22	-3	18	-11	-13
2000	-22	20	-5	22	-13	-15
2001	-22	14	-12	22	-19	-17
2002	-24	12	-12	25	-20	-19
2003	-25	11	-14	23	-23	-21
2004	-26	5	-16	27	-28	-23
2005	-29	1	-20	26	-35	-24
2006	-35	-3	-24	24	-39	-24
2007	-37	-4	-26	24	-42	-21
2008	-43	-7	-27	21	-43	-18
2009	-52	-14	-32	18	-46	-25

Year	Sulphur oxides (annual emissions as a percentage of 1990 levels)	Nitrogen oxides (annual emissions as a percentage of 1990 levels)	Volatile organic compounds (annual emissions as a percentage of 1990 levels)	Ammonia (annual emissions as a percentage of 1990 levels)	Carbon monoxide (annual emissions as a percentage of 1990 levels)	Fine particulate matter (annual emissions as a percentage of 1990 levels)
2010	-55	-12	-32	16	-47	-20
2011	-58	-14	-35	15	-50	-19
2012	-59	-18	-34	19	-52	-15
2013	-59	-20	-34	23	-53	-16
2014	-61	-20	-33	21	-53	-16
2015	-66	-22	-36	22	-54	-18

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.2. Data for Figure 2. Distribution of air pollutant emissions by source, Canada, 2015

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	22.2	24.7	37.3	0.5	9.6	0.6
Manufacturing	4.5	3.9	5.9	2.4	2.4	1.1
Ore and mineral industries	45.8	4.3	0.7	0.3	9.2	2.0
Transportation (road, rail, air and marine)	1.7	43.6	8.0	1.4	29.7	1.3
Off-road vehicles and mobile equipment	<0.1	10.6	8.8	0.1	23.6	1.1
Building heating and energy generation	0.4	3.3	0.2	0.1	0.6	0.3
Electric utilities	23.9	8.0	0.1	0.1	0.7	0.2
Home firewood burning	0.3	1.0	12.4	0.4	21.3	10.0
Incineration and waste	0.3	0.3	0.7	0.9	0.3	0.2
Paints and solvents	<0.1	<0.1	17.5	n/a	<0.1	<0.1

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)
Agriculture (livestock, crop production and fertilizer)	0.9	0.2	5.3	93.8	<0.1	19.6
Dust and fires	<0.1	0.1	0.3	<0.1	2.4	62.3
Miscellaneous	<0.1	<0.1	2.8	0.1	0.2	1.0

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

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.3. Data for Figure 3. Distribution of air pollutant emissions by province and territory, Canada, 2015

Province or territory	Sulphur 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)
Newfoundland and Labrador	1.9	3.4	2.5	0.2	3.4	1.2
Prince Edward Island	<0.1	0.3	0.4	0.5	0.6	0.4
Nova Scotia	6.1	3.7	2.0	0.7	2.5	1.7
New Brunswick	2.1	1.7	1.7	0.7	2.2	1.5
Quebec	10.8	11.8	15.4	14.3	27.2	13.0
Ontario	24.1	16.4	19.5	17.2	24.9	16.9
Manitoba	14.6	2.5	3.7	12.4	3.5	5.0
Saskatchewan	10.3	7.6	12.4	21.1	5.6	19.4
Alberta	24.0	36.3	33.3	29.2	18.5	35.6
British Columbia	5.7	14.6	8.9	3.7	11.4	5.0
Yukon	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Northwest Territories and Nunavut	0.3	1.5	0.2	<0.1	0.2	0.2

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.4. Data for Figure 4. Total sulphur oxide emissions by source, Canada, 1990 to 2015

Year	Ore and mineral industries (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
1990	1484.0	618.5	534.3	429.6	3066.5
1991	1335.5	592.2	535.9	382.1	2845.7
1992	1170.2	610.8	575.7	370.7	2727.3
1993	1113.1	547.3	605.5	380.5	2646.3
1994	892.4	559.9	599.0	383.8	2435.1
1995	1106.5	532.8	594.4	329.7	2563.5
1996	1089.6	542.3	592.4	348.5	2572.8
1997	1032.5	591.5	549.1	357.0	2530.1
1998	1019.7	603.7	515.3	350.7	2489.4
1999	925.5	601.3	512.7	357.3	2396.7
2000	915.9	619.2	508.2	359.4	2402.8
2001	912.8	624.0	493.5	355.1	2385.4
2002	906.5	616.4	459.2	351.2	2333.4
2003	812.5	635.0	480.0	359.1	2286.6
2004	867.4	559.0	473.2	359.9	2259.5
2005	859.0	525.9	469.6	336.1	2190.6
2006	830.9	459.0	431.7	269.8	1991.3
2007	781.5	491.9	403.6	257.6	1934.6
2008	717.7	427.5	378.0	224.8	1748.0
2009	524.9	384.1	368.1	201.3	1478.3
2010	503.7	334.0	337.1	196.5	1371.4
2011	469.0	293.3	327.5	197.8	1287.6
2012	478.2	284.3	318.4	190.8	1271.7
2013	492.1	278.2	301.3	186.3	1257.9

Year	Ore and mineral industries (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
2014	487.2	269.2	263.6	188.4	1208.4
2015	482.9	251.6	234.3	85.6	1054.4

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from transportation (road, rail, air and marine), off-road vehicles and mobile equipment, home firewood burning, incineration and waste, agriculture (livestock, crop production and fertilizer), dust and fires, paints and solvents, building heating and energy generation, manufacturing, and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.5. Data for Figure 5. Sulphur oxide emissions by province and territory, Canada, 1990 and 2015

Province or territory	1990 (emissions in kilotonnes)	2015 (emissions in kilotonnes)
Newfoundland and Labrador	77.0	20.5
Prince Edward Island	3.7	0.2
Nova Scotia	213.5	63.8
New Brunswick	109.1	22.1
Quebec	261.2	113.9
Ontario	1132.7	254.4
Manitoba	509.2	153.8
Saskatchewan	96.7	108.3
Alberta	515.9	253.3
British Columbia	128.2	60.5
Yukon	0.7	0.1
Northwest Territories and Nunavut	18.5	3.5

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.6. Data for Figure 6. Total nitrogen oxide emissions by source, Canada, 1990 to 2015

Year	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
1990	1063.2	344.8	397.4	360.9	253.3	2419.5
1991	985.4	338.0	382.0	358.6	248.0	2312.1
1992	1029.6	353.9	374.2	366.7	257.9	2382.3
1993	1044.7	379.5	382.8	380.7	237.2	2425.0
1994	1120.6	411.3	389.7	383.7	233.2	2538.4
1995	1128.4	427.2	388.0	409.8	243.7	2597.0
1996	1143.4	440.4	384.9	436.5	264.8	2670.0
1997	1234.6	483.7	383.7	443.4	282.5	2827.9
1998	1321.0	494.9	370.7	390.6	302.4	2879.7
1999	1375.4	513.0	373.5	380.8	298.2	2940.9
2000	1380.9	458.1	376.3	378.7	307.7	2901.7
2001	1327.4	457.0	355.0	328.4	296.0	2763.8
2002	1260.4	455.9	377.6	317.3	300.0	2711.2
2003	1186.1	506.1	371.7	334.9	283.7	2682.6
2004	1152.0	435.3	361.4	335.7	255.6	2540.0
2005	1133.2	436.3	338.1	302.3	245.8	2455.6
2006	1087.0	455.1	296.0	279.7	224.6	2342.4
2007	1054.4	466.1	282.3	281.0	239.1	2322.8
2008	1013.7	470.2	261.2	271.9	225.4	2242.4
2009	906.9	469.7	233.8	257.3	218.2	2085.8
2010	916.4	460.4	242.3	274.5	233.9	2127.5
2011	908.2	471.3	248.6	247.6	200.1	2075.8
2012	887.3	459.0	246.2	218.4	166.3	1977.1
2013	869.5	459.5	240.8	210.7	161.9	1942.5

Year	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
2014	844.2	471.1	244.3	201.4	166.8	1927.8
2015	824.8	467.4	248.2	201.4	151.9	1893.8

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from ore and mineral industries, manufacturing, building heating and energy generation, home firewood burning, incineration and waste, agriculture (livestock, crop production and fertilizer), dust and fires, paints and solvents, and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.7. Data for Figure 7. Nitrogen oxide emissions by province and territory, Canada, 1990 and 2015

Province or territory	1990 (emissions in kilotonnes)	2015 (emissions in kilotonnes)
Newfoundland and Labrador	59.0	64.3
Prince Edward Island	7.1	4.9
Nova Scotia	101.4	70.7
New Brunswick	82.5	32.4
Quebec	347.3	223.5
Ontario	624.4	311.5
Manitoba	71.5	47.7
Saskatchewan	143.3	144.0
Alberta	645.3	688.3
British Columbia	318.0	276.4
Yukon	3.7	1.0
Northwest Territories and Nunavut	16.2	29.1

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.8. Data for Figure 8. Total volatile organic compound emissions by source, Canada, 1990 to 2015

Year	Oil and gas industry (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
1990	587.5	357.5	356.5	266.7	646.3	410.9	260.5	2885.9
1991	582.7	350.0	351.4	265.8	768.8	378.4	257.4	2954.6
1992	597.0	352.2	335.9	251.3	777.0	372.3	257.7	2943.4
1993	623.8	351.4	352.1	272.6	779.6	361.9	275.0	3016.4
1994	637.0	362.1	358.4	268.8	768.6	363.8	276.6	3035.4
1995	649.2	375.2	342.1	266.7	778.8	347.3	269.3	3028.6
1996	677.3	373.0	338.4	257.1	771.0	337.4	270.2	3024.5
1997	667.6	374.9	322.6	248.6	715.2	340.9	265.0	2934.8
1998	680.4	377.5	342.0	251.6	664.5	353.4	271.4	2940.7
1999	640.2	389.5	325.0	247.7	574.2	362.9	270.2	2809.8
2000	657.5	395.9	313.6	245.2	521.4	351.9	263.2	2748.7
2001	665.7	375.7	289.7	239.7	407.8	314.5	239.8	2532.9
2002	672.3	368.4	313.2	237.6	404.2	318.3	238.7	2552.7
2003	672.8	370.0	269.5	251.0	390.6	297.4	220.7	2471.8
2004	660.1	366.4	261.5	243.0	400.2	283.4	202.9	2417.3
2005	661.2	366.2	246.3	240.2	347.5	251.8	194.2	2307.5
2006	660.7	351.5	237.7	210.2	335.8	234.9	168.1	2198.9
2007	654.7	349.5	234.9	203.7	324.8	225.9	154.7	2148.2
2008	663.4	340.6	235.3	198.5	306.8	233.8	138.0	2116.2
2009	624.4	310.2	224.3	196.0	292.5	197.8	117.6	1962.9
2010	629.6	316.7	235.9	193.4	283.2	191.5	122.8	1973.0
2011	624.6	304.5	235.2	192.6	211.3	175.8	120.5	1864.6

Year	Oil and gas industry (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
2012	681.8	309.6	234.4	189.5	188.4	168.1	120.8	1892.5
2013	729.2	313.6	233.0	183.9	171.7	162.4	119.9	1913.8
2014	747.4	323.1	231.5	191.0	170.5	152.6	113.7	1929.9
2015	693.4	325.7	230.0	188.1	163.3	148.3	109.8	1858.7

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from incineration and waste, ore and mineral industries, dust and fires, building heating and energy generation, electric utilities, agriculture (livestock, crop production and fertilizer) and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.9. Data for Figure 9. Volatile organic compound emissions by province and territory, Canada, 1990 and 2015

Province or territory	1990 (emissions in kilotonnes)	2015 (emissions in kilotonnes)
Newfoundland and Labrador	92.5	46.4
Prince Edward Island	22.2	7.6
Nova Scotia	63.7	37.8
New Brunswick	54.4	31.2
Quebec	500.2	286.6
Ontario	813.5	362.6
Manitoba	145.1	67.9
Saskatchewan	195.9	229.6
Alberta	640.8	619.7
British Columbia	339.5	164.9
Yukon	5.9	0.9
Northwest Territories and Nunavut	12.0	3.5

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.10. Data for Figure 10. Total ammonia emissions by source, Canada, 1990 to 2015

Year	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
1990	358.2	20.0	14.3	5.5	398.0
1991	355.9	19.1	14.3	5.8	395.1
1992	368.1	19.0	14.2	6.3	407.7
1993	371.1	18.5	15.0	7.3	411.9
1994	383.5	20.0	15.1	8.1	426.6
1995	402.2	19.0	14.8	8.5	444.6
1996	417.6	20.7	14.6	9.1	462.0
1997	424.1	20.9	14.8	9.9	469.6
1998	424.5	20.8	14.9	10.6	470.8
1999	423.4	21.5	14.5	11.3	470.6
2000	434.0	23.2	15.1	11.5	483.7
2001	438.8	19.9	14.4	11.9	484.9
2002	442.8	21.7	21.9	11.5	497.9
2003	449.2	17.7	13.3	11.2	491.4
2004	464.1	17.6	12.4	11.0	505.1
2005	461.4	17.0	13.4	10.6	502.4
2006	453.8	16.1	11.8	10.0	491.8
2007	457.8	16.1	10.9	9.7	494.4
2008	448.6	13.6	12.2	9.1	483.4
2009	435.4	12.6	11.9	8.6	468.5
2010	428.9	11.5	12.7	8.4	461.5
2011	427.6	11.8	12.3	8.0	459.7

Year	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
2012	444.0	12.0	11.5	7.6	475.0
2013	457.3	11.3	12.5	7.5	488.7
2014	452.2	11.4	12.9	7.1	483.6
2015	454.9	11.7	11.7	6.9	485.2

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from incineration and waste, the oil and gas industry, home firewood burning, ore and mineral industries, electric utilities, building heating and energy generation, off-road vehicles and mobile equipment, dust and fires, paints and solvents, and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.
Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.11. Data for Figure 11. Ammonia emissions by province and territory, Canada, 1990 and 2015

Province or territory	1990 (emissions in kilotonnes)	2015 (emissions in kilotonnes)
Newfoundland and Labrador	1.0	0.8
Prince Edward Island	3.5	2.4
Nova Scotia	5.0	3.5
New Brunswick	4.5	3.3
Quebec	67.6	69.2
Ontario	106.8	83.7
Manitoba	38.9	60.2
Saskatchewan	49.8	102.3
Alberta	97.8	141.6
British Columbia	23.2	18.2
Yukon	<0.1	<0.1
Northwest Territories and Nunavut	<0.1	<0.1

Note: The indicator reports air pollutant emissions from human activities only.
Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.12. Data for Figure 12. Total carbon monoxide emissions by source, Canada, 1990 to 2015

Year	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
1990	5821.0	2042.6	1660.4	2305.4	334.6	12 164.0
1991	5098.6	2404.6	1636.4	2402.1	323.0	11 864.7
1992	5176.8	2463.3	1564.8	2228.6	337.6	11 771.2
1993	5131.5	2480.4	1637.9	2419.7	361.3	12 030.9
1994	4876.5	2455.5	1668.5	2366.4	397.9	11 764.7
1995	4494.1	2530.2	1593.1	2404.3	406.7	11 428.6
1996	4457.9	2572.9	1573.8	2147.6	419.3	11 171.4
1997	4659.5	2436.3	1502.7	1880.3	469.4	10 948.2
1998	4858.5	2332.8	1597.0	1792.3	486.8	11 067.4
1999	5017.2	2103.7	1521.8	1719.7	499.1	10 861.7
2000	5062.4	2003.6	1472.7	1641.3	443.9	10 623.9
2001	4705.7	1740.5	1364.1	1530.9	470.8	9812.1
2002	4428.6	1820.5	1482.7	1451.4	502.7	9686.0
2003	4185.5	1848.5	1278.9	1531.8	544.3	9389.0
2004	3863.6	1964.0	1247.9	1231.0	510.2	8816.7
2005	3141.7	1851.2	1180.0	1197.5	499.1	7869.6
2006	2842.3	1874.6	1144.8	1011.3	512.8	7385.8
2007	2638.9	1824.5	1146.8	953.7	527.0	7090.9
2008	2496.7	1753.4	1161.2	963.3	544.4	6919.0
2009	2294.7	1680.0	1121.1	916.9	532.9	6545.6
2010	2161.3	1650.5	1193.9	896.3	528.7	6430.9
2011	1933.0	1487.1	1204.2	887.2	536.5	6048.1

Year	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
2012	1842.9	1349.3	1213.9	916.7	526.5	5849.3
2013	1803.7	1314.3	1206.3	852.1	553.1	5729.5
2014	1705.9	1359.8	1198.2	905.4	539.6	5708.8
2015	1659.3	1323.0	1190.3	883.0	539.3	5594.9

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources" includes emissions from dust and fires, electric utilities, building heating and energy generation, incineration and waste, agriculture (livestock, crop production and fertilizer), paints and solvents, ore and mineral industries, manufacturing and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.13. Data for Figure 13. Carbon monoxide emissions by province and territory, Canada, 1990 and 2015

Province or territory	1990 (emissions in kilotonnes)	2015 (emissions in kilotonnes)
Newfoundland and Labrador	294.5	187.7
Prince Edward Island	76.6	30.9
Nova Scotia	316.9	142.2
New Brunswick	293.0	125.6
Quebec	2543.3	1519.8
Ontario	3416.8	1395.5
Manitoba	458.5	195.5
Saskatchewan	564.9	311.2
Alberta	1820.4	1036.5
British Columbia	2340.8	637.7
Yukon	19.6	2.3
Northwest Territories and Nunavut	18.8	9.8

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.14. Data for Figure 14. Total fine particulate matter emissions by source, Canada, 1990 to 2015

Year	Dust and fires (emissions in kilotonnes)	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
1990	673.0	678.0	262.1	353.6	1966.7
1991	666.0	670.9	258.4	328.6	1923.8
1992	640.0	656.2	247.0	320.0	1863.2
1993	651.4	641.9	258.5	317.2	1869.0
1994	706.9	627.4	263.1	316.8	1914.1
1995	649.9	612.8	251.2	314.9	1828.9
1996	665.2	598.5	248.0	308.0	1819.7
1997	729.1	584.5	234.8	306.4	1854.8
1998	604.7	570.8	247.0	295.0	1717.5
1999	637.4	557.1	232.9	291.1	1718.5
2000	624.8	543.6	223.2	289.5	1681.1
2001	641.9	530.2	204.2	259.8	1636.1
2002	620.0	510.1	219.2	234.9	1584.2
2003	650.2	490.0	186.4	228.9	1555.5
2004	643.4	469.4	179.2	219.7	1511.6
2005	662.2	449.4	166.8	216.0	1494.5
2006	715.5	429.2	158.8	190.2	1493.8
2007	790.0	415.8	158.5	184.9	1549.3
2008	875.0	402.4	160.3	177.4	1615.2
2009	774.5	389.3	154.4	163.1	1481.3
2010	861.4	376.5	163.8	164.1	1565.7
2011	911.6	363.2	164.8	154.0	1593.5

Year	Dust and fires (emissions in kilotonnes)	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Total national emissions (emissions in kilotonnes)
2012	1006.2	350.7	165.8	146.8	1669.4
2013	1001.9	338.5	164.7	144.7	1649.9
2014	1011.3	327.7	163.6	143.1	1645.6
2015	1009.8	318.3	162.5	130.3	1620.9

Note: The indicator reports air pollutant emissions from human activities only. The category "other sources", presented in the following table, includes emissions from ore and mineral industries, transportation (road, rail, air and marine), manufacturing, off-road vehicles and mobile equipment, the oil and gas industry, building heating and energy generation, electric utilities, incineration and wastes, paints and solvents, and other miscellaneous sources. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Total fine particulate matter emissions from other sources, Canada, 1990 to 2015

Year	Ore and mineral industries (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Miscellaneous sources (emissions in kilotonnes)	Oil and gas (emissions in kilotonnes)	Building heating and energy generation (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Incineration and wastes (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)
1990	59.5	42.1	116.0	50.8	14.8	12.4	4.6	48.3	5.0	<0.1
1991	56.1	38.5	104.7	51.3	13.0	12.1	4.6	43.3	5.0	<0.1
1992	53.5	38.1	101.6	51.2	13.0	12.3	4.7	40.5	5.1	<0.1
1993	53.3	39.6	102.4	53.4	13.3	12.9	4.9	32.3	5.2	<0.1
1994	55.0	42.4	102.7	54.3	13.7	13.6	4.9	24.7	5.5	<0.1
1995	55.3	40.6	103.6	56.3	14.2	14.2	4.7	20.6	5.4	<0.1
1996	56.5	39.1	95.5	59.5	14.2	14.2	5.1	18.8	5.1	<0.1
1997	58.2	41.3	87.8	60.0	14.6	14.6	4.9	20.0	5.0	<0.1
1998	54.9	42.9	83.2	53.8	15.3	16.0	4.5	19.6	4.8	<0.1
1999	53.3	42.6	83.2	51.7	15.9	13.8	4.7	21.3	4.6	<0.1
2000	55.6	43.4	78.5	50.2	16.3	13.4	5.2	22.5	4.4	<0.1
2001	52.1	42.6	65.1	41.9	16.5	13.4	5.0	18.7	4.4	<0.1
2002	42.6	41.4	56.3	40.1	16.7	13.8	5.2	14.3	4.4	<0.1
2003	41.4	41.4	55.4	40.8	17.0	13.1	5.5	10.6	3.9	<0.1
2004	40.5	41.6	49.8	40.3	17.5	12.1	5.3	9.0	3.8	<0.1

Year	Ore and mineral industries (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Miscellaneous sources (emissions in kilotonnes)	Oil and gas (emissions in kilotonnes)	Building heating and energy generation (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Incineration and wastes (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)
2005	45.5	43.8	44.0	35.0	17.8	12.4	5.2	8.7	3.7	<0.1
2006	43.9	42.0	28.0	32.1	17.9	12.4	4.8	6.1	3.1	<0.1
2007	41.6	40.2	26.8	31.8	17.9	11.4	5.1	7.0	3.1	<0.1
2008	40.1	39.0	23.9	30.8	18.3	10.3	5.1	6.9	3.0	<0.1
2009	34.4	35.6	21.8	29.0	18.4	9.8	5.0	6.1	3.1	<0.1
2010	37.5	35.4	19.9	30.4	18.1	9.4	4.7	5.7	3.1	<0.1
2011	35.3	34.2	20.9	24.6	17.3	9.6	5.0	4.3	2.9	<0.1
2012	34.6	33.1	20.3	21.3	17.4	9.6	4.5	3.2	2.7	<0.1
2013	33.7	32.3	20.7	20.0	17.2	10.2	4.8	3.2	2.7	<0.1
2014	34.0	31.4	19.0	18.9	16.6	11.5	5.1	4.0	2.7	<0.1
2015	33.0	21.9	18.5	18.5	16.5	10.4	5.1	3.8	2.7	<0.1

Note: The indicator reports air pollutant emissions from human activities only. Consult Table 2 for a complete list of the air pollutant emissions sources included under each category.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.15. Data for Figure 15. Fine particulate matter emissions by province and territory, Canada, 1990 and 2015

Province or territory	1990 (emissions in kilotonnes)	2015 (emissions in kilotonnes)	1990, excluding open sources ^[A] (emissions in kilotonnes)	2015, excluding open sources ^[A] (emissions in kilotonnes)
Newfoundland and Labrador	28.5	19.8	19.4	8.8
Prince Edward Island	7.3	5.9	3.5	2.5
Nova Scotia	40.3	27.7	25.1	13.9
New Brunswick	40.0	25.0	23.6	10.1
Quebec	249.2	210.6	159.0	97.2
Ontario	323.0	274.1	155.3	75.4
Manitoba	104.9	81.6	17.4	8.1
Saskatchewan	479.3	314.9	25.4	11.5
Alberta	509.8	576.5	77.1	32.6
British Columbia	177.1	80.9	107.7	31.4
Yukon	3.2	0.7	0.4	0.1
Northwest Territories and Nunavut	4.1	3.2	1.6	1.1

^[A] Open sources include emissions associated with dust and fires and agriculture (livestock, crop production and fertilizer).

Note: The indicator reports air pollutant emissions from human activities only.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.16. Data for Figure 16. Black carbon emissions by source, Canada, 2015

Source	2015 (emissions in kilotonnes)	2015 (percentage of national emissions)
Home firewood burning	11.5	30.1
Off-road vehicles and mobile equipment	11.4	29.7
Transportation (road, rail, air and marine)	10.6	27.6
Oil and gas industry	2.6	6.7

Source	2015 (emissions in kilotonnes)	2015 (percentage of national emissions)
Other sources	1.2	3.0
Building heating and energy generation	1.1	2.8

Note: The indicator reports air pollutant emissions from human activities only. The table includes emissions from the most significant sources of black carbon. "Other sources" includes emissions from ore and mineral industries, manufacturing, electric utilities and agriculture. Consult the [Data sources and methods](#) section for more details.

Source: Environment and Climate Change Canada (2017) [Canada's Black Carbon Emission Inventory](#).

Table A.17. Data for Figure 17. Contribution of transportation, off-road vehicles and mobile equipment to national air pollutant emissions by transportation mode, Canada, 2015

Transportation mode	Carbon monoxide (percentage of national emissions)	Nitrogen oxides (percentage of national emissions)	Volatile organic compounds (percentage of national emissions)	Fine particulate matter (percentage of national emissions)	Sulphur oxides (percentage of national emissions)	Ammonia (percentage of national emissions)
Passenger cars and motorcycles	8.7	2.3	2.5	0.1	< 0.1	0.6
Passenger light trucks	11.1	3.2	2.7	0.1	0.1	0.5
Large trucks and buses	8.4	15.1	1.6	0.6	< 0.1	0.2
Air, marine and rail travel	1.5	23.0	1.2	0.5	1.6	0.1
Off-road vehicles and equipment, tire wear and brake lining	23.6	10.6	8.8	1.2	< 0.1	0.1

Note: "Passenger cars and motorcycles" include light-duty vehicles powered by motor gasoline, diesel, liquefied petroleum gas and compressed natural gas engines as well as all types of motorcycles. "Passenger light trucks" include light-duty trucks powered by motor gasoline, diesel, liquefied petroleum gas and compressed natural gas engines. "Large trucks and buses" include heavy-duty trucks powered by motor gasoline, diesel, liquefied petroleum gas and compressed natural gas engines.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Emissions of air pollutants from transportation, off-road vehicles and mobile equipment by transportation mode, Canada, 2015

Transportation mode	Carbon monoxide (kilotonnes)	Nitrogen oxides (kilotonnes)	Volatile organic compounds (kilotonnes)	Fine particulate matter (kilotonnes)	Sulphur oxides (kilotonnes)	Ammonia (kilotonnes)
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Transportation mode	Carbon monoxide (kilotonnes)	Nitrogen oxides (kilotonnes)	Volatile organic compounds (kilotonnes)	Fine particulate matter (kilotonnes)	Sulphur oxides (kilotonnes)	Ammonia (kilotonnes)
Passenger cars and motorcycles	486	43	46	1	< 1	3
Passenger light trucks	619	61	49	1	1	3
Large trucks and buses	468	285	30	10	< 1	1
Air, marine and rail travel	86	436	22	8	17	< 1
Off-road vehicles and equipment, tire wear and brake lining	1323	201	163	20	< 1	< 1

Note: "Passenger cars and motorcycles" include light-duty vehicles powered by motor gasoline, diesel, liquefied petroleum gas and compressed natural gas engines as well as all types of motorcycles. "Passenger light trucks" include light-duty trucks powered by motor gasoline, diesel, liquefied petroleum gas and compressed natural gas engines. "Large trucks and buses" include heavy-duty trucks powered by motor gasoline, diesel, liquefied petroleum gas and compressed natural gas engines.
Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.18. Data for Figure 18. Changes in emissions of key air pollutants from transportation, off-road vehicles and mobile equipment, Canada, 1990 to 2015

Year	Nitrogen oxides (emissions changes as a percentage of 1990 levels)	Carbon monoxide (emissions changes as a percentage of 1990 levels)	Volatile organic compounds (emissions changes as a percentage of 1990 levels)
1990	0	0	0
1991	-6	-5	9
1992	-2	-3	9
1993	0	-3	8
1994	6	-7	7
1995	8	-11	7
1996	11	-11	5
1997	18	-10	0
1998	20	-9	-4
1999	23	-9	-11

Year	Nitrogen oxides (emissions changes as a percentage of 1990 levels)	Carbon monoxide (emissions changes as a percentage of 1990 levels)	Volatile organic compounds (emissions changes as a percentage of 1990 levels)
2000	24	-10	-17
2001	16	-18	-32
2002	11	-21	-32
2003	7	-23	-35
2004	4	-26	-35
2005	1	-37	-43
2006	-4	-40	-46
2007	-6	-43	-48
2008	-10	-46	-49
2009	-18	-49	-54
2010	-16	-52	-55
2011	-19	-57	-63
2012	-22	-59	-66
2013	-24	-60	-68
2014	-27	-61	-69
2015	-28	-62	-71

Note: Fine particulate matter, sulphur oxides and ammonia are not shown due to their low share ($\leq 5\%$) of total emissions in 2015.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Emissions of key air pollutants from transportation, off-road vehicles and mobile equipment, Canada, 1990 to 2015

Year	Nitrogen oxides (kilotonnes)	Carbon monoxide (kilotonnes)	Volatile organic compounds (kilotonnes)
1990	1424	7864	1057
1991	1344	7503	1147
1992	1396	7640	1149
1993	1425	7612	1141

Year	Nitrogen oxides (kilotonnes)	Carbon monoxide (kilotonnes)	Volatile organic compounds (kilotonnes)
1994	1504	7332	1132
1995	1538	7024	1126
1996	1580	7031	1108
1997	1678	7096	1056
1998	1712	7191	1018
1999	1756	7121	937
2000	1760	7066	873
2001	1656	6446	722
2002	1578	6249	723
2003	1521	6034	688
2004	1488	5828	684
2005	1435	4993	599
2006	1367	4717	571
2007	1335	4463	551
2008	1286	4250	541
2009	1164	3975	490
2010	1191	3812	475
2011	1156	3420	387
2012	1106	3192	356
2013	1080	3118	334
2014	1046	3066	323
2015	1026	2982	312

Note: Fine particulate matter, sulphur oxides and ammonia are not shown due to their low share ($\leq 5\%$) of total emissions in 2015.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.19. Data for Figure 19. Contribution of electric utilities to national air pollutant emissions by fuel source, Canada, 2015

Fuel source	Sulphur oxides (percentage of national emissions)	Nitrogen oxides (percentage of national emissions)	Carbon monoxide (percentage of national emissions)	Fine particulate matter (percentage of national emissions)	Volatile organic compounds (percentage of national emissions)	Ammonia (percentage of national emissions)
Coal	22.9	6.1	0.3	0.2	<0.1	<0.1
Natural gas	0.2	0.9	0.2	<0.1	<0.1	<0.1
Diesel	<0.1	0.5	<0.1	<0.1	0	<0.1
Other	0.7	0.6	0.1	<0.1	<0.1	<0.1

Note: Excludes emissions from industries that generate electricity and heat as a supporting activity rather than as their primary purpose. "Other" fuel sources include waste material and other uncategorized sources of electricity generation.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Emissions of air pollutants from electric utilities by fuel source, Canada, 2015

Fuel source	Sulphur oxides (kilotonnes)	Nitrogen oxides (kilotonnes)	Carbon monoxide (kilotonnes)	Fine particulate matter (kilotonnes)	Volatile organic compounds (kilotonnes)	Ammonia (kilotonnes)
Coal	242	115	16	3	< 1	< 1
Natural gas	2	16	14	< 1	1	< 1
Diesel	< 1	9	1	< 1	< 1	< 1
Other	8	12	8	< 1	1	< 1

Note: Excludes emissions from industries that generate electricity and heat as a supporting activity rather than as their primary purpose. "Other" fuel sources include waste material and other uncategorized sources of electricity generation.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.20. Data for Figure 20. Changes in emissions of key air pollutants from electric utilities, Canada, 1990 to 2015

Year	Nitrogen oxides (emissions changes as a percentage of 1990 levels)	Sulphur oxides (emissions changes as a percentage of 1990 levels)
1990	0	0
1991	-2	-4
1992	2	-1
1993	-6	-12

Year	Nitrogen oxides (emissions changes as a percentage of 1990 levels)	Sulphur oxides (emissions changes as a percentage of 1990 levels)
1994	-8	-9
1995	-4	-14
1996	5	-12
1997	12	-4
1998	19	-2
1999	18	-3
2000	21	0
2001	17	1
2002	18	0
2003	12	3
2004	1	-10
2005	-3	-15
2006	-11	-26
2007	-6	-20
2008	-11	-31
2009	-14	-38
2010	-8	-46
2011	-21	-53
2012	-34	-54
2013	-36	-55
2014	-34	-56
2015	-40	-59

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown due to their low share ($\leq 1\%$) of total emissions in 2015. Excludes emissions from industries that generate electricity and heat as a supporting activity rather than as their primary purpose.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Emissions of key air pollutants from electric utilities, Canada, 1990 to 2015

Year	Nitrogen oxides (kilotonnes)	Sulphur oxides (kilotonnes)
1990	253	618
1991	248	592
1992	258	611
1993	237	547
1994	233	560
1995	244	533
1996	265	542
1997	282	591
1998	302	604
1999	298	601
2000	308	619
2001	296	624
2002	300	616
2003	284	635
2004	256	559
2005	246	526
2006	225	459
2007	239	492
2008	225	428
2009	218	384
2010	234	334
2011	200	293
2012	166	284
2013	162	278
2014	167	269
2015	152	252

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown due to their low share ($\leq 1\%$) of total emissions in 2015. Excludes emissions from industries that generate electricity and heat as a supporting activity rather than as their primary purpose.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.21. Data for Figure 21. Contribution of the oil and gas industry to national air pollutant emissions, Canada, 2015

Activity type	Volatile organic compounds (percentage of national emissions)	Sulphur oxides (percentage of national emissions)	Nitrogen oxides (percentage of national emissions)	Carbon monoxide (percentage of national emissions)	Fine particulate matter (percentage of national emissions)	Ammonia (percentage of national emissions)
Upstream oil and gas	35.9	17.9	22.6	9.0	0.5	0.4
Downstream oil and gas	1.4	4.3	2.0	0.6	0.1	<0.1

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Emissions of air pollutants from the oil and gas industry, Canada, 2015

Activity type	Volatile organic compounds (kilotonnes)	Sulphur oxides (kilotonnes)	Nitrogen oxides (kilotonnes)	Carbon monoxide (kilotonnes)	Fine particulate matter (kilotonnes)	Ammonia (kilotonnes)
Upstream oil and gas	668	189	429	506	9	2
Downstream oil and gas	25	45	39	34	2	< 1

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Table A.22. Data for Figure 22. Changes in emissions of key air pollutants from the oil and gas industry, Canada, 1990 to 2015

Year	Carbon monoxide (emissions changes as a percentage of 1990 levels)	Nitrogen oxides (emissions changes as a percentage of 1990 levels)	Volatile organic compounds (emissions changes as a percentage of 1990 levels)	Sulphur oxides (emissions changes as a percentage of 1990 levels)
1990	0	0	0	0
1991	-3	-2	-1	0
1992	1	3	2	8
1993	8	10	6	13

Year	Carbon monoxide (emissions changes as a percentage of 1990 levels)	Nitrogen oxides (emissions changes as a percentage of 1990 levels)	Volatile organic compounds (emissions changes as a percentage of 1990 levels)	Sulphur oxides (emissions changes as a percentage of 1990 levels)
1994	19	19	8	12
1995	22	24	10	11
1996	25	28	15	11
1997	40	40	14	3
1998	45	44	16	-4
1999	49	49	9	-4
2000	33	33	12	-5
2001	41	33	13	-8
2002	50	32	14	-14
2003	63	47	15	-10
2004	52	26	12	-11
2005	49	27	13	-12
2006	53	32	12	-19
2007	57	35	11	-24
2008	63	36	13	-29
2009	59	36	6	-31
2010	58	34	7	-37
2011	60	37	6	-39
2012	57	33	16	-40
2013	65	33	24	-44
2014	61	37	27	-51
2015	61	36	18	-56

Note: Fine particulate matter and ammonia are not shown due to their low share ($\leq 1\%$) of total emissions in 2015.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

Emissions of key air pollutants from the oil and gas industry, Canada, 1990 to 2015

Year	Carbon monoxide (kilotonnes)	Nitrogen oxides (kilotonnes)	Volatile organic compounds (kilotonnes)	Sulphur oxides (kilotonnes)
1990	335	345	588	534
1991	323	338	583	536
1992	338	354	597	576
1993	361	380	624	606
1994	398	411	637	599
1995	407	427	649	594
1996	419	440	677	592
1997	469	484	668	549
1998	487	495	680	515
1999	499	513	640	513
2000	444	458	658	508
2001	471	457	666	493
2002	503	456	672	459
2003	544	506	673	480
2004	510	435	660	473
2005	499	436	661	470
2006	513	455	661	432
2007	527	466	655	404
2008	544	470	663	378
2009	533	470	624	368
2010	529	460	630	337
2011	537	471	625	328
2012	527	459	682	318
2013	553	460	729	301
2014	540	471	747	264

Year	Carbon monoxide (kilotonnes)	Nitrogen oxides (kilotonnes)	Volatile organic compounds (kilotonnes)	Sulphur oxides (kilotonnes)
2015	539	467	693	234

Note: Fine particulate matter and ammonia are not shown due to their low share ($\leq 1\%$) of total emissions in 2015.

Source: Environment and Climate Change Canada (2017) [Air Pollutant Emission Inventory](#).

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