AIR POLLUTANT EMISSIONS

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

Canada

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CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS
AIR POLLUTANT EMISSIONS

June 2022

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Air pollutant emissions

Air pollution problems, such as smog and acid rain, result from the release of pollutants into the atmosphere. These pollutants can affect Canadians' health, the environment, buildings, structures and the economy. The majority of these pollutants are released through human activities, such as transportation, the burning of fuels for electricity and heating, and a variety of industrial activities. The indicators on sulphur oxides (SO_X), nitrogen oxides (NO_X), volatile organic compounds (VOCs), carbon monoxide (CO), ammonia (NH_3), fine particulate matter ($PM_{2.5}$) and black carbon, a component of $PM_{2.5}$, report emissions released through human activities.

The latest year reported in the indicators (2020) was marked by the 1st year of the COVID-19 pandemic. This coincides with observed emission decreases between the years 2019 and 2020 for almost all pollutants with the exception of NH_3. The long-term trends presented must be interpreted with caution as the economic slowdown influenced the results.

National air pollutant trends

This section presents a summary of Canada's emissions of 6 key air pollutants between 1990 to 2020 along with highlights of the main sources and provincial and territorial distributions for 2020. Detailed analysis by pollutant, including black carbon, along with information on emissions from 3 of the largest source sectors in Canada is presented following the indicators.

Key results

- In 2020, emissions of 5 key air pollutants were lower than in 1990:
  - SO_X 78% lower,
  - NO_X 36% lower,
  - VOCs 49% lower,
  - CO 59% lower, and
  - $PM_{2.5}$ 15% lower
- Emissions of NH_3 were 24% higher in 2020 than in 1990

Figure 1. Air pollutant emissions, Canada, 1990 to 2020

Percentage change from 1990 level
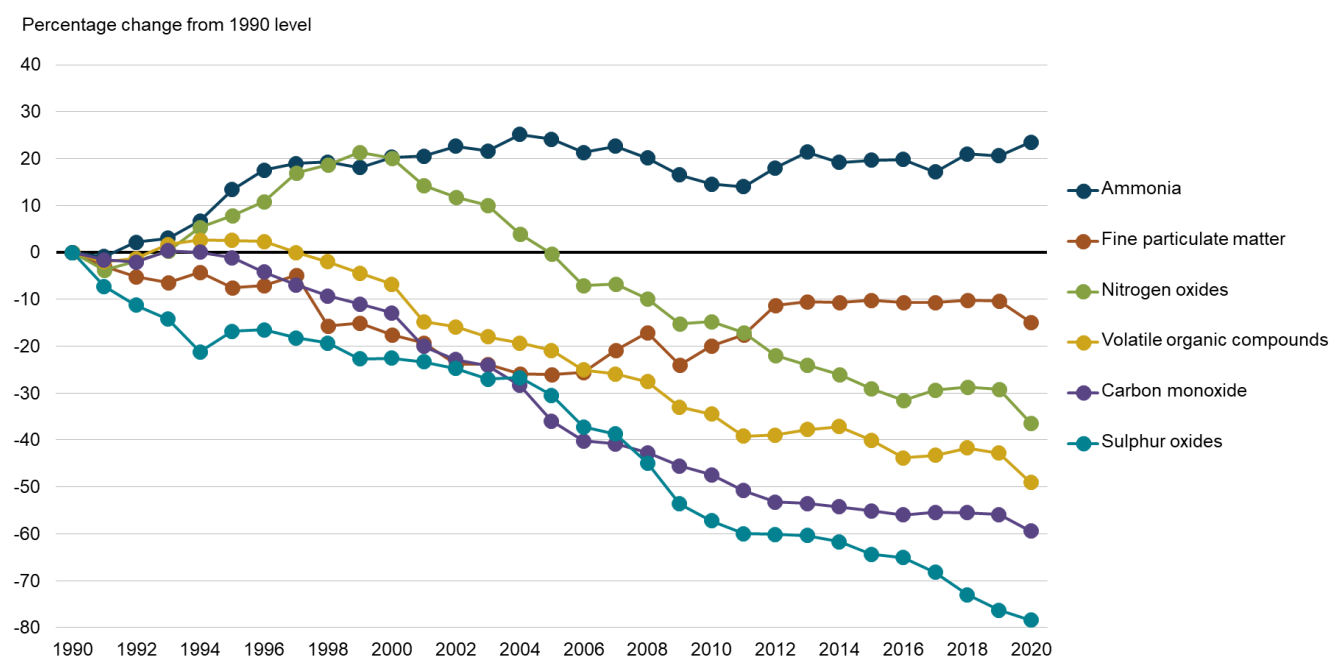
Data for Figure 1

Note: This indicator reports emissions of 6 key air pollutants from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. Emissions from black carbon, a component of $PM_{2.5}$, are also not included. Consult the black carbon section for a detailed analysis of the pollutant or the interactive figures to explore the national results and emissions from black carbon in a dynamic and customizable format.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Between 1990 and 2020, the largest emission reductions were observed for SO_X, which decreased by 78%. It was followed by CO emissions (59% reduction), VOCs (49%), NO_X (36%) and $PM_{2.5}$ (15%). 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.

Air pollutant emissions by source

Key results

- In 2020, the largest sources of emissions of the 6 key air pollutants in Canada were the oil and gas industry, transportation, agriculture, and dust and fires (for example, road dust, dust from construction operations and prescribed burning).

Figure 2. Distribution of air pollutant emissions by source, Canada, 2020
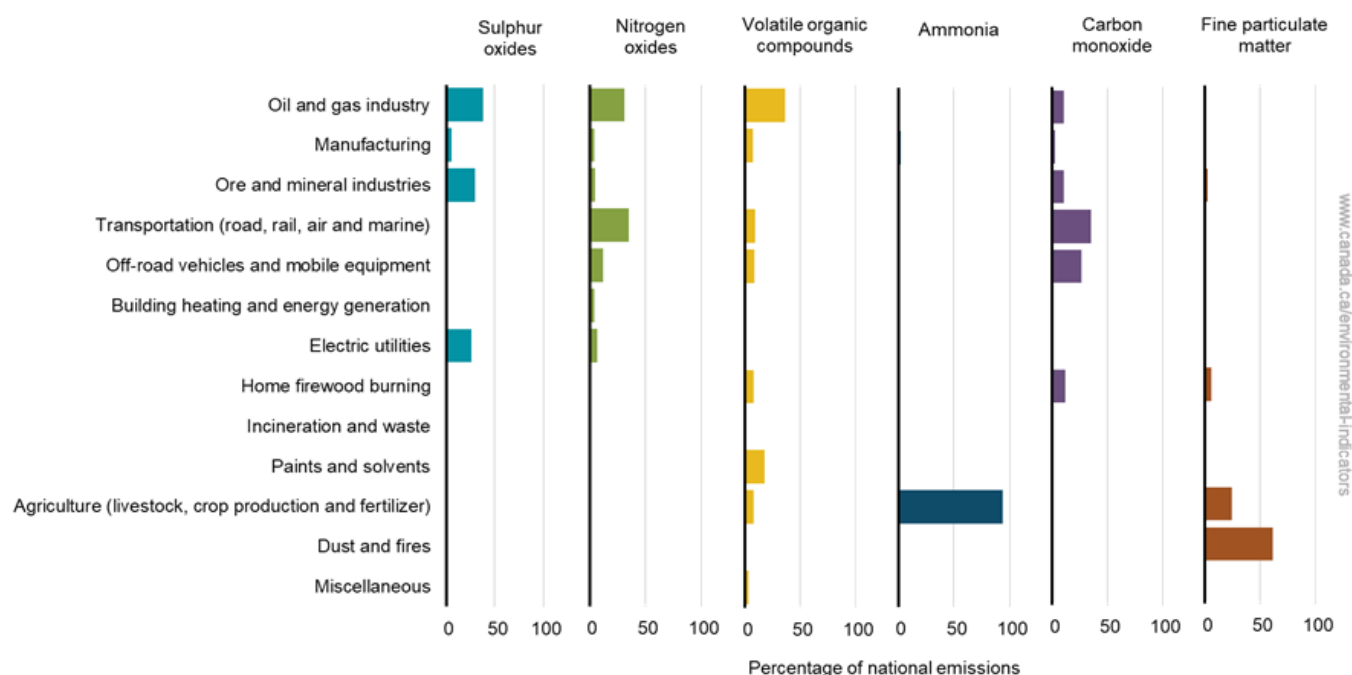
Data for Figure 2

Note: The indicator reports emissions of 6 key air pollutants from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. Emissions from black carbon, a component of $PM_{2.5}$, are also not included. Consult the black carbon section for a detailed analysis of the pollutant. The category "dust and fires" includes emissions from human activities such as prescribed burning and dust from roads. Consult Table 2 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

In 2020, the human made sources most contributing to Canada's air pollutant emissions were the following:

- the oil and gas industry, ore and mineral industries and electric utilities together represented the majority of SO_X emissions
- transportation (road, rail, air and marine) was a key source of NO_X and CO emissions
- off-road vehicles and mobile equipment and home firewood burning were also important sources of CO emissions and the oil and gas industry was an important source of NO_X 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 NH$_3$ emissions
- dust and fires were the most important sources of PM$_{2.5}$ emissions

Air pollutant emissions by province and territory

Key results

At the provincial and territorial level, emissions of the 6 key air pollutants in 2020 were:

- the highest in Alberta for SO$_X$, (28% of national emissions), NO$_X$ (39%), VOCs (31%), NH$_3$ (27%) and PM$_{2.5}$ (35%)
- the highest in Quebec for CO (26%)
- the second highest in Ontario for SO$_X$ (17% of national emissions), NO$_X$ (16%), VOCs (21%) and CO (24%)
- also important in Saskatchewan for SO$_X$, NH$_3$ and PM$_{2.5}$, accounting for 16%, 21% and 30% of the national emissions of these pollutants

Figure 3. Distribution of air pollutant emissions by province and territory, Canada, 2020
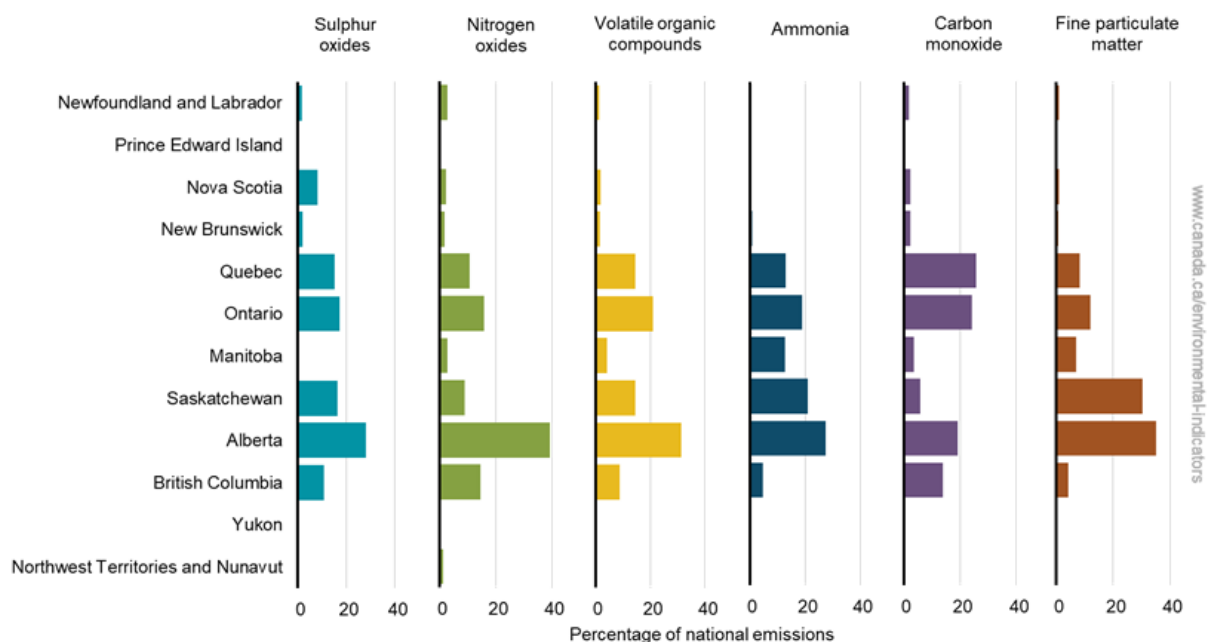
Data for Figure 3

Note: The indicator reports emissions of 6 key air pollutants from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. Emissions from black carbon, a component of PM$_{2.5,}$ are also not included. Consult the black carbon section for a detailed analysis of the pollutant.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Sulphur oxide emissions by source

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 (SO_2). Sulphur dioxide can affect respiratory systems of humans and animals and cause damage to vegetation, buildings and materials. It also contributes to the formation of fine particulate matter ($PM_{2.5}$) and acid rain.

Key results

- Between 1990 and 2020, SO_X emissions decreased by 78% from 3 009 kilotonnes (kt) to 651 kt
- In 2020, 3 sources accounted for 93% (607 kt) of the total SO_X emissions: the oil and gas industry, electric utilities and ore and mineral industries

Figure 4. Total sulphur oxide emissions by source, Canada, 1990 to 2020

Emissions in kilotonnes

www.canada.ca/en/environmental-indicators
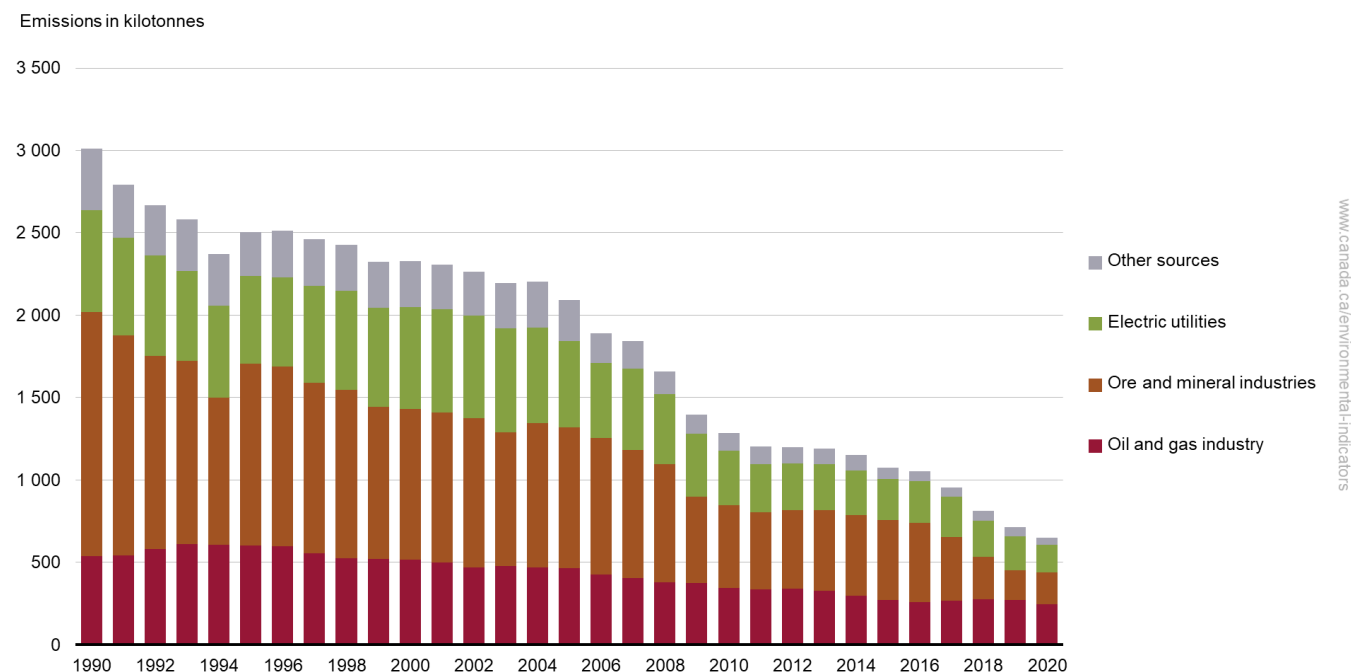
[Data for Figure 4](#)

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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](#) in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. New [interactive figures](#) provide a dynamic and customizable format to explore the emissions.
Source: Environment and Climate Change Canada (2022) [Air Pollutant Emissions Inventory](#).

In 2020, the [oil and gas industry](#) accounted for approximately 38% of total national SO_X emissions (245 kt). Ore and mineral industries and [electric utilities](#) followed with 30% (193 kt) and 26% (168 kt) of national emissions. For the ore and mineral industries, 44% (85 kt) of its SO_X emissions came from the non-ferrous refining and smelting industry.

The largest reduction in emissions between 1990 and 2020 was from ore and mineral industries with a reduction in emissions of 1 288 kt. The largest driver of the reduction from the source was from the non-ferrous refining and smelting industry with a reduction of 1 180 kt over the period.

This significant decrease in SO_X emissions from 1990 to 2020 (78%) 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 4 major smelters in Manitoba, Ontario, Quebec and New Brunswick
- lower emissions from fossil-fuel-fired (for example, coal-fired) power-generating utilities as a result of better technologies and plant closures (for example, the phase-out of coal electricity generation in Ontario)
- better emission control technologies within the oil and gas sector and the closure of a petroleum refining facility in Newfoundland and Labrador
- implementation of regulations on low-sulphur fuels[3,4]

More recently, between 2019 and 2020, SO_X emissions have declined mainly due to decreases in emissions from electric utilities of 37 kt (18%) and the oil and gas industry of 26 kt (10%).

Sulphur oxide emissions by province and territory

Key results

- In 2020, Alberta and Ontario accounted for 45% (295 kt) of national SO_X emissions
- Between 1990 and 2020
  - the largest reductions were observed in Ontario and Manitoba. Emissions in these provinces decreased by 1 010 kt (90%) and 507 kt (99%)
  - Saskatchewan was the only province that experienced an increase in SO_X (3%, or 3 kt)

[1] Environment and Climate Change Canada (1991) Canada-United States Air Quality Agreement. Retrieved on February 2, 2022.

[2] Canadian Council of Ministers of the Environment (1998) The Canada-Wide Acid Rain Strategy for Post-2000. Retrieved on February 2, 2022.

[3] Environment and Climate Change Canada (2020) Sulphur in Gasoline Regulations. Retrieved on February 2, 2022.

[4] Environment and Climate Change Canada (2017) Sulphur in Diesel Fuel Regulations. Retrieved on February 2, 2022.

Figure 5. Sulphur oxide emissions by province and territory, Canada, 1990, 2005 and 2020

Emissions in kilotonnes
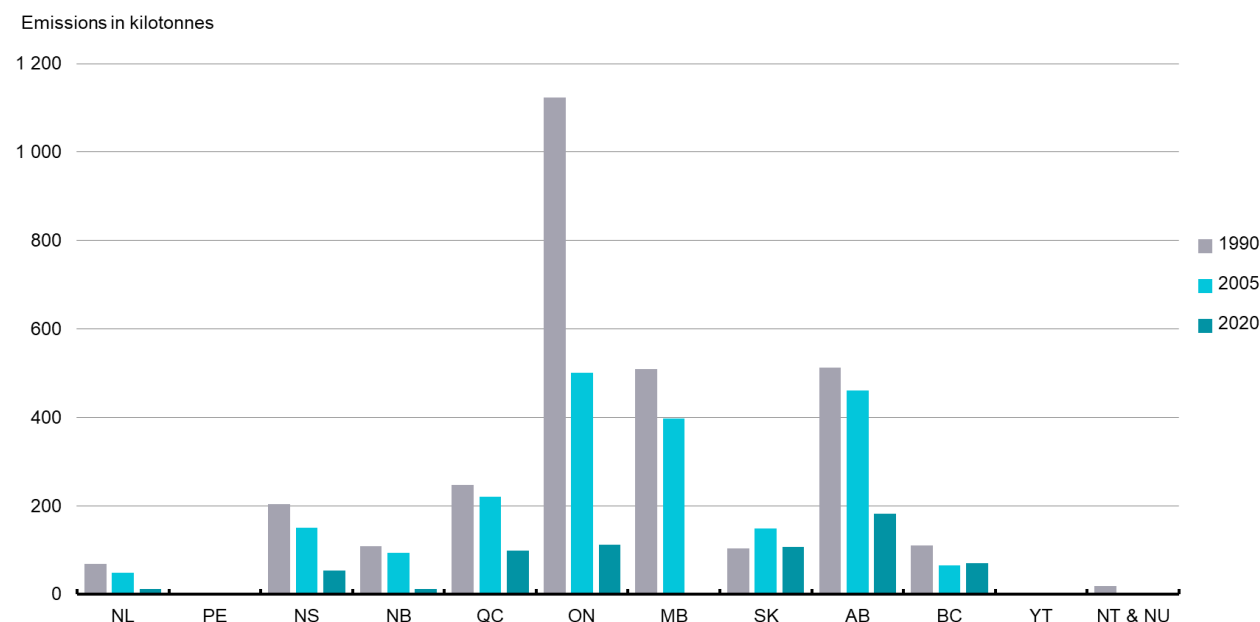
Data for Figure 5

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Alberta had the highest SO$_X$ emissions level in 2020, accounting for 28% (183 kt) of total national emissions. Emissions in the province mainly came from the oil and gas industry and electric utilities, combined accounting for 95% (174 kt) of the emissions. Between 2005 to 2020, the province experienced a 60% decline in emissions (278 kt) with the oil and gas industry, notably reductions from natural gas and crude oil production, responsible for a large part of the reductions.

Ontario was the second-highest emitter of SO$_X$ in 2020, accounting for 17% (113 kt) of total national emissions. Emissions from ore and mineral industries was the largest contributor to SO$_X$ emissions in the province in 2020. The sharp reduction (90%) in SO$_X$ emissions in Ontario between 1990 and 2020 was mainly due to emission reductions from ore and mineral industries (notably the non-ferrous refining and smelting industry) and electric utilities. The majority of the reductions (388 kt or 77%) occurred between 2005 and 2020.

Saskatchewan ranked third, with 16% (106 kt) of total national emissions; electric utilities and the oil and gas industry were the most important sources of emissions in the province.

Sulphur oxide emissions by facilities

The National Pollutant Release Inventory provides detailed information on air pollutant emissions from industrial and commercial facilities that meet its reporting criteria.

The Canadian Environmental Sustainability Indicators provide access to this information through an interactive map. The map allows you to explore SO$_X$ emissions from individual facilities.

In 2020, 2 593 facilities across Canada reported SO$_X$ emissions representing 89% of total national emissions. Of these facilities:

- 2 191 facilities reported emissions under 25 tonnes (t)
- 379 facilities reported emissions between 25 to 6 000 t
- 23 facilities reported emissions above 6 000 t located in Alberta (6), Ontario (4), Quebec (4), Saskatchewan (4), Nova Scotia (3), Newfoundland and Labrador (1) and British Columbia (1)

Figure 6. Sulphur oxide emissions by reporting facilities, Canada, 2020

Sulphur oxide emissions (tonnes)
- ◆ 0 to 25
- ◆ 25 to 100
- ◆ 100 to 500
- ◆ 500 to 2 000
- ◆ 2 000 to 6 000
- ◆ 6 000 or more

Source: Environment and Climate Change Canada (2022) National Pollutant Release Inventory.

Navigate data using the interactive map

Nitrogen oxide emissions by source

Nitrogen oxides (NO_X) include emissions of nitric oxide (NO) and nitrogen dioxide (NO_2). 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 (O_3) and fine particulate matter ($PM_{2.5}$).

Key results

- In 2020, NO_X emissions were 1 447 kilotonnes (kt). This is 36% lower than in 1990
- Transportation (road, rail, air and marine) was the largest source of NO_X representing 35% (508 kt) of total emissions in 2020

Figure 7. Total nitrogen oxide emissions by source, Canada, 1990 to 2020

Emissions in kilotonnes
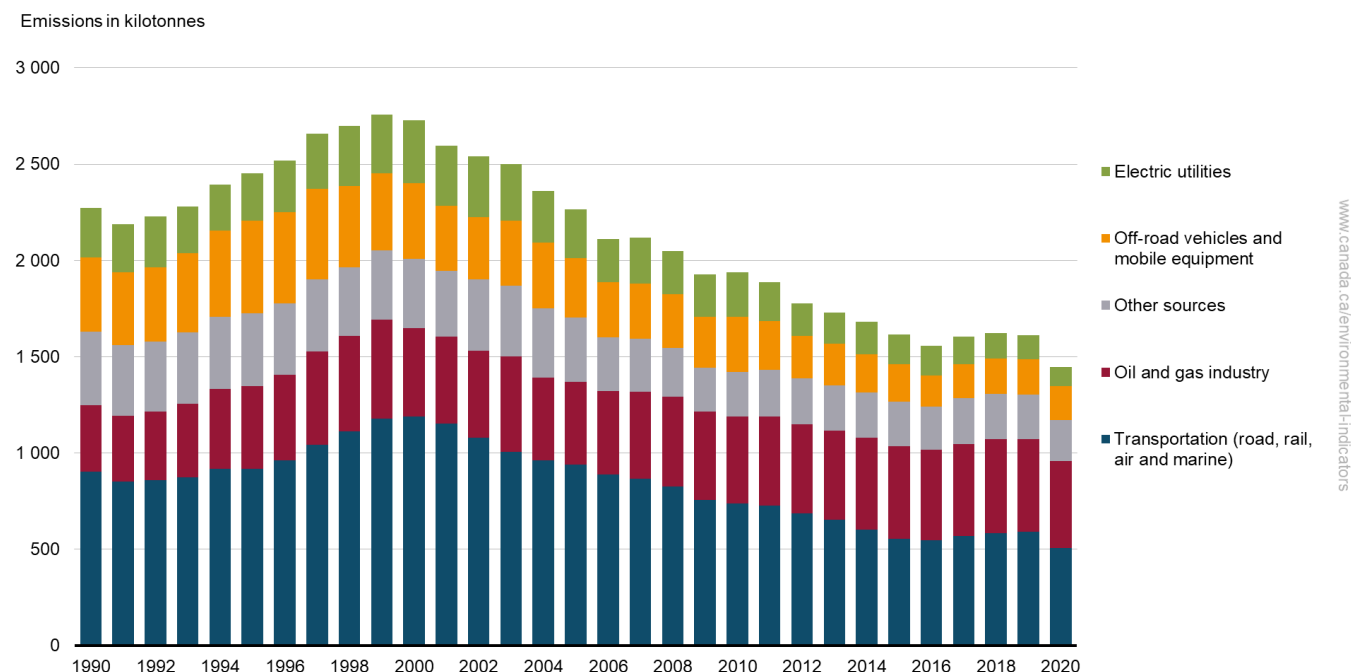
Data for Figure 7

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. New interactive figures provide a dynamic and customizable format to explore the emissions.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

While transportation (road, rail, air and marine) was the largest single contributor of NO_X, it was also the sector that experienced the largest reduction between 1990 and 2020. Emissions of NO_X from this sector decreased by 393 kt (44%) during that period.

The oil and gas industry emitted the next largest proportions of NO_X emissions in 2020, representing 31% (449 kt) of total national emissions. This sector also experienced the largest increase 30% (103 kt) in emissions between 1990 and 2020, partly offsetting reductions from other sectors.

The decline in NO_X emissions between 1990 and 2020 is mostly attributable to 2 factors:

- the reduction in emissions from transportation after 2000, given the progressive introduction of cleaner technology and fuels for vehicles

- lower emissions from fossil-fuel-fired (for example, coal-fired) power-generating utilities as a result of better emission control technologies and certain plant closures (for example, the closure of coal power plants in Ontario)

More recently, between 2019 and 2020, NO_X emissions have declined mainly due to decreases in emissions from transportation (road, rail, air and marine) sources of 82 kt (14 %), notably from light-duty gasoline vehicles and trucks, and the oil and gas industry of 33 kt (7%) mostly from reductions in natural gas and crude oil production.

Nitrogen oxide emissions by province and territory

Key results

- In 2020, among provinces and territories, Alberta emitted the most NO_X. The province accounted for 39% (568 kt) of national emissions
- Between 1990 and 2020,
  - the largest reduction was observed in Ontario. Emissions decreased by 62% (373 kt) in the province
  - NO_X emissions increased in Northwest Territories and Nunavut by 25% (4 kt)

Figure 8. Nitrogen oxide emissions by province and territory, Canada, 1990, 2005 and 2020
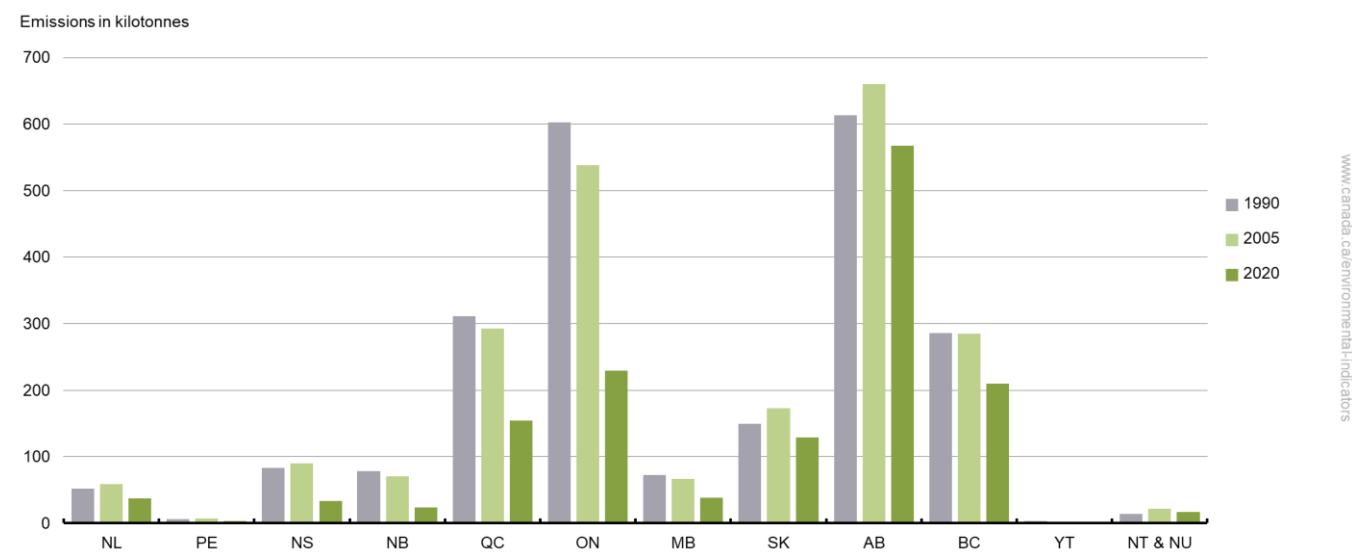
Data for Figure 8

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

The oil and gas industry is an important source of NO_X emissions in Alberta, accounting for 62% (352 kt) of the province's NO_X emissions in 2020. The increasing contribution of this sector to the province's emissions between 1990 and 2020 was more than offset by emission reductions from the transport and electric utilities sectors.

Ontario and British Columbia both contributed the second and third largest proportion of NO_X emissions in 2020, accounting for 16% (229 kt) and 14% (209 kt) of total national emissions, with transportation (road, rail, air and marine) being the most important source in both provinces followed by off-road vehicles and mobile equipment in Ontario and the oil and gas industry in British Columbia. However, Ontario experienced the largest decrease in emissions (373 kt) between 1990 and 2020 in large part due to emission reductions from transportation (road, rail, air and marine), electric utilities and off-road vehicles and mobile equipment. The majority of total NO_X emission reductions occurred between 2005 and 2020 (309 kt).

Quebec ranked fourth, with 11% (155 kt) of total national emissions. Transportation (road, rail, air and marine) was the most important source of NO_X in this province. Quebec also experienced a large decrease in emissions (138 kt) between 2005 and 2020 due to emission reductions from transportation (road, rail, air and marine).

Nitrogen oxide emissions by facilities

The National Pollutant Release Inventory provides detailed information on air pollutant emissions from industrial and commercial facilities that meet its reporting criteria.

The Canadian Environmental Sustainability Indicators provide access to this information through an interactive map. The map allows you to explore NOX emissions from individual facilities.

In 2020, 3 496 facilities across Canada reported NO_X emissions representing 36% of total national emissions. Of these facilities:

- 2 024 facilities reported emissions under 50 tonnes (t)
- 1 366 facilities reported emissions between 50 to 800 t
- 106 facilities reported emissions above 800 t located in Alberta (42), Ontario (19), Quebec (9), British Columbia (8), Newfoundland and Labrador (8), Saskatchewan (7), Nova Scotia (5), New Brunswick (4) and Northwest Territories and Nunavut (4)

Figure 9. Nitrogen oxide emissions by reporting facilities, Canada, 2020
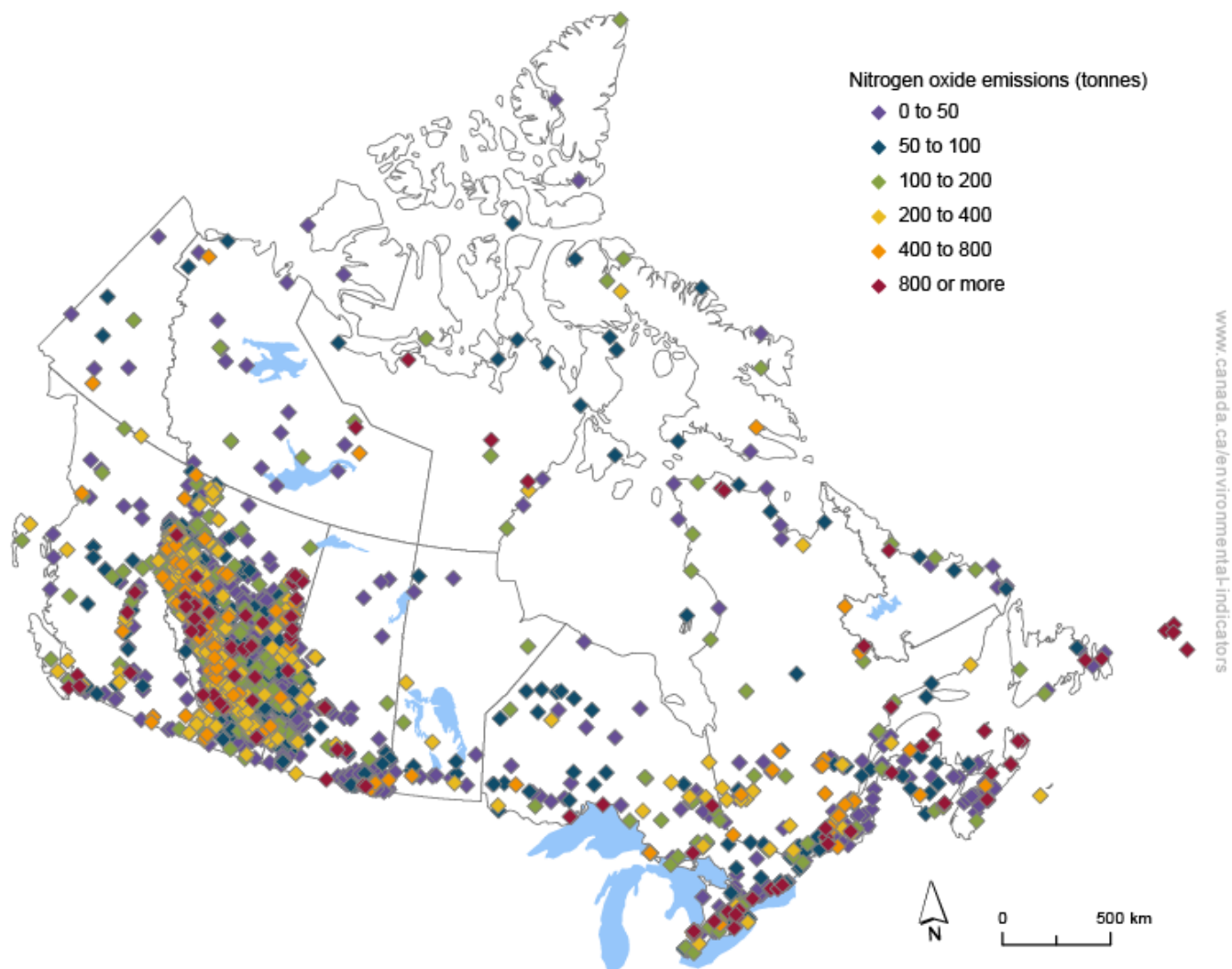
Source: Environment and Climate Change Canada (2022) National Pollutant Release Inventory.

Navigate data using the interactive map

Volatile organic compound emissions by source

Volatile organic compounds (VOCs) are carbon-containing gases and vapours released into the atmosphere by natural sources and human activities.[5] 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 2020, VOC emissions in Canada were 1 462 kilotonnes (kt). This is a 1 407 kt (49%) decrease from 1990 levels
- Since 2000, the oil and gas industry has been the highest contributor to VOC emissions. In 2020, the sector accounted for 36% (534 kt) of total emissions

Figure 10. Total volatile organic compound emissions by source, Canada, 1990 to 2020

Emissions in kilotonnes

Legend:
- Manufacturing
- Home firewood burning
- Off-road vehicles and mobile equipment
- Transportation (road, rail, air and marine)
- Other sources
- Paints and solvents
- Oil and gas industry

www.canada.ca/environmental-indicators

Data for Figure 10

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. New interactive figures provide a dynamic and customizable format to explore the emissions.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Paints and solvents, and transportation (road, rail, air and marine) were also important sources of VOC emissions in 2020 contributing 18% (261 kt) and 9% (132 kt) of total emissions.

The largest emissions reduction between 1990 and 2020 was from off-road vehicles and mobile equipment, with emissions reductions of 694 kt (85%).

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

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[5] 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

Compared to the previous year, VOC emissions decreased by 179 kt (11%) in 2020. The largest reduction was from the oil and gas industry 83 kt (13%), notably from reductions in crude oil production.

Volatile organic compound emissions by province and territory

Key results

- Alberta emitted the highest proportion of VOCs in 2020. The province represented 31% (457 kt) of national emissions
- Between 1990 and 2020,
- Ontario experienced the largest reduction in VOC emissions. Emissions in the province decreased by 64% (545 kt)
- Saskatchewan was the only province that experienced an increase in VOC emissions of 14% (26 kt)

Figure 11. Volatile organic compound emissions by province and territory, Canada, 1990, 2005 and 2020
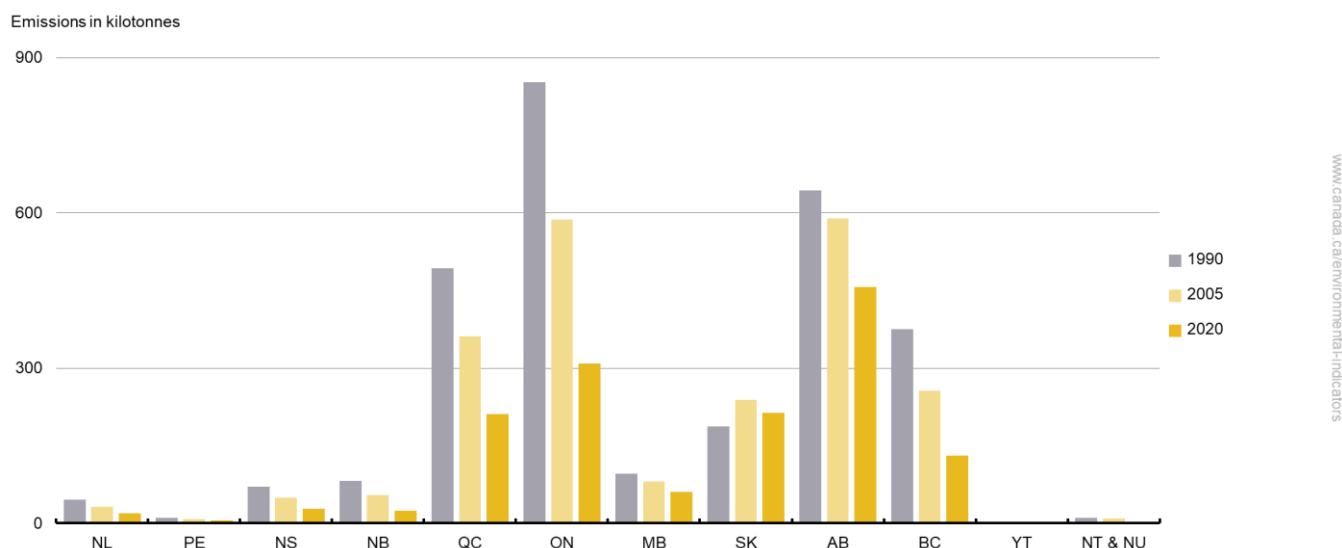
Data for Figure 11

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Alberta was the highest emitting province of VOCs in 2020 (457 kt), with the oil and gas industry as the main source, contributing 72% (327 kt) of the province's emissions.

Ontario was the second-highest emitter of VOCs, accounting for 21% (308 kt) of total national emissions in 2020. The main emission sources are paints and solvents, off-road vehicles and mobile equipment, and manufacturing. Ontario also experienced the largest reduction in emissions, with 545 kt (64%) between 1990 and 2020, mainly as a result of emission reductions from off-road vehicles and mobile equipment and transportation (road, rail, air and marine). More than half of the reductions in Ontario (51%) occurred between 2005 to 2020.

Saskatchewan was the third largest emitter, with 15% (213 kt) of total national emissions in 2020, where the oil and gas industry accounted for 74% of the emissions in that province.

Most provinces and territories experienced significant reductions in emissions between 1990 and 2020 with the exception of Saskatchewan, where emissions increased 14% over the period. The oil and gas industry is responsible for the increase in emissions in Saskatchewan.

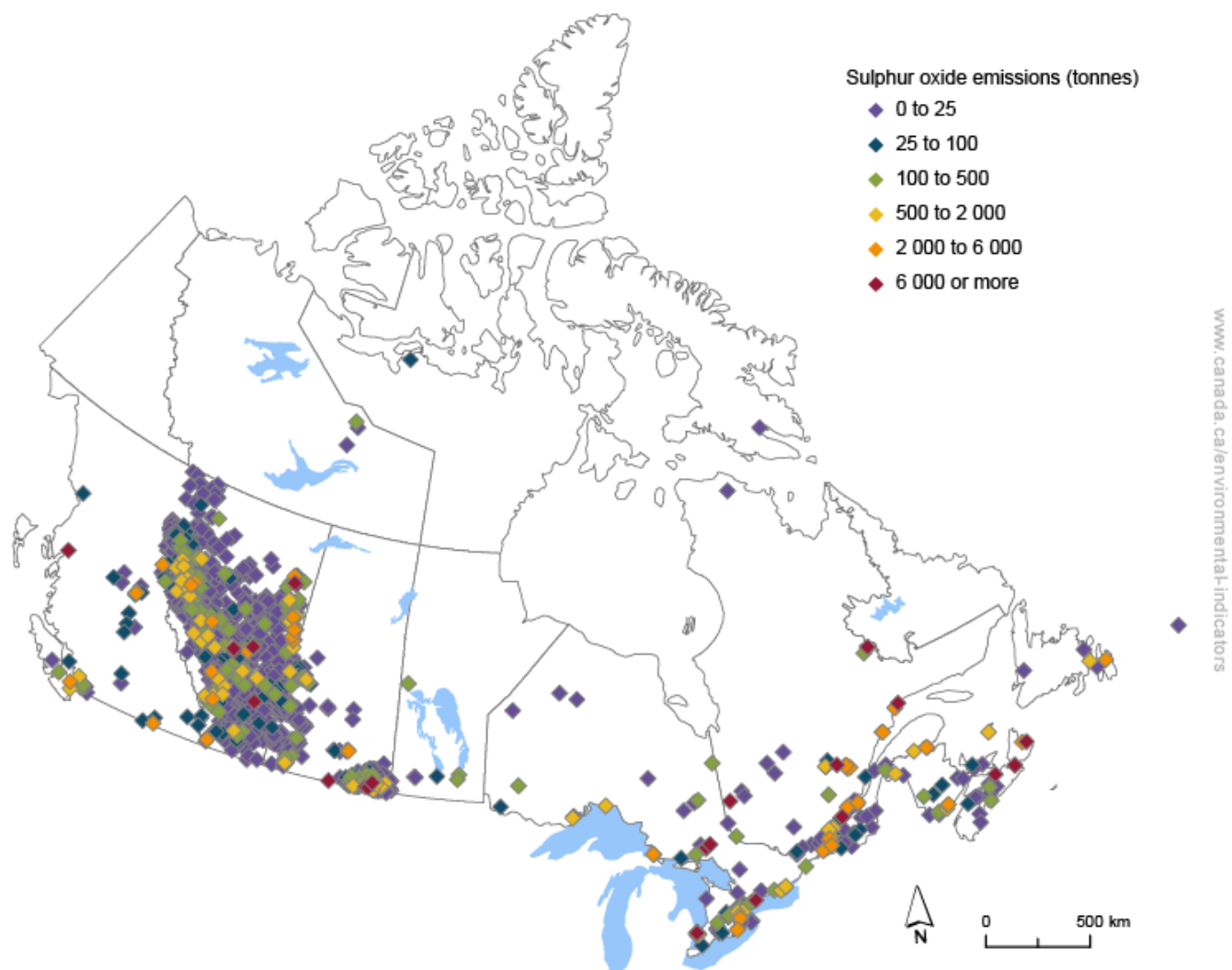# Volatile organic compound emissions by facilities

The National Pollutant Release Inventory provides detailed information on air pollutant emissions from industrial and commercial facilities that meet its reporting criteria.

The Canadian Environmental Sustainability Indicators provide access to this information through an interactive map. The map allows you to explore VOC emissions from individual facilities.

In 2020, 4 127 facilities across Canada reported VOC emissions representing 17% of total national emissions. Of these facilities:

- 2 325 facilities reported emissions under 15 tonnes (t)
- 1 711 facilities reported emissions between 15 to 400 t
- 91 facilities reported emissions above 400 t located in Alberta (35), Ontario (21), Saskatchewan (10), British Columbia (6), Manitoba (6), Quebec (6), Newfoundland and Labrador (3), New Brunswick (3) and Nova Scotia (1)

Figure 12. Volatile organic compound emissions by reporting facilities, Canada, 2020
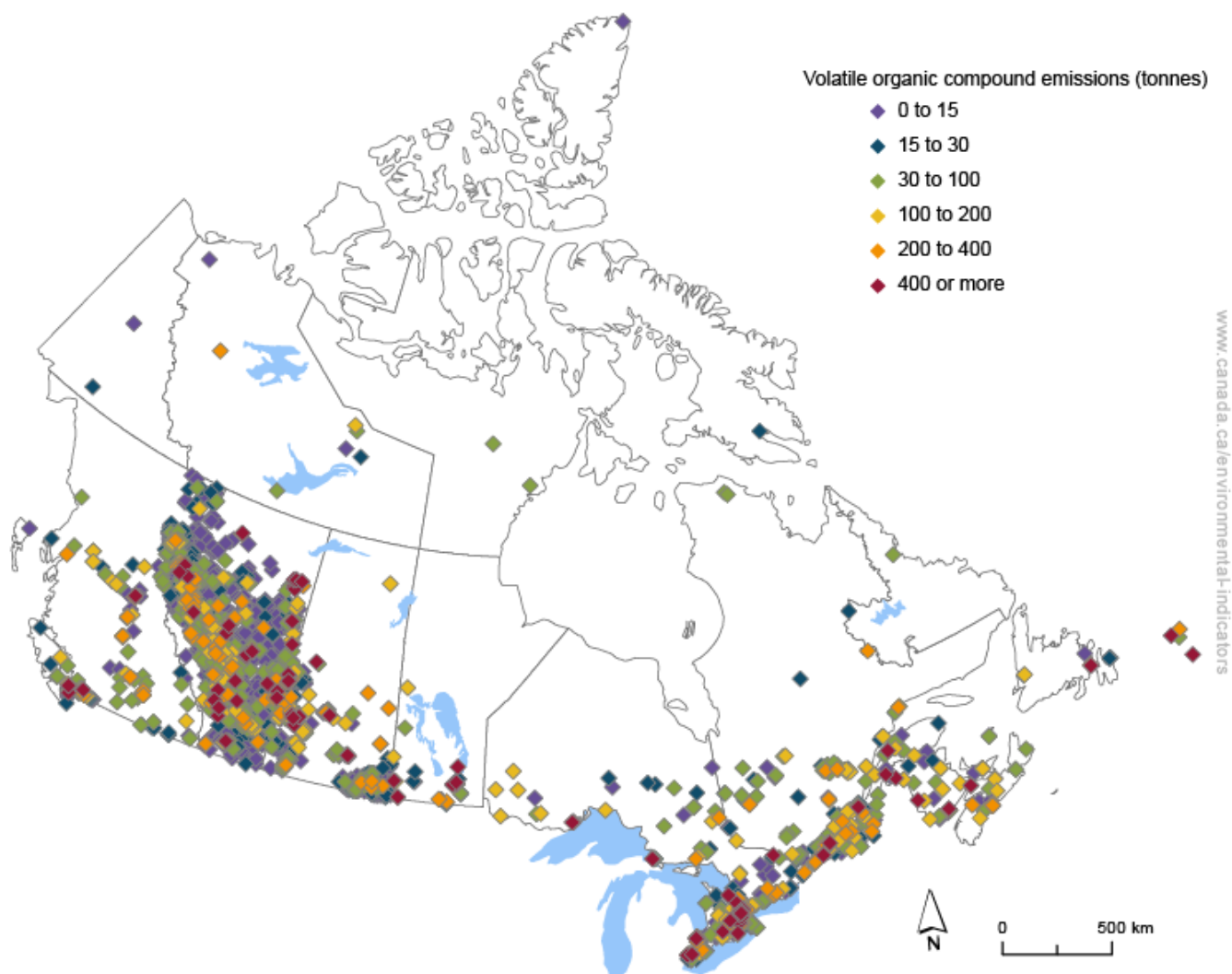
Source: Environment and Climate Change Canada (2022) National Pollutant Release Inventory.

Navigate data using the interactive map

Ammonia emissions by source

Ammonia (NH$_3$) 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 2020, NH$_3$ emissions were 487 kilotonnes (kt). This is 24% higher than in 1990
- Agriculture (livestock, crop production and fertilizer) was the main source of NH$_3$ emissions in 2020. Emissions from this source accounted for more than 94% (457 kt) of total national emissions

Figure 13. Total ammonia emissions by source, Canada, 1990 to 2020

Emissions in kilotonnes

Legend:
- Transportation (road, rail, air and marine)
- Other sources
- Manufacturing
- Agriculture (livestock, crop production and fertilizer)

www.canada.ca/environmental-indicators

Data for Figure 13

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. New interactive figures provide a dynamic and customizable format to explore the emissions.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Between 1990 and 2020, agriculture (livestock, crop production and fertilizer) experienced the largest increase (28% or 101 kt) in NH$_3$ emissions. It also remained the key source of NH$_3$ emissions throughout that period. Emissions from other sources (12 kt), manufacturing (12 kt) and transportation (road, rail, air and marine) (6 kt) combined represented 6% of national emissions in 2020.

The growth in NH$_3$ emissions from agriculture (livestock, crop production and fertilizer) between 1990 and 2020 is mainly due to the increased use of synthetic nitrogen fertilizers. Up to 2005, larger livestock populations also added to the growth. However, from 2006 to 2011, livestock populations decreased and NH$_3$ emissions from that source have since declined slowly. More recently, emissions from crop production have been steadily increasing since 2006.

Ammonia emissions by province and territory

Key results

- In 2020, Alberta and Saskatchewan accounted for almost half (235 kt) of national NH_3 emissions
- Between 1990 and 2020,
  - Ontario experienced the largest emissions reduction of 19 kt (17%)
  - The largest increase in NH_3 emissions was in Saskatchewan with emissions more than doubling (a 53 kt increase)

Figure 14. Ammonia emissions by province and territory, Canada, 1990, 2005 and 2020
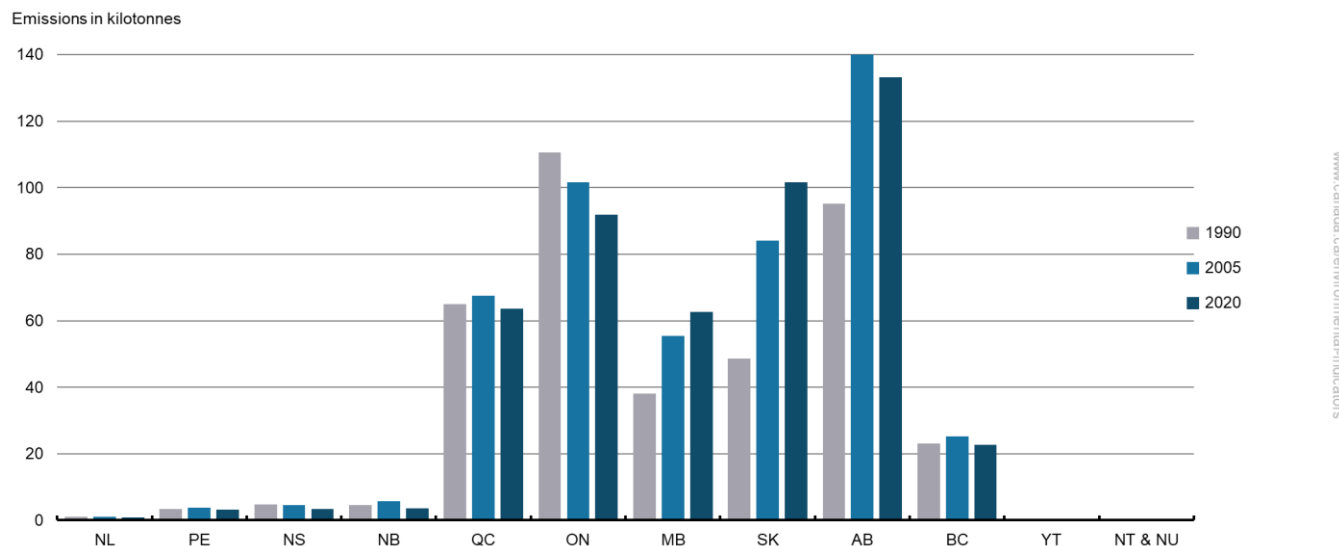
Data for Figure 14

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

In 2020, Alberta emitted the most NH_3 of all the provinces and territories, accounting for 27% (133 kt) of total national emissions. Saskatchewan contributed the second-largest proportion of NH_3, representing 21% (102 kt).

Ontario and Quebec followed with 19% and 13% (92 kt and 64 kt) of total national emissions, respectively. For both provinces, livestock farms and the application of fertilizers were the most important sources of NH_3 emissions.

Virtually all of the increase in emissions between 1990 and 2020 took place in Saskatchewan, Alberta and Manitoba.

Ammonia emissions by facilities

The National Pollutant Release Inventory provides detailed information on air pollutant emissions from industrial and commercial facilities that meet its reporting criteria.

The Canadian Environmental Sustainability Indicators provide access to this information through an interactive map. The map allows you to explore NH_3 emissions from individual facilities.

In 2020, 253 facilities across Canada reported NH_3 emissions representing 13% of total national emissions. Of these facilities:

- 158 facilities reported emissions under 25 tonnes (t)
- 87 facilities reported emissions between 25 to 400 t

- 8 facilities reported emissions above 400 t located in Alberta (5), British Columbia (1), Manitoba (1) and Saskatchewan (1)

Figure 15. Ammonia emissions by reporting facilities, Canada, 2020
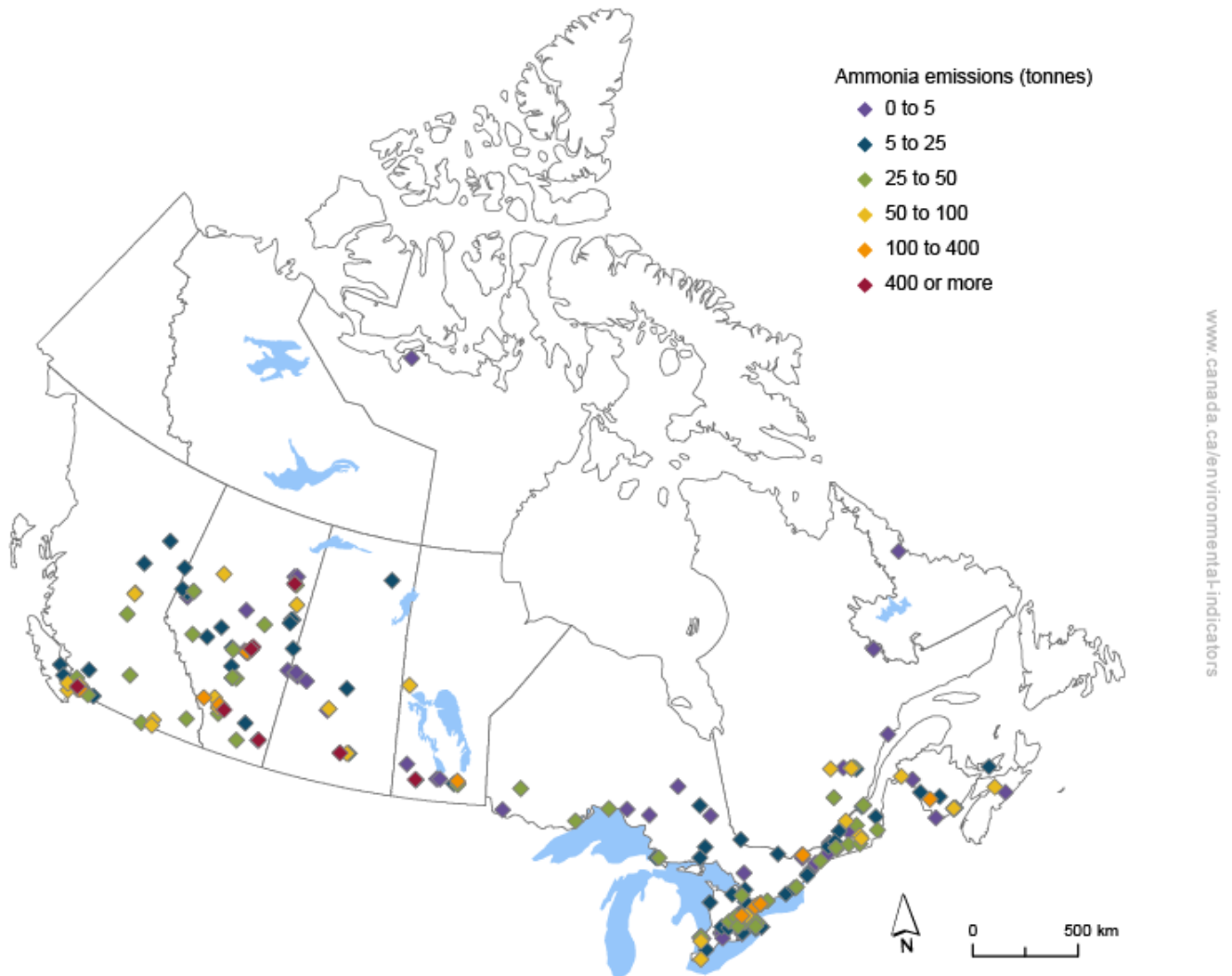
Source: Environment and Climate Change Canada (2022) National Pollutant Release Inventory.

Navigate data using the interactive map

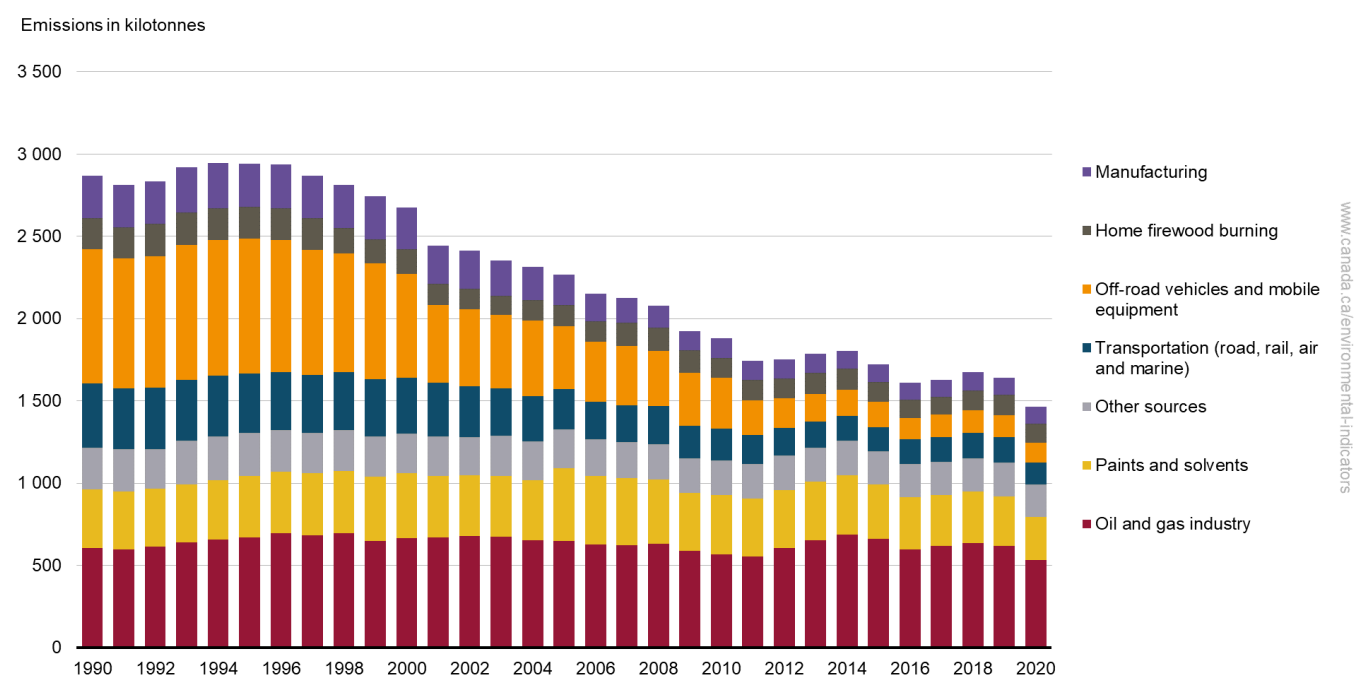# Carbon monoxide emissions by source

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 2020,
  - CO emissions in Canada were 4 655 kilotonnes (kt), a decrease of 59% from 1990 levels
  - Transportation (road, rail, air and marine) was the largest source of CO emissions in Canada representing 35% (1 637 kt) of total emissions

Figure 16. Total carbon monoxide emissions by source, Canada, 1990 to 2020
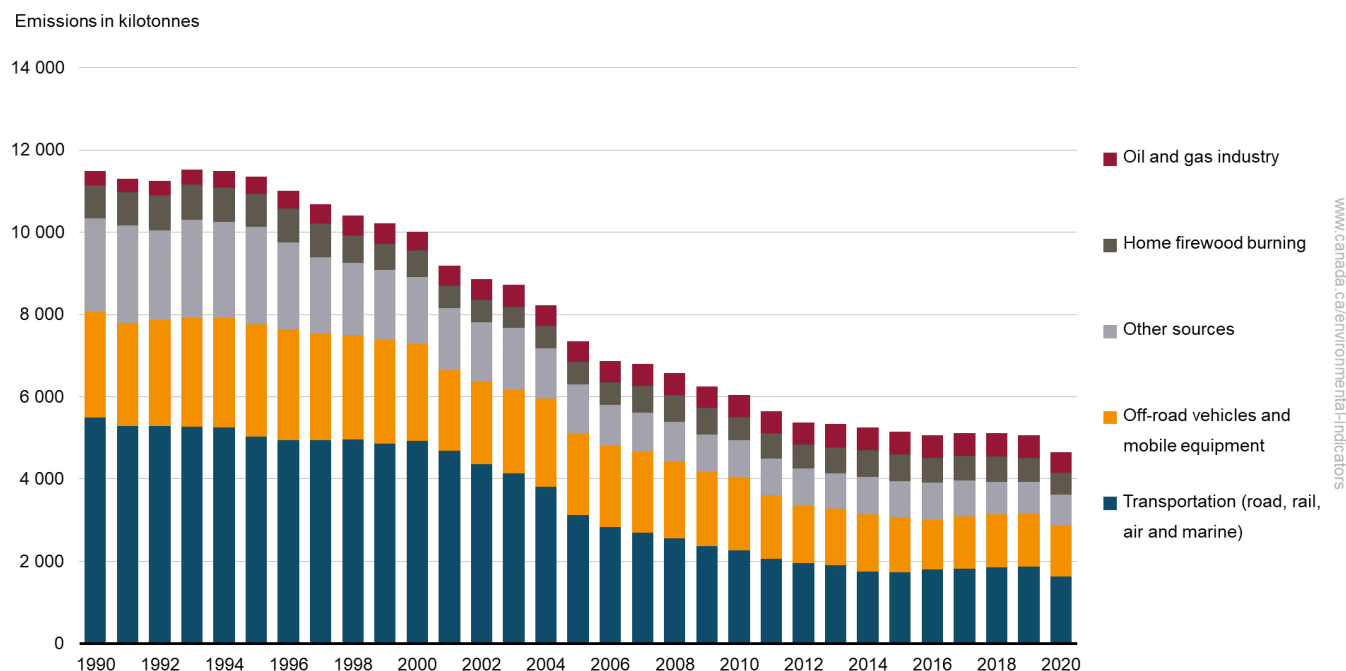
Emissions in kilotonnes

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. New interactive figures provide a dynamic and customizable format to explore the emissions.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

In 2020, transportation and off-road vehicles and mobile equipment were the 2 most important sources of CO. These sources combined represented 62% (2 880 kt) of national emissions.

The largest reduction in emissions between 1990 and 2020 occurred in transportation (road, rail, air and marine) with an emission decrease of 3 857 kt (70%).

The decline in CO emissions between 1990 and 2020 is mainly due to increasingly stringent engine and vehicle regulations and the progressive introduction of cleaner and more efficient technology in vehicles (for example, catalytic converters).

More recently, between 2019 and 2020, CO emissions have declined mainly due to decreases in emissions from transportation (road, rail, air and marine) sources of 234 kt (13 %), notably from the use of light-duty gasoline vehicles and trucks.

Carbon monoxide emissions by province and territory

Key results

- In 2020, Quebec and Ontario accounted for 50% (2 324 kt) of national CO emissions
- Between 1990 and 2020,
  - all provinces and territories experienced significant reductions in emissions
  - the largest reductions occurred in Ontario (2 141 kt or 65%), British Columbia (1 695 kt or 72%) and Quebec (1 059 kt or 47%)

Figure 17. Carbon monoxide emissions by province and territory, Canada, 1990, 2005 and 2020

Emissions in kilotonnes
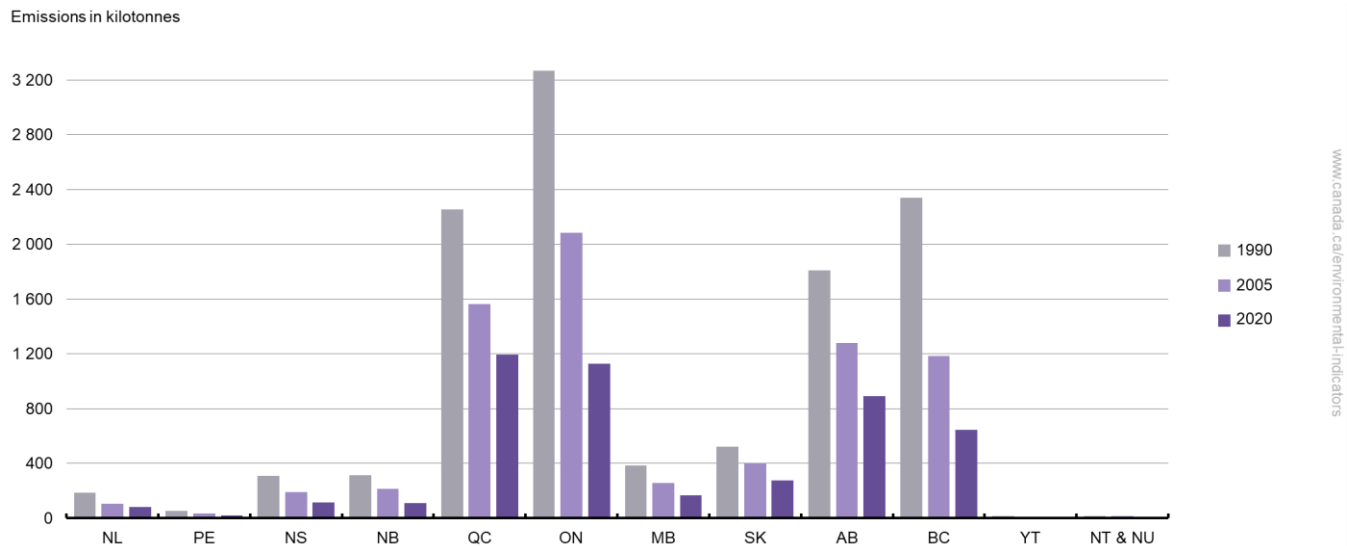
Data for Figure 17

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

In 2020, Quebec emitted the most CO of all the provinces and territories, representing 26% (1 196 kt) of the total national emissions. Ore and mineral industries, specifically the aluminum industry representing 93% (344 kt) of the sector's emissions, was the most important source of CO emissions for Quebec.

The province of Ontario ranked second, with 24% (1 128 kt) of total national emissions in 2020, with 79% of those emissions from 2 sources, namely transportation (road, rail, air and marine) and off-road vehicles and mobile equipment.

Alberta, the third largest CO emitter, accounted for 19% (890 kt) of total national emissions. The oil and gas industry accounted for 43% of the province's CO emissions.

The sharp decrease in emissions between 1990 and 2020 in all provinces and territories is mainly attributable to emission reductions from transportation (road, rail, air and marine). Some of the largest reductions occurred between 1990 to 2005 notably for British Columbia with emissions decreasing by 1 156 kt (49%) and for Ontario with emissions decreasing by 1 187 kt (36%).

## Carbon monoxide emissions by facilities

The National Pollutant Release Inventory provides detailed information on air pollutant emissions from industrial and commercial facilities that meet its reporting criteria.

The Canadian Environmental Sustainability Indicators provide access to this information through an interactive map. The map allows you to explore CO emissions from individual facilities.

In 2020, 3 304 facilities across Canada reported CO emissions representing 18% of total national emissions. Of these facilities:

- 1 488 facilities reported emissions under 25 tonnes (t)
- 1 731 facilities reported emissions between 25 to 1 000 t
- 85 facilities reported emissions above 1 000 t located in Alberta (29), Quebec (15), British Columbia (15), Ontario (14), New Brunswick (6), Newfoundland and Labrador (3) and Saskatchewan (3)

Figure 18. Carbon monoxide emissions by reporting facilities, Canada, 2020
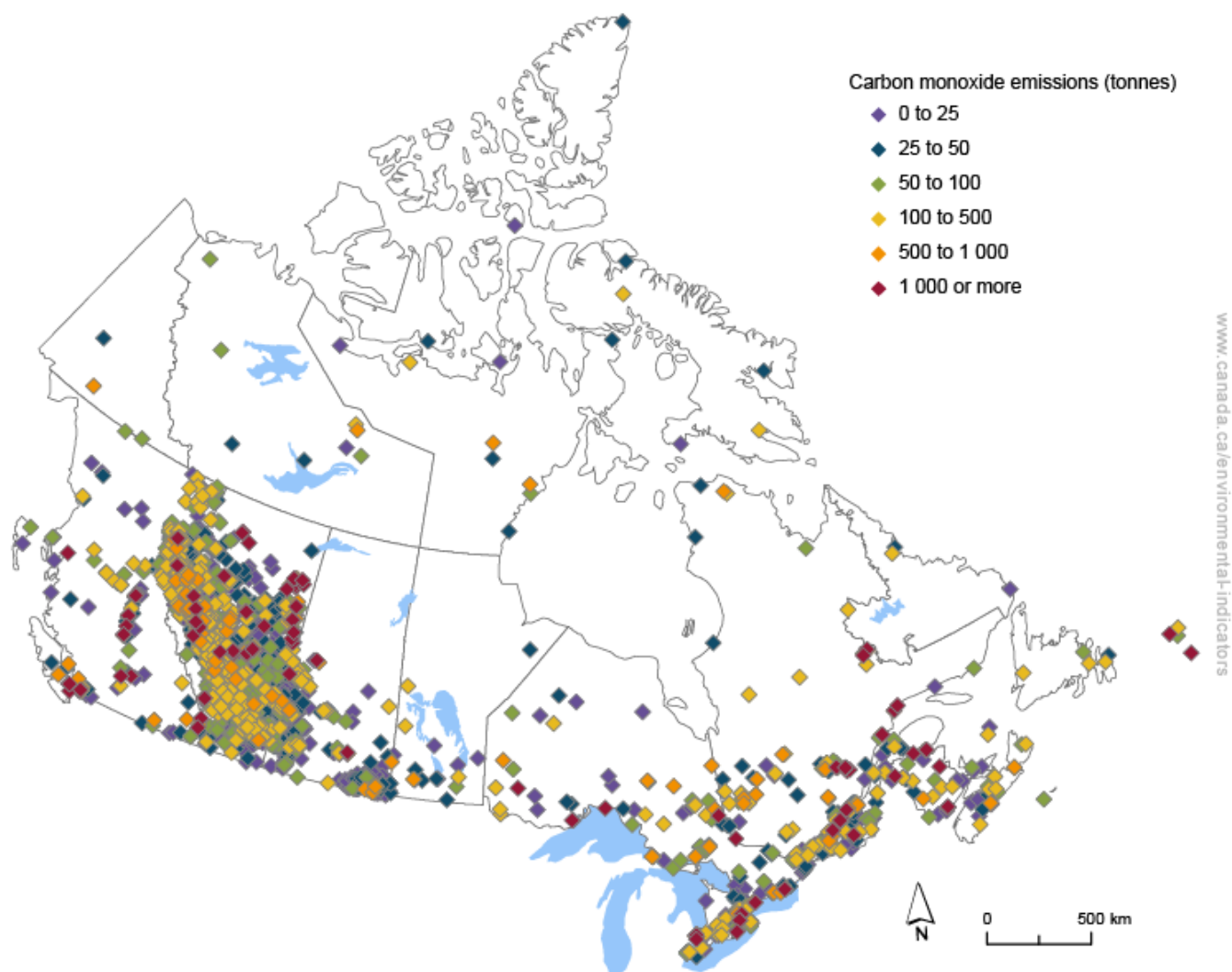
Source: Environment and Climate Change Canada (2022) National Pollutant Release Inventory.
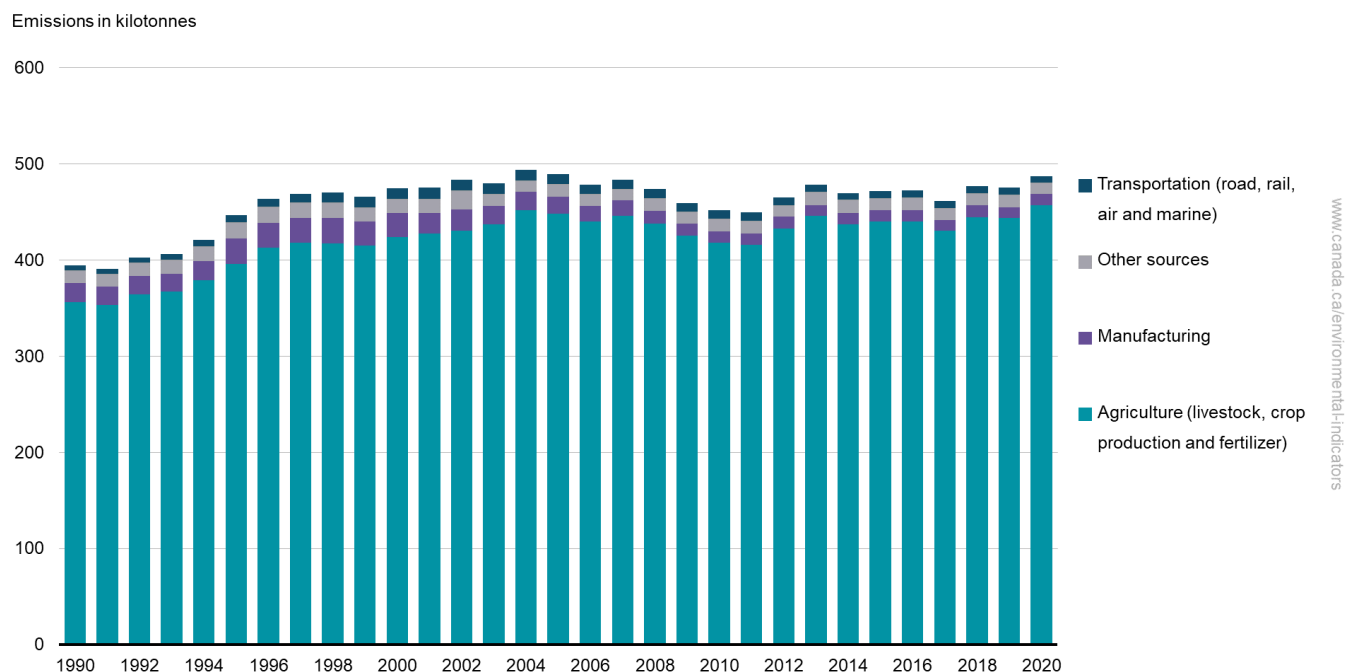
Navigate data using the interactive map

Fine particulate matter emissions by source

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.[6] Fine particulate matter ($PM_{2.5}$) refers to particulate matter with a size of less than 2.5 micrometres (also called 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 2020, $PM_{2.5}$ emissions were 1 432 kilotonnes (kt). This is 15% lower than in 1990
- Emissions from dust and fires (for example, road dust, dust from construction operations and prescribed burning) accounted for the majority of $PM_{2.5}$ emissions, reaching 62% (884 kt) of total national emissions in 2020.
    - These emissions increased by 67% (354 kt) between 1990 and 2020. Dust from construction operations and unpaved roads accounted for the majority of the increase.

Figure 19. Total fine particulate matter emissions by source, Canada, 1990 to 2020

Emissions in kilotonnes
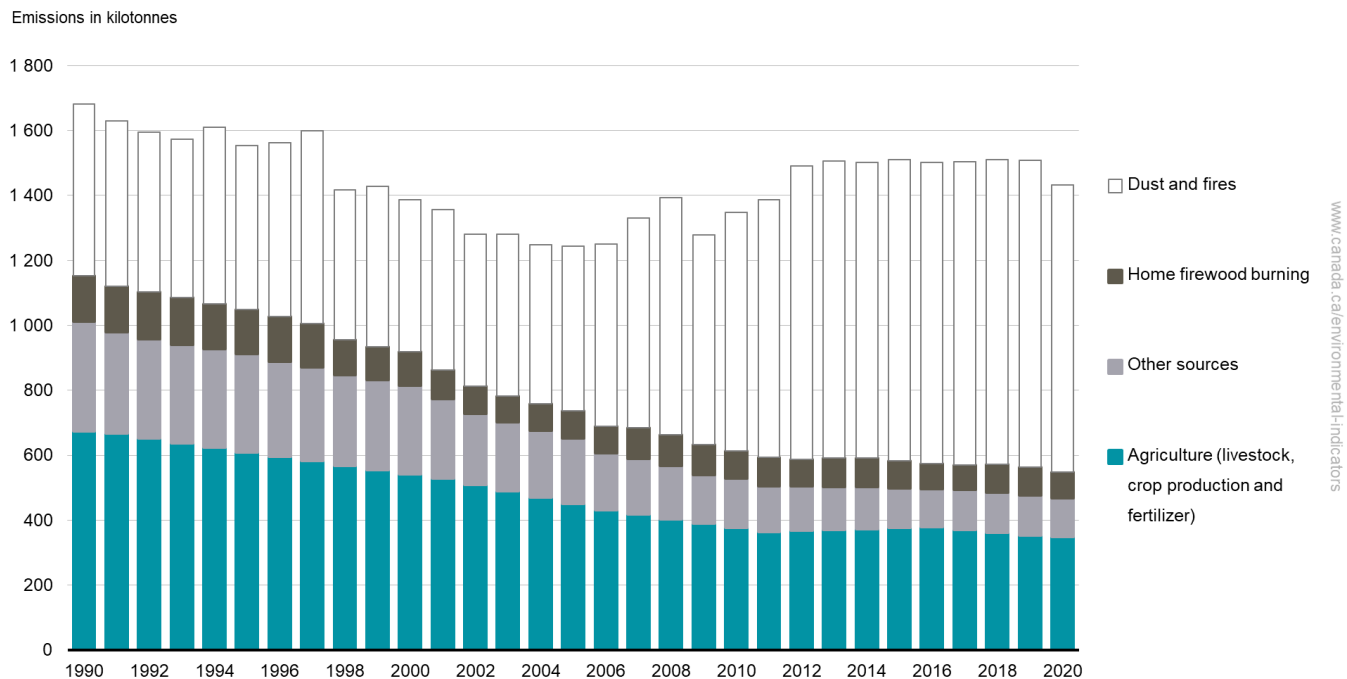
Data for Figure 19

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. New interactive figures provide a dynamic and customizable format to explore the emissions.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

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[6] PM formed in the air from chemical and physical reactions involving the precursor substances are not included in the indicator.

In 2020, 86% of $PM_{2.5}$ emissions came from open source emissions, such as dust and fires, and agriculture (livestock[7], crop production and fertilizer). In general, these emissions are spread over large geographical areas, are highly dependent on weather conditions (for example, wind and rain) and are located outside of urban areas.

The remaining 14% of $PM_{2.5}$ emissions in 2020 came from home firewood burning (80 kt or 6%) and other sources, including:

- ore and mineral industries, representing 2% (34 kt) of the emissions
- transportation (road, rail, air and marine), representing 1% (17 kt)
- manufacturing and miscellaneous sources, such as emissions from commercial cooking, each representing about 1% (16 kt) of emissions
- off-road vehicles and mobile equipment, representing 1% (14 kt)
- the oil and gas industry, representing less than 1% (12 kt)
- other emissions (less than 1%) coming from building heating and energy generation, electric utilities, incineration and wastes, and the use of paints and solvents

Many of the sources above, despite representing a small proportion of national emissions, can have a disproportionate impact on the population because they are generally concentrated in populated areas.

The decreases in $PM_{2.5}$ emissions between 1990 and 2020 are mainly attributable to emission reductions from agriculture (livestock, crop production and fertilizer), manufacturing and home firewood burning. These reductions outweigh the increase in emissions from dust and fires (specifically road dust and dust from construction operations) over the period. The adoption of conservation 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. Since 2010, however, emissions from dust and fires have gradually increased, as a result of an increase from road dust and dust from construction operations, with a slight drop in 2020, offsetting reductions from the other sources. The emission reduction in 2020 is driven predominantly by decreased use of unpaved roads.

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[7] $PM_{2.5}$ emissions are produced as a result of the aerial transport of feed particles, feather fragments, fecal material, dander, etc. from ventilation systems in livestock buildings.

Table 1. Source emissions changes between 1990 and 2020

Source	PM$_{2.5}$ (change in kilotonnes from 1990 to 2020)	PM$_{2.5}$ (percentage change from 1990 to 2020)
Dust and fires	354.0	66.8
Miscellaneous	1.5	10.9
Building heating and energy generation	0.5	10.4
Oil and gas industry	0.1	1.1
Paints and solvents	0.02	467
Incineration and waste	-0.3	-10.3
Transportation (road, rail, air and marine)	-18.2	-52.3
Ore and mineral industries	-18.7	-35.2
Off-road vehicles and mobile equipment	-39.5	-73.6
Electric utilities	-46.0	-95.0
Manufacturing	-98.0	-85.7
Home firewood burning	-60.0	-43.0
Agriculture (livestock, crop production and fertilizer)	-325.1	-48.2
All sources	**-249.7**	**-14.8**

Note: The changes have been calculated using source data that are not rounded.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Fine particulate matter emissions by province and territory

Key results

- In 2020, Alberta emitted the most PM$_{2.5}$. The province represented 35% (501 kt) of total national emissions
- Between 1990 and 2020, all provinces and territories, with the exception of Alberta, decreased their emissions
    - The largest decrease was observed in Saskatchewan with 109 kt (20%)
    - Alberta's PM$_{2.5}$ emissions increased by 68 kt (16%)

Figure 20. Fine particulate matter emissions by province and territory, Canada, 1990, 2005 and 2020

Emissions in kilotonnes
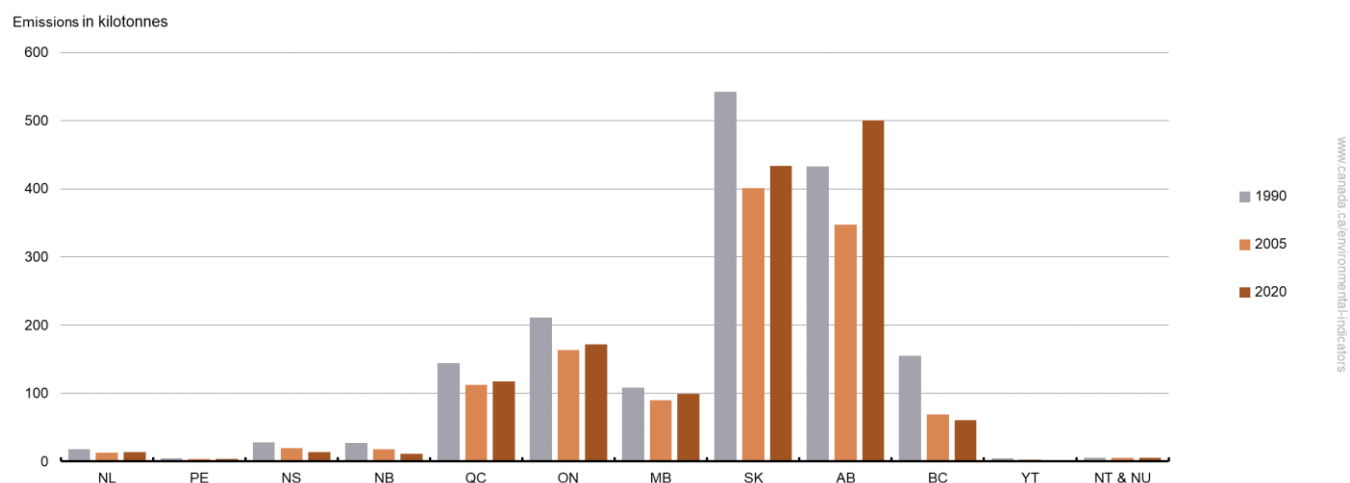
Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

In 2020, Alberta was the highest emitting province of PM$_{2.5}$ emissions, accounting for 35% (501 kt) of total national emissions. Dust and fires (specifically road dust and dust from construction operations) were the largest sources of PM$_{2.5}$ emissions in the province. The increase in emissions in Alberta between 1990 and 2020 can be attributed to growth in construction operations for the oil and gas industries. Since 2005, total emissions in the province increased by 153 kt (44%).

Saskatchewan ranked second in 2020, with 30% (434 kt) of PM$_{2.5}$ emissions. Dust and fires (specifically road dust and dust from construction operations) were the largest sources, with agriculture (livestock, crop production and fertilizer) being the second-largest source of PM$_{2.5}$.

Ontario ranked third, with 12% (172 kt), and Quebec ranked fourth with 8% (118 kt). For the 2 provinces, dust and fires were the largest source of emissions.

The exclusion of 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 2020, representing 29% (58 kt) of total emissions (200 kt). Ontario ranks second with 24% (47 kt) of emissions. British Columbia and Alberta rank third and fourth, representing 14% and 13% (29 kt and 26 kt, respectively) of emissions. Between 1990 and 2020, with dust, fires and agriculture excluded, all of the provinces and territories experienced emissions reductions between 83% (Yukon, with a 0.4 kt emission reduction) and 36% (Northwest Territories and Nunavut, with a 0.6 kt emission reduction).

Fine particulate matter emissions by facilities

The National Pollutant Release Inventory provides detailed information on air pollutant emissions from industrial and commercial facilities that meet its reporting criteria.

The Canadian Environmental Sustainability Indicators provide access to this information through an interactive map. The map allows you to explore PM$_{2.5}$ emissions from individual facilities.

In 2020, 4 408 facilities across Canada reported PM$_{2.5}$ emissions representing 4% of total national emissions. Of these facilities:

- 2 462 facilities reported emissions under 1 tonne (t)
- 1 856 facilities reported emissions between 1 to 100 t

- 90 facilities reported emissions above 100 t located in Alberta (21), British Columbia (18), Ontario (17), Quebec (15), Saskatchewan (8), Newfoundland and Labrador (6), New Brunswick (2), Manitoba (1), Nova Scotia (1) and Northwest Territories and Nunavut (1)

Figure 21. Fine particulate matter by reporting facilities, Canada, 2020
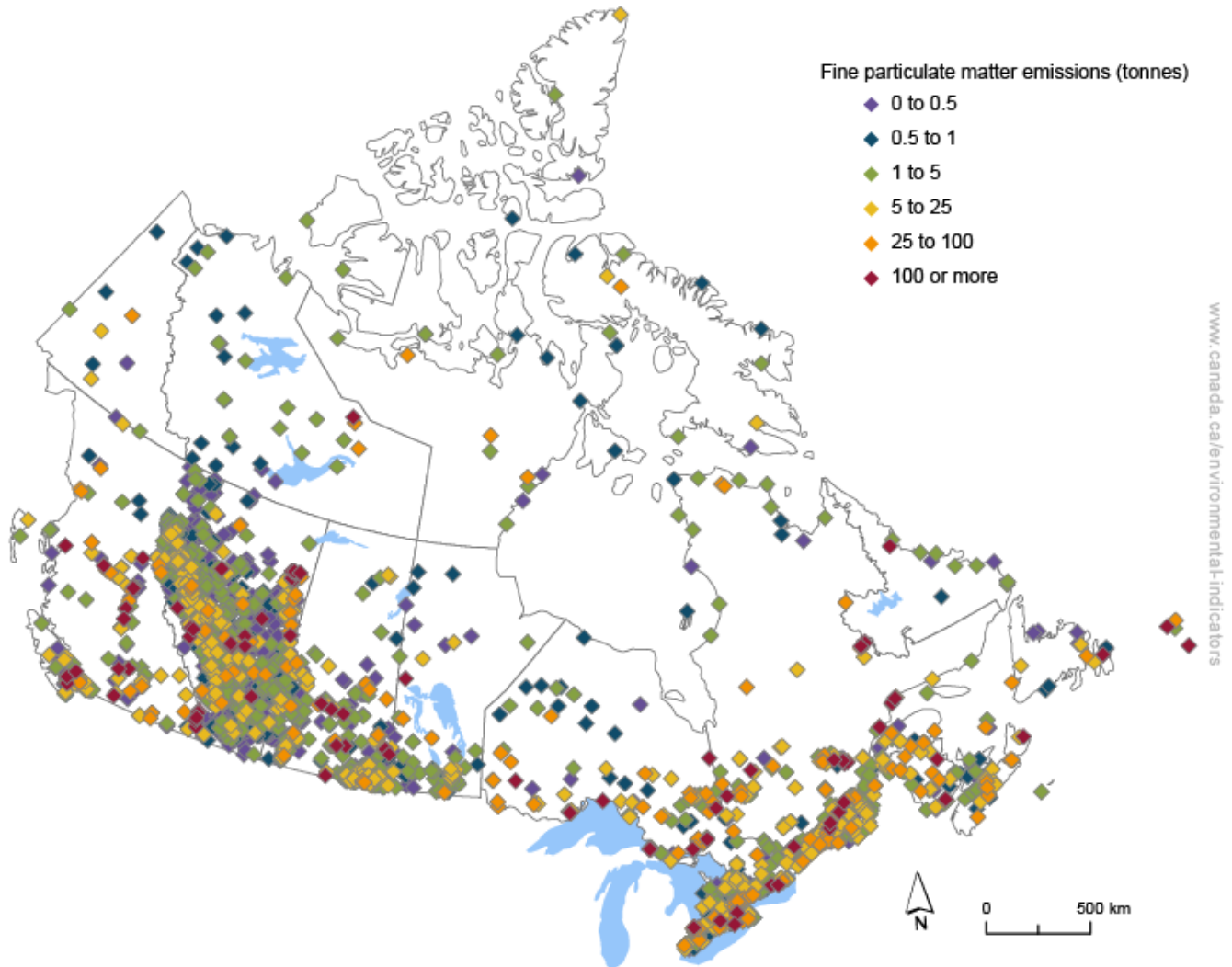
Source: Environment and Climate Change Canada (2022) National Pollutant Release Inventory.

Navigate data using the interactive map

Black carbon emissions by source

Black carbon is a component of PM$_{2.5}$ and is generated by the incomplete combustion of fossil fuels and biomass. It is a short-lived climate pollutant, and is linked to both climate warming and adverse human health effects. Reductions in black carbon emissions have near-immediate and local benefits.

Key results

- Emissions of black carbon were 29 kt in 2020, a decrease of 22% from 2013
- In 2020, 3 sectors accounted for 83% of national black carbon emissions:
    - off-road vehicles and mobile equipment
    - transportation (road, rail, air and marine)
    - home firewood burning

**Figure 22. Total black carbon emissions by source, Canada, 2013 to 2020**

Emissions in kilotonnes

Legend:
- Other sources
- Building heating and energy generation
- Oil and gas industry
- Home firewood burning
- Off-road vehicles and mobile equipment
- Transportation (road, rail, air and marine)

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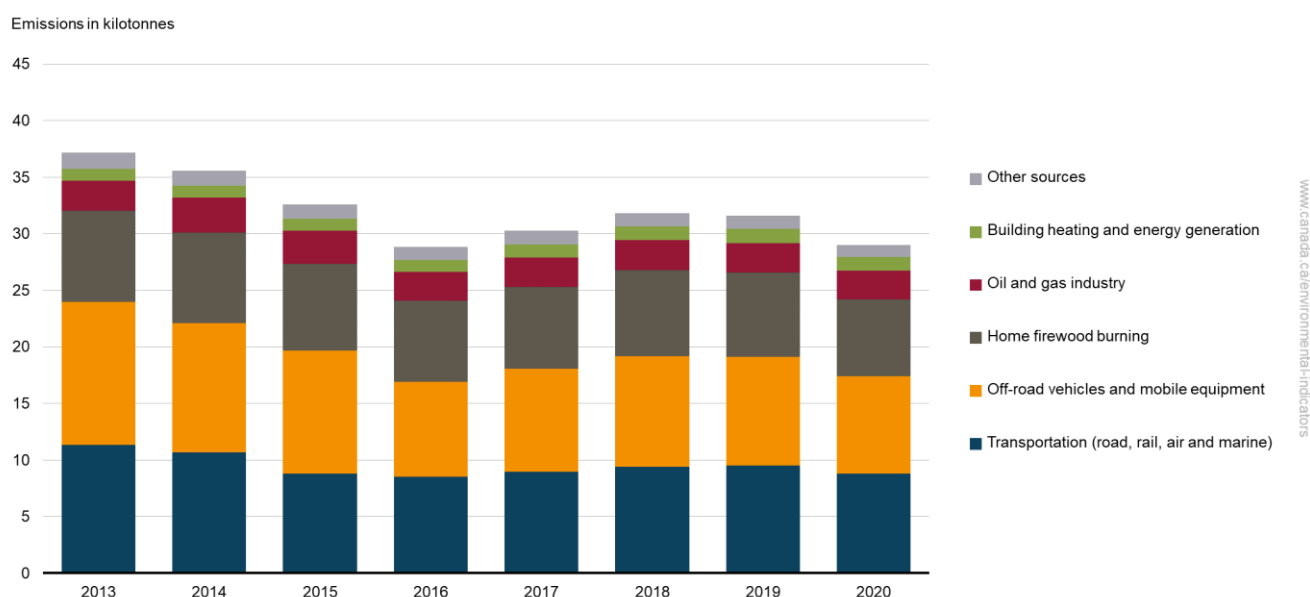
Data for Figure 22

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires. The chart 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 Table 2 in the Data sources and methods for more details. New interactive figures provide a dynamic and customizable format to explore the emissions.
Source: Environment and Climate Change Canada (2022) Canada's Black Carbon Emissions Inventory.

In 2020, off-road vehicles and mobile equipment (for example, lawn and garden equipment, recreational vehicles, excavators, graders) and transportation (road, rail, air and marine) accounted for the largest proportions of total national emissions, both representing 30% (9 kt) of emissions. Home firewood burning was also a large contributor, representing about 23% (7 kt) of total national emissions. The remaining 17% of emissions came from the oil and gas industry, building heating and energy generation and other sources (such as ore and mineral industries).

For both transportation and off-road vehicles and mobile equipment, the use of diesel engines was the main source of black carbon emissions.

Black carbon emissions by province and territory

Key results

- In 2020, 3 provinces, Alberta, Ontario and Quebec, accounted for 62% (18 kt) of total national black carbon emissions

- Between 2013 and 2020,
  - all provinces and territories, with the exception of Prince Edward Island, experienced reductions in black carbon emissions between 4% to 56%
  - Ontario and Quebec experienced the largest reductions in emissions of 2.1 kt and 1.6 kt, respectively. For both provinces, the reductions were mainly attributable to lower emissions from off-road vehicles and mobile equipment

Figure 23. Black carbon emissions by province and territory, Canada, 2013 and 2020

Emissions in kilotonnes
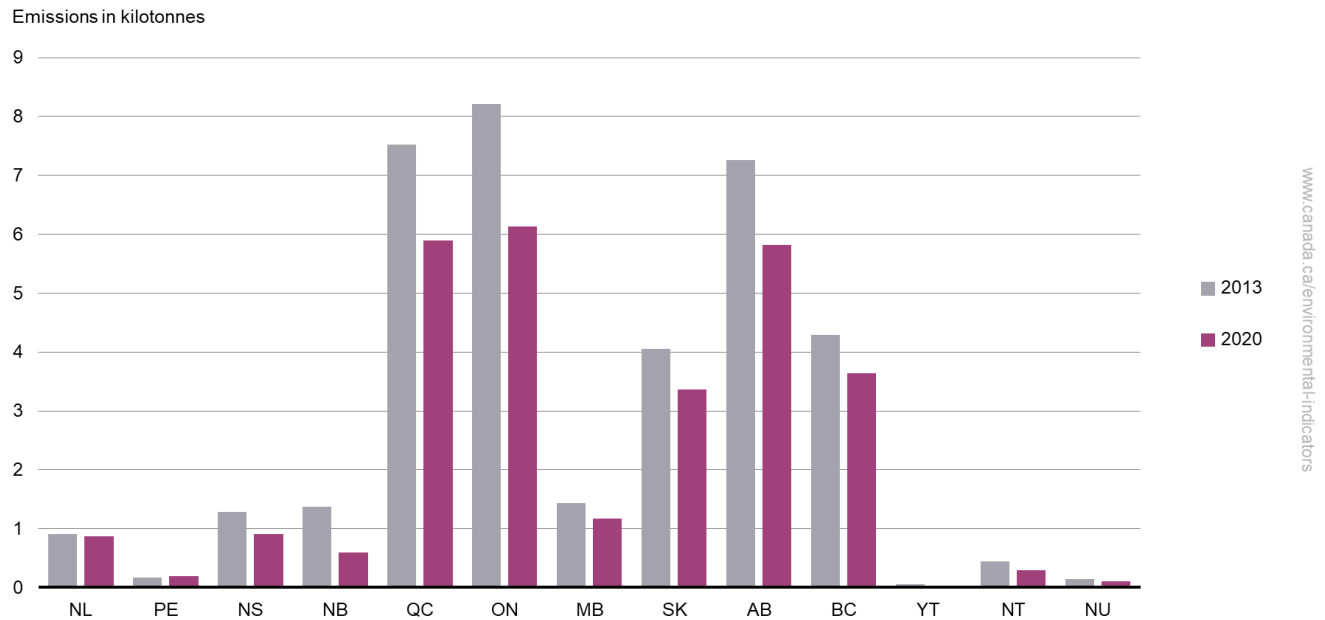
Data for Figure 23

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires.
Source: Environment and Climate Change Canada (2022) Canada's Black Carbon Emissions Inventory.

Alberta, Ontario and Quebec had the highest black carbon emissions in 2020, combined accounting for 62% (18 kt) of total national emissions.

Emissions in Alberta primarily came from 3 sources, off-road vehicles and mobile equipment, transportation (road, rail, air and marine) and the oil and gas industry representing 90% (5 kt) of the emissions.

Ontario's emissions also came from off-road vehicles and mobile equipment (1.9 kt), and transportation (road, rail, air and marine) (1.8 kt) as well as home firewood burning (1.7 kt), representing 87% of emissions in the province.

In Quebec, emissions came primarily from home firewood burning representing 49% (3 kt) of emissions.

Air pollutant emissions from the oil and gas industry

The oil and gas sector is an important contributor to air pollutant emissions. Most emissions from the oil and gas sector come from upstream (i.e., exploration, drilling, production and field processing) activities and to a lesser extent downstream (i.e., refining, storage and distribution) activities. Air pollutants are responsible for the formation of fine particulate matter ($PM_{2.5}$), ozone (O_3), smog and acid rain. They also adversely affect human health, the environment, and the economy.

Key results

- In 2020, the oil and gas industry was a major contributor to total national emissions of sulphur oxides (SO_X) (38%), volatile organic compounds (VOCs) (36%), nitrogen oxides (NO_X) (31%) and carbon monoxide (CO) (11%)
- The oil and gas industry is also a source of emissions of fine particulate matter ($PM_{2.5}$) and ammonia (NH_3). However, in 2020, it made up less than 1% of the total emissions of these pollutants

Figure 24. Contribution of the oil and gas industry to total air pollutant emissions by activity type, Canada, 2020

Percentage of national emissions
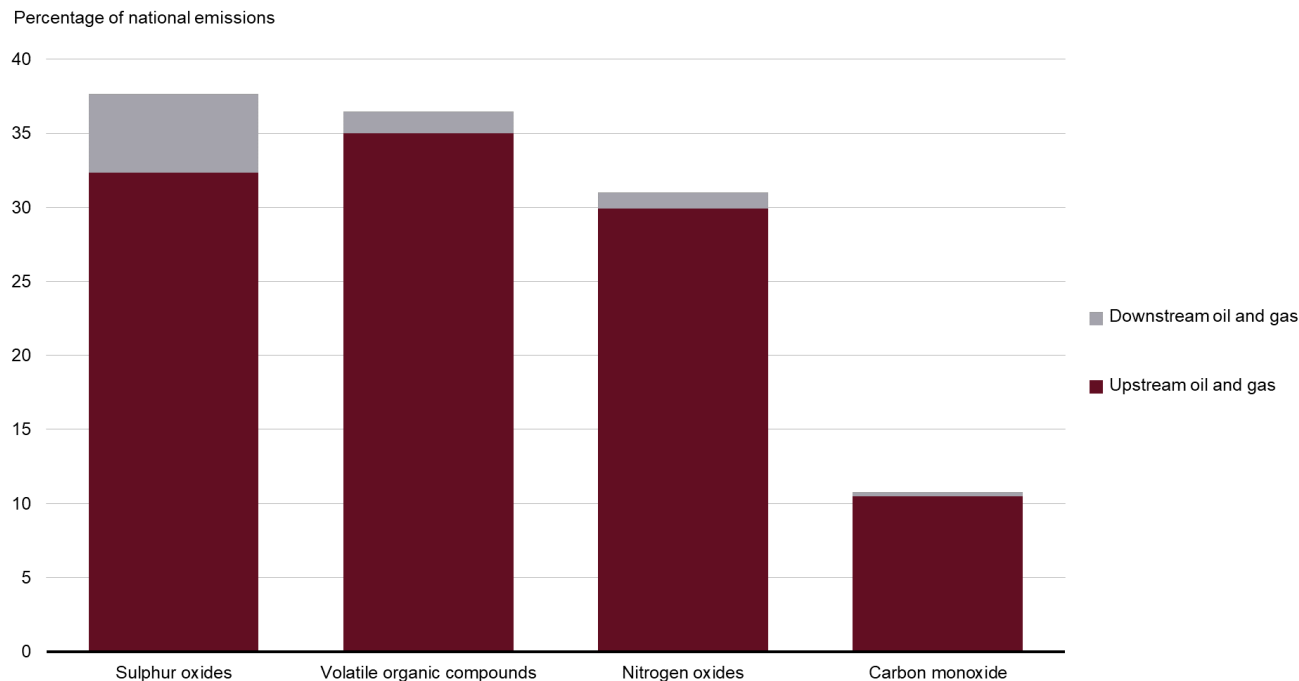
Data for Figure 24

Note: Fine particulate matter and ammonia are not shown in the chart due to their low share (≤ 1%) of total emissions in 2020. In the oil and gas industry, upstream activities include exploration, drilling, production and field processing and downstream activities include refining, storage and distribution.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

In 2020, the oil and gas industry was the sector contributing the most to total national emissions of SO_X and VOCs. It was also the second-largest contributor to emissions of NO_X, and the fourth-largest contributor to emissions of CO.

Most of emissions from the oil and gas industry came from upstream activities compared to downstream activities. In 2020, 97% of CO, 96% of VOC and NO_X and 86% of SO_X emissions from the oil and gas sector were from upstream activities.

Changes in emissions from the oil and gas industry

Key results

- Emissions of SO_X and VOC emissions decreased 54% and 12% , respectively, between 1990 and 2020
- CO and NO_X increased by 49% and 30% over that period

Figure 25. Changes in emissions of key air pollutants from the oil and gas industry, Canada, 1990 to 2020

Percentage change from 1990 level
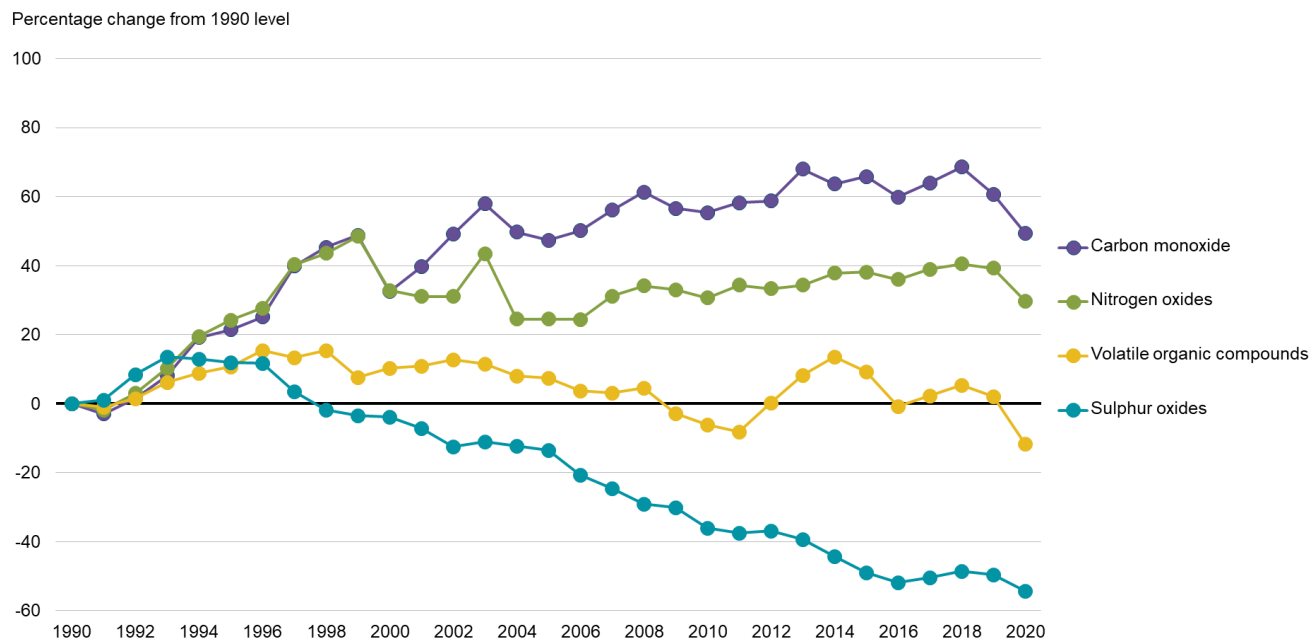
Data for Figure 25

Note: Fine particulate matter and ammonia are not shown in the chart due to their low share (≤ 1%) of total emissions in 2020.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

The increases in CO and NO_X emissions between 1990 and 2020 were due to growth in oil and gas production (the upstream sector of the industry), as emissions from the downstream sector declined due to facility closures during that period. This increase is in part explained by the fact that crude oil production 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 oil sands mining, extraction and upgrading, and natural gas production and processing, attributed to better emission control technologies.

For VOCs, the recent decline was partly due to reductions in crude oil production and petroleum refining, storage and distribution. In addition in 2020, federal and provincial regulations to reduce fugitive emissions from the sector came into effect contributing further to the decline.

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

Transportation, off-road vehicles and mobile equipment are among 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 2020, transportation, off-road vehicles and mobile equipment accounted for more than half (62%) of total national emissions of carbon monoxide (CO), 47% of nitrogen oxides (NO_X) and 17% of total emissions of volatile organic compounds (VOCs)
- While also a source of emissions for fine particulate matter ($PM_{2.5}$), sulphur oxides (SO_X) and ammonia (NH_3), the sectors represented less than 3% of total national emissions of these other pollutants

Figure 26. Contribution of transportation, off-road vehicles and mobile equipment to total air pollutant emissions by transportation mode, Canada, 2020

Percentage of national emissions

Legend:
- Off-road vehicles and equipment, tire wear and brake lining
- Air, marine and rail travel
- Large trucks and buses
- Passenger light trucks
- Passenger cars and motorcycles

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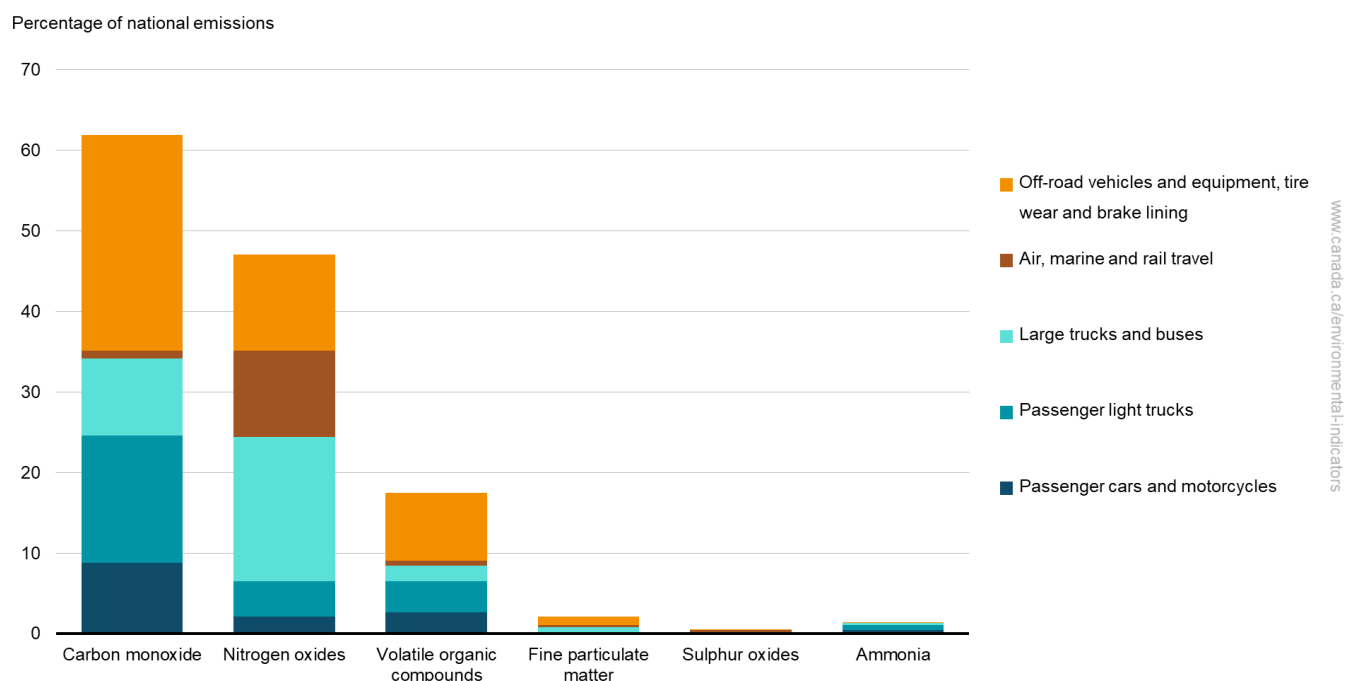
Data for Figure 26

Note: "Passenger cars and motorcycles" include cars 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 (2022) Air Pollutant Emissions Inventory.

The contribution of each transportation mode to emissions of different air pollutants is in large part explained by the mix of fuels used in these modes.

Large trucks and buses, and rail and marine travel rely predominantly on diesel fuel. Aviation relies on turbo aviation fuel. These transportation modes are the largest sources of NO_X transportation-related emissions accounting for 29% (414 kilotonnes [kt]) of total NO_X emissions.

Passenger cars and light trucks mostly use gasoline and are an important source of pollutants, especially in urban centres. In 2020, emissions from passenger cars, motorcycles and light trucks amounted to 1 146 kt of CO, 94 kt

of NO$_X$ and 95 kt of VOCs. These emissions represented 25%, 6% and 7% of all emissions of these pollutants respectively.

Other sources (mainly composed of off-road vehicles and equipment)[8] are also a significant source of pollution. Their combined emissions make up 27%, 12% and 8% of the total emissions of CO, NO$_X$ 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.

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

Key results

- Between 1990 and 2020, total emissions of NO$_X$, CO and VOCs from transportation, off-road vehicles and mobile equipment decreased by 47%, 64% and 79%, respectively
- Since 2000, all 3 pollutants demonstrated the same downward trend in their emissions level

Figure 27. Changes in emissions of key air pollutants from transportation, off-road vehicles and mobile equipment, Canada, 1990 to 2020
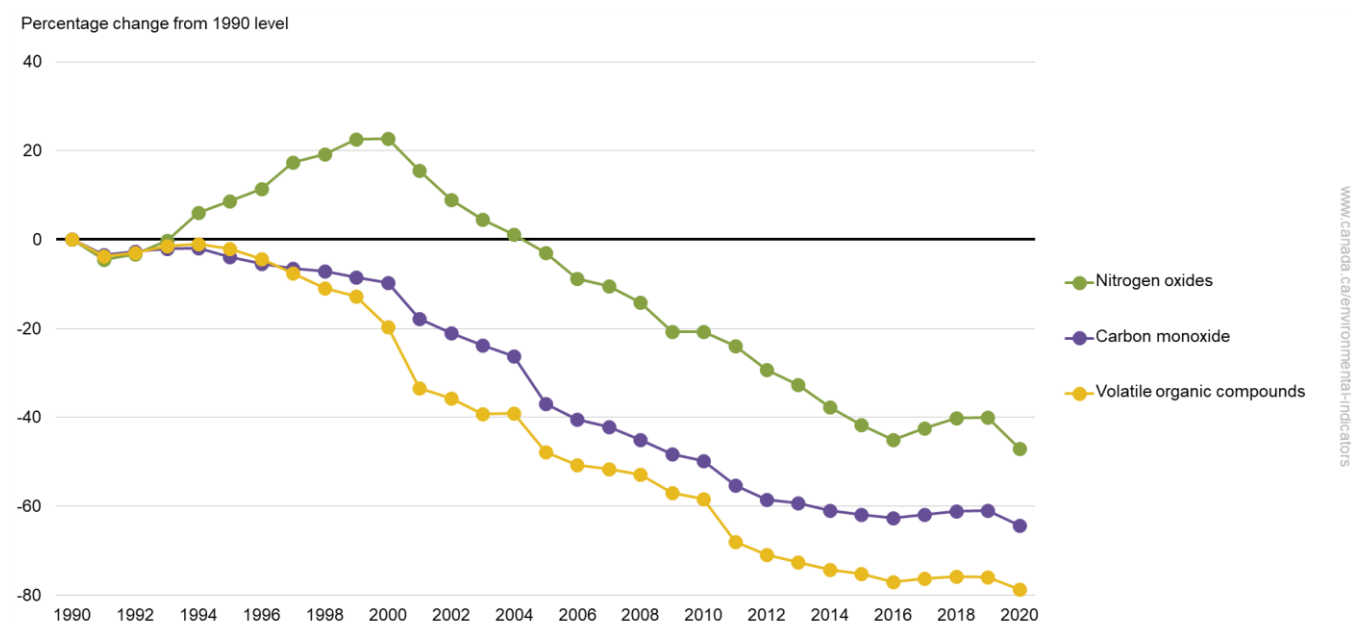
Data for Figure 27

Note: Fine particulate matter, sulphur oxides and ammonia are not shown in the chart due to their low share (≤ 5%) of total emissions in 2020.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Pollutant emissions have decreased despite economic and population growth as well as growth in transport activities for the period between 1990 and 2020. This decrease is mainly attributable to the adoption of new regulations that lead to the gradual introduction of emission control technologies and clean fuel for vehicles.

Between 1990 and 2000, NO$_X$ emissions increased by 23%. It includes the increase in emissions from light trucks (92%), large trucks and buses (44%) and marine transportation (19%). From 2000 to 2020, new regulations contributed to a decrease in emissions from light trucks (69%), large trucks and buses (51%) and emissions from

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[8] 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.

marine travel by 10%. Emissions from air, marine and rail travel represented 11% of national emissions of NO$_x$ in 2020.

Transportation 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.

Air pollutant emissions from electric utilities

Electricity generation produces a large share of total national sulphur oxides (SO_X) and nitrogen oxides (NO_X). SO_X 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, the environment, and the economy.

Key results

- In 2020, electric utilities were the source of 26% and 7% of total national emissions of sulphur oxides (SO_X) and nitrogen oxides (NO_X) respectively
- 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 (NH_3) emissions. However, they account for less than 1% of the total national emissions of these pollutants

Figure 28. Contribution of electric utilities to total air pollutant emissions by fuel source, Canada, 2020

Percentage of national emissions

Legend: Other sources, Diesel, Natural gas, Coal

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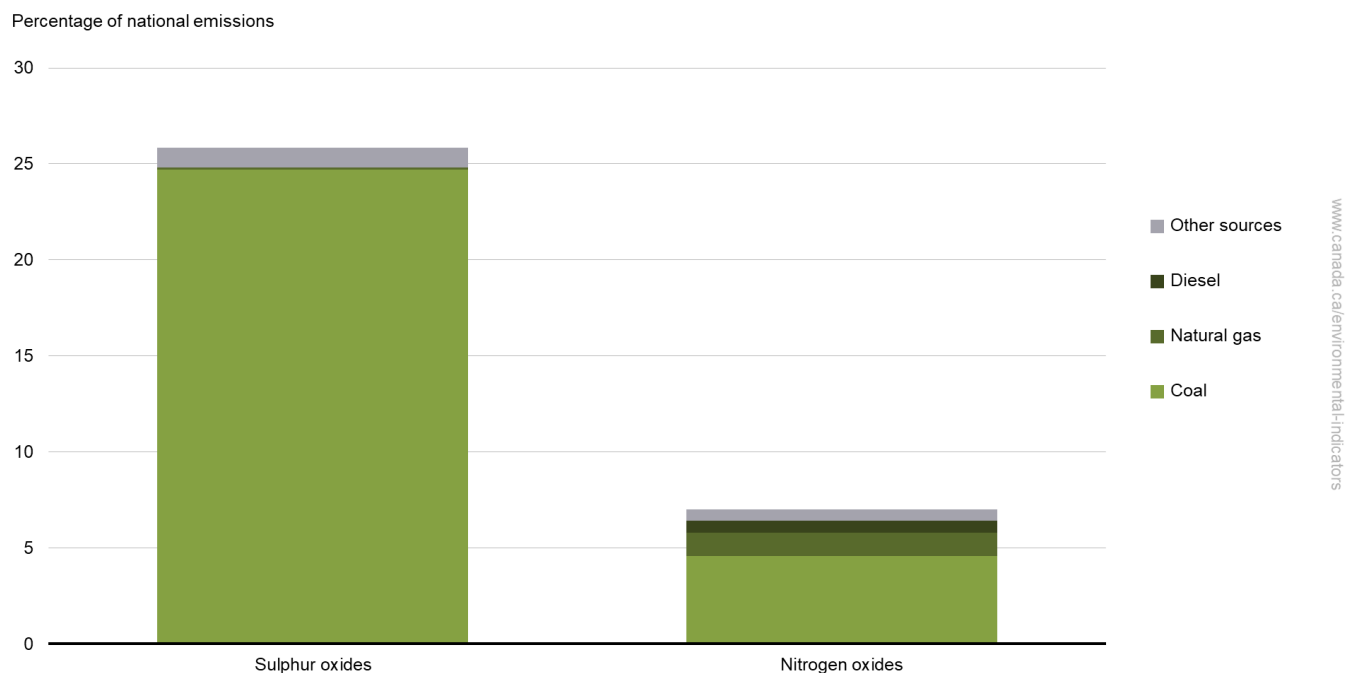
Data for Figure 28

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown in the chart due to their low share (≤ 1%) of total emissions in 2020. The indicator excludes emissions from industries that generate electricity and heat as a supporting activity rather than as their primary purpose. "Other sources" include fuel sources such as waste material and other uncategorized sources of electricity generation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

In 2020, 96% of SO_X and 66% 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 wind, nuclear 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
- 15% comes from nuclear power plants

- 7% comes from non-hydro renewable sources, such as wind, solar, tidal power and biomass[9]

Changes in emissions from electric utilities

Key results

- Emissions of SO_X and NO_X from electric utilities declined by 73% and 61%, respectively, between 1990 and 2020
- Most of that decline occurred from 2005 onward

Figure 29. Changes in emissions of key air pollutants from electric utilities, Canada, 1990 to 2020

Percentage change from 1990 level

www.canada.ca/environmental-indicators
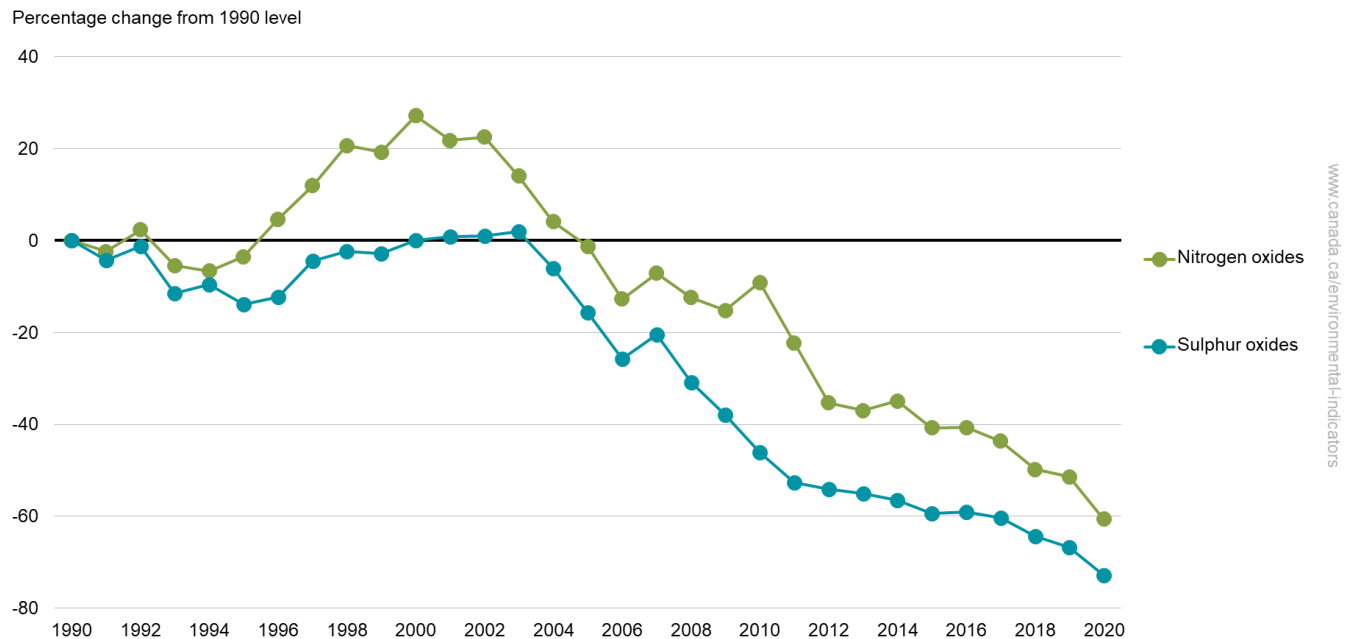
Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown in the chart due to their low share (≤ 1%) of total emissions in 2020. Excludes emissions from industries that generate electricity and heat as a supporting activity rather than as their primary purpose.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

The majority of the decline in SO_X and NO_X emissions between 1990 and 2020 occurred from 2005 onwards. Between 2005 and 2020, the share of electricity that came from burning fossil fuels fell from 22% to 19%. This decrease was mostly the result of a drop in electricity generation from coal power plants.[10] 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

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[9] Natural Resources Canada (2021) Clean Power and Low Carbon Fuels. Retrieved on February 17, 2022.

[10] Statistics Canada (2022) CANSIM Table 127-0007 - Electric power generation, by class of electricity producer, annual (megawatt hour). Retrieved on February 17, 2022.

About the indicators

What 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 (NH_3), carbon monoxide (CO) and fine particulate matter ($PM_{2.5}$). Black carbon, which is a component of $PM_{2.5}$, is also reported.[11] 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.[12]

Why these indicators are 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 (O_3) 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 [NO_2]) and VOCs are the main contributors to the formation of O_3. Nitrogen oxides, SO_X (such as sulphur dioxide [SO_2]), NH_3 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 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.

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 in reducing emissions to improve ambient air quality in Canada.

Safe and healthy communities

These indicators track progress on the 2019 to 2022 Federal Sustainable Development Strategy, supporting the target: Continued decrease in emissions from 1990 of fine particulate matter, nitrogen oxides, sulphur oxides and volatile organic compounds from all sources. The most recent data available shows that, in 2020, emissions of fine particulate matter, nitrogen oxides, volatile organic compounds and sulphur oxides were 15% to 78% lower than in 1990. These indicators are being proposed to track progress in the draft 2022 to 2026 Federal Sustainable Development Strategy.

In addition, the indicators contribute to the Sustainable Development Goals of the 2030 Agenda for Sustainable Development. They are linked to Goal 11: Sustainable cities and communities.

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[11] 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 sulphates. 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 (2022) Canada's Black Carbon Emissions Inventory. Retrieved on March 15, 2022.

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

The indicators also help Canada report against its international compliance commitments under the Convention on Long-range Transboundary Air Pollution's amended Gothenburg Protocol. Under the amended protocol, Canada has committed to emission reductions by 2020 for 4 air pollutants:

- sulphur dioxide (SO_X) (55% reduction from 2005 levels by 2020)
- nitrogen oxides (NO_X) (35% reduction from 2005 levels by 2020)
- volatile organic compounds (VOCs) (20% reduction from 2005 levels by 2020)
- fine particulate matter ($PM_{2.5}$) (25% reduction from 2005 levels by 2020)

Canada has been able to meet its emissions reduction commitments. In 2020, emissions were:

- 69% below 2005 levels for SO_X
- 36% below 2005 levels for NO_X
- 36% below 2005 levels for VOCs
- 30% below 2005 levels for $PM_{2.5}$ (excludes open source emissions from road dust, construction operations, and crop production)

Related indicators

The International comparison: air pollutant emissions in selected countries indicators compare Canada's emissions of 5 key air pollutants with those of top emitting member countries of the Organisation for Economic Co-operation and Development.

The Air health trends indicator provides an overview of the public health impacts attributable to outdoor air pollution in Canada.

The Air quality indicators track ambient concentrations of $PM_{2.5}$, O_3, SO_2, NO_2, and VOCs at the national and regional level and at local monitoring stations.

The Emissions of harmful substances to air indicators track human-related emissions to air of 3 toxic substances, namely mercury, lead and cadmium, and their compounds. For each substance, data are provided at the national, provincial/territorial and facility level and by source. Global emissions to air are also provided for mercury.

The Greenhouse gas emissions indicators report trends in total anthropogenic (human-made) GHG emissions at the national level, per person and per unit gross domestic product, by province and territory and by economic sector.

The Greenhouse gas emissions from large facilities indicator reports GHG emissions from the largest GHG emitters in Canada (industrial and other types of facilities).

The Population exposure to outdoor air pollutants indicator tracks the proportion of the Canadian population living in areas where outdoor concentrations of air pollutants are less than or equal to the 2020 Canadian Ambient Air Quality Standards.

Data sources and methods

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 (NH_3), carbon monoxide (CO) and fine particulate matter ($PM_{2.5}$). The emissions data used are from Canada's Air Pollutant Emissions Inventory for the years 1990 to 2020.

Data for the black carbon indicator, a component of $PM_{2.5}$, come from Canada's Black Carbon Emissions Inventory and are reported for the years 2013 to 2020 by source at the national level and by province and territory.

Facility data for local air pollutant emissions reported in interactive maps come from the National Pollutant Release Inventory and are available for the years 2011 to 2020.

More information

The Air Pollutant Emissions Inventory and the Black Carbon Emissions Inventory provide data and estimates on releases of air pollutants from human activities. These pollutants contribute to smog, acid rain, reduced air quality and climate change. Improvements to data and the analysis of trends are made periodically as new emission estimation methodologies are adopted and additional information is made available. Historical emissions are updated on the basis of these improvements.

Air Pollutant Emissions Inventory

The Air Pollutant Emissions Inventory fulfills many of Canada's international pollution levels reporting obligations. Specifically, under the 1979 Convention on Long-range Transboundary Air Pollution, Canada is committed to submitting an annual inventory of emissions of key air pollutants to the United Nations Economic Commission for Europe. The inventory is a comprehensive assessment of 17 air pollutants,[13] 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 provides a comprehensive overview of pollutant emissions across Canada.

The national and provincial/territorial inventory data are current as of March 15, 2022, and cover the period from 1990 to 2020. Emissions data are compiled into a database for reporting approximately one year after data collection, validation and calculation have been completed. After this process is the interpretation of results and public reporting of the inventory. The Air pollutant emissions indicators are reported following the public release of the inventory data.

Black carbon emissions 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 Emissions Inventory is compiled using $PM_{2.5}$ emissions data from combustion-related sources from the Air Pollutant Emissions Inventory. Black carbon estimates are published separately from the Air Pollutant Emissions Inventory. The data are current as of March 15, 2022.

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 (CO_2) (which can persist in the atmosphere for thousands of years) 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

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[13] Includes the 6 key air pollutants (sulphur oxides, nitrogen oxides, volatile organic compounds, ammonia, carbon monoxide and fine particulate matter) along with cadmium, lead, mercury, dioxins and furans, 4 types of polycyclic aromatic hydrocarbons, hexachlorobenzene, coarse particulate matter and total particulate matter.

Earth's surface.[14] Black carbon absorbs more solar radiation 460 to 1 500 times than CO_2.[15] 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 Polar Regions, such as the Arctic.[16] The Intergovernmental Panel on Climate Change (IPCC) special report on Global Warming states that reductions in short-lived climate pollutants are required to limit warming to a maximum of 1.5°C, and Canada's Changing Climate Report flags short-lived climate pollutants as an important part of climate policy discussions.

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, disposals and transfers annually to the department. The inventory data from 1993 to 2020 are current as of March 2, 2022.

Methods

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

Compilation of air pollutant emissions

The Air Pollutant Emissions Inventory is developed using 2 types of information:

- facility-reported data, consisting of emissions from relatively large industrial, commercial and institutional facilities
- in-house estimates, including diffuse sources and other sources that are too numerous to be accounted for individually, such as road and non-road vehicles, agricultural activities, construction and solvent use

The Air Pollutant Emissions Inventory is developed using many sources of information, procedures and emission estimation models. Emissions data reported by individual facilities to the department's National Pollutant Release Inventory are supplemented with documented, science-based estimation tools to quantify total emissions. Together, these data sources provide a comprehensive overview of pollutant emissions across Canada.

A compilation framework has been developed that makes use of the best available data, while ensuring that there is no double-counting or omissions. Additional information on the inventory compilation process is provided in Chapter 3 of the Air Pollutant Emissions Inventory Report.

Facility-reported emissions data

Facility-reported emissions data generally refers to any stationary sources that emit pollutants through stacks or other equipment at specific locations. The major source of facility-reported data is the National Pollutant Release Inventory.

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[14] Environment and Climate Change Canada (2019) Short-lived climate pollutants. Retrieved on February 18, 2022.

[15] Climate and Clean Air Coalition (2022) Science: Black carbon. Retrieved on February 18, 2022.

[16] Environment and Climate Change Canada (2022) Canada's Black Carbon Inventory Report 2022. Retrieved on March 15, 2022.

Facility-reported data from the [National Pollutant Release Inventory](#) are used in the Air Pollutant Emissions Inventory without modifications, except when data quality issues are detected and not addressed during the quality control exercise. The National Pollutant Release Inventory reporting requirements and thresholds vary by pollutant and, in some cases, by industry. Details on these reporting requirements and thresholds are available on the National Pollutant Release Inventory website.

A distinction has been made between reporting facilities and non-reporting facilities. Reporting facilities meet the threshold required to report to the National Pollutant Release Inventory; while non-reporting facilities do not meet these thresholds due to their size or emission levels, and therefore are not required to report to the inventory. Some facilities may be required to report emissions on only certain pollutants. Therefore, emissions from the non-reporting facilities or of non-reported pollutants must be estimated in-house to ensure complete coverage.

In-house emission estimates

In-house emission estimates are calculated with information such as production data and activity data, using various estimation methodologies and emission models. These emission estimates are at the national level rather than at any specific geographic locations. These include emissions from non-industrial, residential, commercial, transportation, and other sources, such as open burning, agricultural activities and construction operations. The Air Pollutant Emissions Inventory uses in-house estimates for the following emission sources:

- any residential, governmental, institutional, or commercial operation that does not report to the National Pollutant Release Inventory
- on-site solid waste disposal facilities
- motor vehicles, aircraft, vessels or other transportation equipment or devices
- other sources, such as open burning, agricultural activities and construction operations

In general, in-house emission estimates are calculated from activity data and emission factors.[17] Activity data usually comprise statistical production or process data at the provincial, territorial or national level. This information is typically provided by provincial/territorial agencies, federal government departments, industry associations, etc. For each source category, activity data are combined with emission factors to produce provincial/territorial-level emission estimates.

The in-house emission estimate methodologies and emission models used in Canada are often based on those developed by the United States Environmental Protection Agency (U.S. EPA) and are adapted to reflect the Canadian climate, fuels, technologies and practices. Methods used in Canada's Air Pollutant Emissions Inventory are therefore generally consistent with those used in the United States or those recommended in the emission inventory guidebook.[18]

The Air Pollutant Emissions Inventory reports air pollutant emissions from mobile sources such as on-road vehicles, off-road vehicles and engines. For the current edition of the Air Pollutant Emissions Inventory, an emissions estimation model developed by the U.S. EPA (MOVES) was used. The emissions for off-road vehicles and engines (such as graders, heavy trucks, outboard motors and lawnmowers) were estimated using the U.S. EPA's NONROAD emission estimation model (see "off-road vehicles and equipment" in [Table A2-4 of Annex 2](#) of the Air Pollutant Emissions Inventory Report). The parameters in both models were modified to take into account variations in the Canadian vehicle fleet, emission control technologies, types of fuels, vehicle standards, and types of equipment engines and their application in various industries. The emission estimates for civil and international aviation, railways and navigation are

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[17] The United States Environmental Protection Agency defines an emission factor as "…a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (for example, kilograms of particulate emitted per megagram of coal burned)."

[18] European Monitoring and Evaluation Programme / European Environment Agency (2013) EMEP/EEA Air Pollutant Emission Inventory Guidebook 2013. [Technical Guidance to Prepare National Emission Inventories](#). Luxembourg: Publications Office of the European Union. Technical Report No. 12/2013.

estimated using detailed vehicle movement statistics coupled with fuel consumption, engine information, and emission rates by vehicle types.

Calculation of black carbon emissions

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 profiles[19] of air pollution sources. Annex 2 of Canada's Black Carbon Emissions Inventory lists all the ratios used for each source.

Recalculations

Emission recalculation is an essential practice in the maintenance of an up-to-date air pollutant emissions inventory. The Air Pollutant Emissions Inventory is continuously updated with improved estimation methodologies, statistics and more recent and appropriate emission factors. As new information and data become available, previous estimates are updated and recalculated to ensure a consistent and comparable trend in emissions. Recalculations of previously reported emission estimates are common for both in-house estimates and facility-reported emission data. More information on recalculations is provided in Annex 3 of the Air Pollutant Emissions Inventory Report.

Emissions reconciliation

In several sectors, estimation of total emissions involves combining estimates provided by facilities with estimates developed in-house by the department. To prevent double counting of emissions and to confirm that the Air Pollutant Emissions Inventory includes all emissions, a comparison and reconciliation of emission estimates from various sources is performed for each pollutant, industry sector and geographical region, as appropriate. More information on the reconciliation process is provided in section 3.4 of the Air Pollutant Emissions Inventory Report.

Temporal coverage

Historical data are provided at the national level for the period from 1990 to 2020. For the regional indicators (provincial/territorial), emissions are presented for 1990 and 2020. Facility level emissions information are available from 2011 to 2020.

Air pollutant emissions by source classification

For the purpose of reporting the indicators, calculated emissions data from the Air Pollutant Emissions Inventory and Black Carbon Emissions 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

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[19] 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 (2022) Canada's Black Carbon Emissions Inventory 2022. Retrieved on March 15, 2022.

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 indicators compared with the sources and sectors reported by the Air Pollutant Emissions Inventory.

Table 2. Alignment of sources reported in the indicators with the sources and sectors from the Air Pollutant Emissions Inventory/Black Carbon Emissions Inventory

Sources in the indicators	Sources and sectors in the Air Pollutant Emissions Inventory and Black Carbon Emissions Inventory
Agriculture (livestock, crop production and fertilizer)	Agriculture: Animal production
Agriculture (livestock, crop production and fertilizer)	Agriculture: Crop production
Agriculture (livestock, crop production and fertilizer)	Agriculture: Fuel use
Building heating and energy generation	Commercial/Residential/Institutional: Commercial and institutional fuel combustion
Building heating and energy generation	Commercial/Residential/Institutional: Construction fuel combustion
Building heating and energy generation	Commercial/Residential/Institutional: Residential fuel combustion
Dust and fires	Dust: Coal transportation
Dust and fires	Dust: Construction operations
Dust and fires	Dust: Mine tailings
Dust and fires	Dust: Paved roads
Dust and fires	Dust: Unpaved roads
Dust and fires	Fires: Prescribed burning
Dust and fires	Fires: Structural fires
Electric utilities	Electric power generation (utilities): Coal
Electric utilities	Electric power generation (utilities): Diesel
Electric utilities	Electric power generation (utilities): Natural gas
Electric utilities	Electric power generation (utilities): Waste materials[A]
Electric utilities	Electric power generation (utilities): Other (electric power generation)
Home firewood burning	Commercial/Residential/Institutional: Home firewood burning
Incineration and waste	Incineration and waste: Crematoriums
Incineration and waste	Incineration and waste: Waste incineration
Incineration and waste	Incineration and waste: Waste treatment and disposal
Manufacturing	Manufacturing: Abrasives manufacture
Manufacturing	Manufacturing: Bakeries
Manufacturing	Manufacturing: Biofuel production
Manufacturing	Manufacturing: Chemicals industry

Sources in the indicators	Sources and sectors in the Air Pollutant Emissions Inventory and Black Carbon Emissions Inventory
Manufacturing	Manufacturing: Electronics
Manufacturing	Manufacturing: Food preparation
Manufacturing	Manufacturing: Glass manufacturing
Manufacturing	Manufacturing: Grain industry
Manufacturing	Manufacturing: Metal fabrication
Manufacturing	Manufacturing: Plastics manufacturing
Manufacturing	Manufacturing: Pulp and paper industry
Manufacturing	Manufacturing: Textiles
Manufacturing	Manufacturing: Vehicle manufacturing (engines, parts, assembly, painting)
Manufacturing	Manufacturing: Wood products
Manufacturing	Manufacturing: Other (manufacturing)
Miscellaneous	Commercial/Residential/Institutional: Commercial cooking
Miscellaneous	Commercial/Residential/Institutional: Human[B]
Miscellaneous	Commercial/Residential/Institutional: Marine cargo handling
Miscellaneous	Commercial/Residential/Institutional: Other (commercial/residential/institutional)
Miscellaneous	Commercial/Residential/Institutional: Service stations
Off-road vehicles and mobile equipment	Transportation and mobile equipment: Off-road diesel vehicles and equipment
Off-road vehicles and mobile equipment	Transportation and mobile equipment: Off-road gasoline / liquefied petroleum gas / natural gas vehicles and equipment
Oil and gas industry	Oil and gas industry: Downstream oil and gas industry
Oil and gas industry	Oil and gas industry: Upstream oil and gas industry
Ore and mineral industries	Ore and mineral industries: Aluminum industry
Ore and mineral industries	Ore and mineral industries: Asphalt paving industry
Ore and mineral industries	Ore and mineral industries: Cement and concrete industry
Ore and mineral industries	Ore and mineral industries: Foundries
Ore and mineral industries	Ore and mineral industries: Iron and steel industry
Ore and mineral industries	Ore and mineral industries: Iron ore industry
Ore and mineral industries	Ore and mineral industries: Mineral products industry
Ore and mineral industries	Ore and mineral industries: Mining and rock quarrying
Ore and mineral industries	Ore and mineral industries: Non-ferrous refining and smelting industry[C]
Paints and solvents	Paints and solvents: Dry cleaning
Paints and solvents	Paints and solvents: General solvent use
Paints and solvents	Paints and solvents: Printing
Paints and solvents	Paints and solvents: Surface coatings

Sources in the indicators	Sources and sectors in the Air Pollutant Emissions Inventory and Black Carbon Emissions Inventory
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Air transportation (Landing and takeoff)
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Heavy-duty diesel vehicles
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Heavy-duty gasoline vehicles
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Heavy-duty liquefied petroleum gas / natural gas vehicles
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Light-duty diesel trucks
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Light-duty diesel vehicles
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Light-duty gasoline trucks
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Light-duty gasoline vehicles
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Light-duty liquefied petroleum gas / natural gas trucks
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Light-duty liquefied petroleum gas / natural gas vehicles
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Domestic marine navigation, fishing and military
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Motorcycles
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Rail transportation
Transportation (road, rail, air and marine)	Transportation and mobile equipment: Tire wear and brake lining

Note: [A] Includes electric power generation from combustion of waste materials by utilities and by industry for commercial sale and/or private use. [B] Includes human respiration, perspiration and dental amalgams. [C] These sectors from the Air Pollutant Emissions Inventory are sometimes shown as individual sources in the indicators.

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 Emissions 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 2020. They also provide information about emissions of selected pollutants, by sector, for the period from 1990 to 2020.

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

Table 3. Alignment of sources reported in the transportation, off-road vehicles and mobile equipment indicator of Air pollutant emissions with the sources and sectors from the Air Pollutant Emissions Inventory/Black Carbon Emissions Inventory

Air pollutant emissions from transportation, off-road vehicles and mobile equipment	Sources and sectors in the Air Pollutant Emissions Inventory and Black Carbon Emissions Inventory
Air, marine and rail travel	Transportation and mobile equipment: Air transportation (Landing and takeoff)
Air, marine and rail travel	Transportation and mobile equipment: Domestic marine navigation, fishing and military
Air, marine and rail travel	Transportation and mobile equipment: Rail transportation
Large trucks and buses	Transportation and mobile equipment: Heavy-duty diesel vehicles
Large trucks and buses	Transportation and mobile equipment: Heavy-duty gasoline vehicles
Large trucks and buses	Transportation and mobile equipment: Heavy-duty liquefied petroleum gas / natural gas vehicles
Off-road vehicles and equipment, tire wear and brake lining	Transportation and mobile equipment: Off-road diesel vehicles and equipment
Off-road vehicles and equipment, tire wear and brake lining	Transportation and mobile equipment: Off-road gasoline / liquefied petroleum gas / natural gas vehicles and equipment
Off-road vehicles and equipment, tire wear and brake lining	Transportation and mobile equipment: Tire wear and brake lining
Passenger cars and motorcycles	Transportation and mobile equipment: Light-duty diesel vehicles
Passenger cars and motorcycles	Transportation and mobile equipment: Light-duty gasoline vehicles
Passenger cars and motorcycles	Transportation and mobile equipment: Light-duty liquefied petroleum gas / natural gas vehicles
Passenger cars and motorcycles	Transportation and mobile equipment: Motorcycles
Passenger light trucks	Transportation and mobile equipment: Light-duty diesel trucks
Passenger light trucks	Transportation and mobile equipment: Light-duty gasoline trucks
Passenger light trucks	Transportation and mobile equipment: Light-duty liquefied petroleum gas / natural gas trucks

Table 4. Alignment of sources reported in the electric utilities indicator of Air pollutant emissions with the sources and sectors from the Air Pollutant Emissions Inventory/Black Carbon Emissions Inventory

Air pollutant emissions from electric utilities	Sources and sectors in the Air Pollutant Emissions Inventory and Black Carbon Emissions Inventory
Coal	Electric power generation (utilities): Coal
Diesel	Electric power generation (utilities): Diesel
Natural gas	Electric power generation (utilities): Natural gas

Air pollutant emissions from electric utilities	Sources and sectors in the Air Pollutant Emissions Inventory and Black Carbon Emissions Inventory
Other	Electric power generation (utilities): Waste materials[A]
Other	Electric power generation (utilities): Other (electric power generation)

Note: [A] Includes electric power generation from combustion of waste materials by utilities and by industry for commercial sale and/or private use.

Table 5. Alignment of sources reported in the oil and gas industry indicator of Air pollutant emissions with the sources and sectors from the Air Pollutant Emissions Inventory/Black Carbon Emissions Inventory

Air pollutant emissions from the oil and gas industry	Sources and sectors in the Air Pollutant Emissions Inventory and Black Carbon Emissions Inventory
Downstream oil and gas	Oil and gas industry: Downstream oil and gas industry
Upstream oil and gas	Oil and gas industry: Upstream oil and gas industry

Recent changes

The emission estimates reported in the Air Pollutant Emissions Inventory used in the indicators have undergone a number of significant recalculations. Specifically, the sector emissions for ore and mineral industries, the oil and gas industry, manufacturing, transportation, agriculture, commercial/residential/institutional, and incineration and waste, following the implementation of improved quantification methods. For more information about these recent changes, consult Annex 3 of the Air Pollutant Emissions Inventory Report.

Canada's Black Carbon Emissions 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 3.3 of Canada's Black Carbon Emissions Inventory for more information.

Caveats and limitations

The methodologies for compiling air pollutant emissions generally improve over time, and revisions are made to the Air Pollution Emissions 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 2020 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 were used.

The Air Pollutant Emissions 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 Emissions Inventory at a given time because of updates to point source data from National Pollutant Release Inventory reporting. The inventory also uses different rounding protocols in its final report and total emissions reported in the indicators may be slightly different.

Only the most significant sources of black carbon have been reported. It is estimated that emissions from these sources (home firewood burning, off-road vehicles and mobile equipment and transportation) represent approximately 83% of the national anthropogenic black carbon emissions.

The latest year reported (2020) coincides with the first year of the COVID-19 pandemic which had an impact on a wide range of economic sectors, especially the energy and transport sectors. The emissions change for the periods from 1990 to 2020 must be interpreted with caution as the level of incidence of the pandemic on the emissions is not discussed in detail in the indicators.

Resources

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Related information

Air pollution: drivers and impacts

Air Pollutant Emissions Inventory: overview

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 2020

Year	Sulphur oxides (percentage change from 1990 level)	Nitrogen oxides (percentage change from 1990 level)	Volatile organic compounds (percentage change from 1990 level)	Ammonia (percentage change from 1990 level)	Carbon monoxide (percentage change from 1990 level)	Fine particulate matter (percentage change from 1990 level)
1990	0	0	0	0	0	0
1991	-7	-4	-2	-1	-2	-3
1992	-11	-2	-1	2	-2	-5
1993	-14	0	2	3	0	-6
1994	-21	5	3	7	0	-4
1995	-17	8	3	13	-1	-8
1996	-17	11	2	18	-4	-7
1997	-18	17	0	19	-7	-5
1998	-19	19	-2	19	-9	-16
1999	-23	21	-4	18	-11	-15
2000	-23	20	-7	20	-13	-18
2001	-23	14	-15	20	-20	-19
2002	-25	12	-16	23	-23	-24
2003	-27	10	-18	22	-24	-24
2004	-27	4	-19	25	-28	-26
2005	-31	0	-21	24	-36	-26
2006	-37	-7	-25	21	-40	-26
2007	-39	-7	-26	23	-41	-21
2008	-45	-10	-28	20	-43	-17
2009	-54	-15	-33	16	-46	-24
2010	-57	-15	-34	15	-47	-20
2011	-60	-17	-39	14	-51	-18
2012	-60	-22	-39	18	-53	-11

Year	Sulphur oxides (percentage change from 1990 level)	Nitrogen oxides (percentage change from 1990 level)	Volatile organic compounds (percentage change from 1990 level)	Ammonia (percentage change from 1990 level)	Carbon monoxide (percentage change from 1990 level)	Fine particulate matter (percentage change from 1990 level)
2013	-60	-24	-38	21	-54	-10
2014	-62	-26	-37	19	-54	-11
2015	-64	-29	-40	20	-55	-10
2016	-65	-32	-44	20	-56	-11
2017	-68	-29	-43	17	-55	-11
2018	-73	-29	-42	21	-55	-10
2019	-76	-29	-43	21	-56	-10
2020	-78	-36	-49	24	-59	-15

Note: The indicator reports emissions of 6 key air pollutants from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. Emissions from black carbon, a component of PM$_{2.5}$, are also not included.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 2. Data for Figure 2. Distribution of air pollutant emissions by source, Canada, 2020

Source	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)
Oil and gas industry	37.7	31.0	36.5	0.5	10.8	0.9
Manufacturing	5.4	4.3	6.9	2.5	2.6	1.1
Ore and mineral industries	29.7	5.1	0.8	0.3	10.9	2.4
Transportation (road, rail, air and marine)	0.4	35.1	9.1	1.3	35.2	1.2
Off-road vehicles and mobile equipment	<0.1	12.0	8.4	<0.1	26.7	1.0
Building heating and energy generation	0.4	4.3	0.2	0.1	0.7	0.4
Electric utilities	25.8	7.0	<0.1	<0.1	0.6	0.2
Home firewood burning	0.2	0.6	7.8	0.2	11.6	5.6
Incineration and waste	0.2	0.3	1.1	1.1	0.3	0.2

Source	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)
Paints and solvents	n/a	<0.1	17.8	n/a	n/a	<0.1
Agriculture (livestock, crop production and fertilizer)	<0.1	0.2	7.9	93.8	<0.1	24.4
Dust and fires	<0.1	<0.1	0.1	<0.1	0.6	61.7
Miscellaneous	<0.1	<0.1	3.2	0.1	0.1	1.1

Note: n/a = not available. The indicator reports emissions of 6 key air pollutants from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. Emissions from black carbon, a component of $PM_{2.5}$, are also not included. The percentages have been rounded off and their sum may not add up to 100.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 3. Data for Figure 3. Distribution of air pollutant emissions by province and territory, Canada, 2020

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	1.8	2.6	1.3	0.2	1.8	0.9
Prince Edward Island	<0.1	0.2	0.3	0.7	0.4	0.2
Nova Scotia	8.2	2.3	1.9	0.7	2.5	1.0
New Brunswick	1.9	1.6	1.6	0.7	2.4	0.8
Quebec	15.2	10.7	14.5	13.1	25.7	8.2
Ontario	17.3	15.8	21.1	18.9	24.2	12.0
Manitoba	0.3	2.7	4.2	12.8	3.6	6.9
Saskatchewan	16.3	8.9	14.6	20.9	6.0	30.3
Alberta	28.0	39.2	31.2	27.3	19.1	35.0
British Columbia	10.7	14.5	9.0	4.7	13.9	4.2
Yukon	<0.1	<0.1	<0.1	<0.1	0.1	0.1
Northwest Territories and Nunavut	<0.1	1.2	0.2	<0.1	0.3	0.3

Note: The indicator reports emissions of 6 key air pollutants from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. Emissions from black carbon, a component of $PM_{2.5}$, are also not included. The percentages have been rounded off and their sum may not add up to 100.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 4. Data for Figure 4. Total sulphur oxide emissions by source, Canada, 1990 to 2020

Year	Oil and gas industry (emissions in kilotonnes)	Ore and mineral industries (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
1990	536.8	1 481.2	618.4	372.3	3 008.7
1991	542.4	1 334.3	592.1	322.6	2 791.5
1992	582.5	1 169.3	610.7	306.7	2 669.1
1993	610.2	1 112.6	547.2	311.2	2 581.1
1994	606.6	892.0	559.8	311.0	2 369.4
1995	600.6	1 105.7	532.6	263.8	2 502.7
1996	599.9	1 089.1	542.2	280.5	2 511.6
1997	555.7	1 032.1	591.3	281.9	2 461.0
1998	526.8	1 019.4	603.6	277.3	2 427.1
1999	518.9	925.4	601.1	280.4	2 325.8
2000	516.1	914.5	619.2	279.7	2 329.4
2001	498.7	911.7	623.9	272.8	2 307.2
2002	470.3	903.8	624.3	266.1	2 264.6
2003	477.4	812.2	630.4	274.7	2 194.7
2004	470.6	874.4	581.5	278.6	2 205.2
2005	464.1	857.2	521.9	247.5	2 090.7
2006	426.3	826.7	458.9	177.8	1 889.7
2007	404.7	778.9	491.9	167.8	1 843.3
2008	380.4	715.1	427.5	135.2	1 658.2
2009	375.1	522.5	384.0	113.9	1 395.4
2010	343.9	501.4	333.9	107.4	1 286.6
2011	335.6	467.1	293.2	108.1	1 204.0
2012	339.4	477.3	284.2	97.9	1 198.8
2013	326.3	492.0	278.2	95.5	1 192.0
2014	299.3	487.2	269.2	95.7	1 151.4
2015	273.6	482.8	251.5	65.4	1 073.3

Year	Oil and gas industry (emissions in kilotonnes)	Ore and mineral industries (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
2016	258.7	481.2	253.1	58.2	1 051.2
2017	265.9	388.9	245.5	56.2	956.5
2018	276.0	258.0	220.3	58.2	812.5
2019	271.2	183.2	205.5	53.1	713.0
2020	245.2	193.2	168.2	44.4	650.9

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. The numbers have been rounded off and their sum may not correspond to the total.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 5. Data for Figure 5. Sulphur oxide emissions by province and territory, Canada, 1990, 2005 and 2020

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2020 (emissions in kilotonnes)
Newfoundland and Labrador	68.8	48.9	11.5
Prince Edward Island	3.4	2.3	0.3
Nova Scotia	203.2	150.1	53.3
New Brunswick	109.3	93.0	12.5
Quebec	246.9	220.5	99.2
Ontario	1 123.2	500.4	112.8
Manitoba	509.1	397.2	1.9
Saskatchewan	102.9	149.0	106.4
Alberta	512.4	460.4	182.5
British Columbia	110.7	65.2	69.9
Yukon	0.6	1.3	<0.1
Northwest Territories and Nunavut	18.0	2.6	0.6

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 6. Data for Figure 7. Total nitrogen oxide emissions by source, Canada, 1990 to 2020

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 emissions (emissions in kilotonnes)
1990	901.4	345.9	382.1	387.0	257.0	2 273.4
1991	852.5	339.6	368.7	377.4	250.9	2 189.1

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 emissions (emissions in kilotonnes)
1992	860.0	356.2	363.2	386.7	262.9	2 228.9
1993	873.3	381.4	370.0	412.6	243.0	2 280.2
1994	919.0	413.4	376.1	446.4	240.0	2 394.8
1995	918.8	429.7	375.3	481.1	248.1	2 453.1
1996	962.8	441.9	373.2	472.6	269.0	2 519.5
1997	1042.4	485.5	372.9	469.8	287.7	2 658.4
1998	1112.4	496.6	354.6	422.9	310.1	2 696.7
1999	1179.8	513.7	358.0	400.4	306.4	2 758.3
2000	1188.2	459.3	361.9	393.3	326.8	2 729.6
2001	1151.3	453.5	340.6	337.9	313.0	2 596.4
2002	1078.5	453.5	368.5	324.8	314.9	2 540.3
2003	1005.9	496.2	365.8	340.5	293.0	2 501.4
2004	961.2	430.6	361.1	341.5	267.5	2 361.8
2005	939.2	430.8	332.4	310.1	253.7	2 266.2
2006	889.8	430.4	282.1	286.1	224.3	2 112.7
2007	865.6	453.8	273.4	287.8	238.8	2 119.4
2008	827.1	464.1	253.4	279.3	225.1	2 048.9
2009	756.5	460.2	226.6	265.3	218.0	1 926.6
2010	737.2	452.1	233.1	283.6	233.7	1 939.7
2011	725.9	464.9	240.6	254.2	199.8	1 885.5
2012	687.2	461.2	237.7	223.1	166.3	1 775.4
2013	653.2	464.7	233.6	214.9	162.0	1 728.2
2014	601.7	476.7	235.0	200.9	167.2	1 681.6
2015	555.7	478.0	231.5	196.3	152.3	1 613.8
2016	546.1	470.5	224.9	161.6	152.4	1 555.5
2017	567.3	480.6	238.3	174.3	144.9	1 605.4
2018	584.8	486.1	236.1	185.0	129.1	1 621.1
2019	590.5	481.9	230.6	183.0	124.9	1 611.0
2020	508.1	448.9	215.5	173.4	101.1	1 447.1

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. The numbers have been rounded off and their sum may not correspond to the total.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 7. Data for Figure 8. Nitrogen oxide emissions by province and territory, Canada, 1990, 2005 and 2020

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2020 (emissions in kilotonnes)
Newfoundland and Labrador	52.0	58.7	37.9
Prince Edward Island	6.7	6.9	3.3
Nova Scotia	82.9	89.9	33.8
New Brunswick	78.7	70.3	23.7
Quebec	311.6	292.8	154.9
Ontario	602.6	538.7	229.3
Manitoba	72.6	66.5	38.7
Saskatchewan	149.3	172.9	129.5
Alberta	613.3	659.9	567.7
British Columbia	286.0	285.1	209.5
Yukon	3.7	2.5	1.4
Northwest Territories and Nunavut	13.9	22.1	17.4

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 8. Data for Figure 10. Total volatile organic compound emissions by source, Canada, 1990 to 2020

Year	Oil and gas industry (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
1990	603.6	357.5	255.7	388.5	816.8	188.3	258.6	2 869.1
1991	598.3	350.0	257.2	371.9	789.1	189.5	255.2	2 811.3
1992	612.7	352.2	243.3	371.0	797.7	199.2	256.3	2 832.4
1993	640.5	351.4	265.9	369.5	817.6	200.0	273.0	2 918.0
1994	656.9	362.1	264.2	370.6	821.9	194.3	275.2	2 945.2
1995	668.8	375.2	262.5	358.4	822.3	189.6	265.1	2 941.8
1996	696.7	373.0	254.5	351.7	800.8	193.7	264.2	2 934.6
1997	684.6	374.9	244.3	352.1	761.5	191.1	259.0	2 867.6
1998	696.7	377.5	246.5	352.5	721.6	153.1	263.1	2 811.1
1999	650.3	389.5	242.0	347.8	703.8	148.1	260.9	2 742.4
2000	665.4	395.9	239.9	338.9	629.4	149.7	256.0	2 675.2
2001	669.3	375.7	237.6	328.1	473.6	128.8	230.8	2 443.8
2002	680.3	366.9	233.7	308.6	465.2	124.1	233.6	2 412.5
2003	673.2	368.8	245.2	288.9	444.1	116.5	216.9	2 353.7
2004	652.5	364.3	238.0	274.3	459.1	123.4	201.8	2 313.4
2005	648.5	441.0	235.3	245.1	383.5	126.8	188.0	2 268.2
2006	626.8	417.1	223.3	227.4	366.2	124.0	165.3	2 150.1
2007	622.4	409.4	218.0	224.3	358.9	142.9	149.4	2 125.5
2008	630.6	392.3	213.2	233.0	335.0	140.3	134.6	2 079.0
2009	586.3	353.3	211.0	197.9	320.5	139.0	114.1	1 922.1
2010	566.3	361.4	209.7	191.9	310.5	120.8	119.4	1 880.0
2011	555.0	349.7	211.0	177.9	207.9	125.7	117.0	1 744.3
2012	604.8	354.6	207.6	169.1	181.1	116.5	118.6	1 752.2
2013	653.0	357.0	202.9	162.1	167.5	126.1	116.9	1 785.5
2014	686.1	363.6	208.0	148.9	161.5	125.7	110.3	1 804.1

Year	Oil and gas industry (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
2015	659.2	331.6	204.1	144.7	153.9	120.3	106.0	1 719.9
2016	598.4	315.4	203.7	148.8	128.7	111.8	104.7	1 611.5
2017	617.7	310.1	202.5	150.6	134.5	110.6	101.5	1 627.5
2018	635.6	311.6	203.6	153.4	138.3	122.4	107.7	1 672.4
2019	616.5	302.3	205.4	155.2	133.8	124.4	104.1	1 641.8
2020	533.7	260.8	196.7	132.4	123.2	114.5	100.9	1 462.3

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. The numbers have been rounded off and their sum may not correspond to the total.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 9. Data for Figure 11. Volatile organic compound emissions by province and territory, Canada, 1990, 2005 and 2020

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2020 (emissions in kilotonnes)
Newfoundland and Labrador	45.9	31.9	19.4
Prince Edward Island	10.5	8.5	5.0
Nova Scotia	70.2	49.3	27.9
New Brunswick	82.1	54.0	24.0
Quebec	492.9	361.4	211.7
Ontario	852.8	586.8	308.2
Manitoba	96.1	81.1	61.0
Saskatchewan	186.9	238.4	213.1
Alberta	643.8	589.7	456.9
British Columbia	375.0	255.7	131.2
Yukon	2.4	1.8	0.9
Northwest Territories and Nunavut	10.6	9.6	3.0

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 10. Data for Figure 13. Total ammonia emissions by source, Canada, 1990 to 2020

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 emissions (emissions in kilotonnes)
1990	356.0	20.0	13.3	5.1	394.3
1991	353.0	19.0	13.5	5.2	390.8
1992	364.3	19.0	13.9	5.6	402.7
1993	367.1	18.5	14.8	6.0	406.3
1994	379.1	19.9	15.0	6.8	420.9
1995	396.1	26.6	16.9	7.5	447.0
1996	412.6	26.2	16.4	8.2	463.5
1997	418.2	25.2	16.5	9.1	469.0
1998	417.4	26.0	16.7	10.0	470.1
1999	415.2	24.8	14.7	10.9	465.6
2000	424.0	24.9	14.4	11.1	474.4
2001	427.5	21.8	14.1	11.6	475.1
2002	430.7	21.7	19.9	11.3	483.5
2003	437.2	18.8	12.6	11.0	479.7
2004	452.1	18.5	12.1	10.7	493.5
2005	448.4	17.2	13.4	10.5	489.5
2006	440.1	16.1	12.3	9.9	478.4

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 emissions (emissions in kilotonnes)
2007	445.9	16.1	11.7	9.8	483.5
2008	437.9	13.6	13.0	9.2	473.6
2009	425.1	12.6	12.8	8.8	459.3
2010	418.2	11.5	13.4	8.7	451.8
2011	416.1	11.8	13.2	8.4	449.5
2012	433.0	11.9	12.3	7.9	465.2
2013	446.0	11.2	13.5	7.8	478.5
2014	437.5	11.3	13.8	7.3	469.9
2015	440.4	11.7	12.6	7.2	471.9
2016	440.0	12.0	12.9	7.4	472.3
2017	430.6	11.3	12.5	7.5	461.8
2018	444.7	12.0	12.7	7.6	477.0
2019	443.7	11.1	13.1	7.6	475.6
2020	456.8	12.0	11.9	6.4	487.0

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. The numbers have been rounded off and their sum may not correspond to the total.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 11. Data for Figure 14. Ammonia emissions by province and territory, Canada, 1990, 2005 and 2020

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2020 (emissions in kilotonnes)
Newfoundland and Labrador	1.0	1.1	0.9
Prince Edward Island	3.4	3.7	3.2
Nova Scotia	4.9	4.6	3.5
New Brunswick	4.6	5.7	3.6
Quebec	65.0	67.6	63.7
Ontario	110.5	101.6	91.9
Manitoba	38.0	55.4	62.6
Saskatchewan	48.6	84.0	101.7
Alberta	95.3	140.5	133.2
British Columbia	23.0	25.2	22.7
Yukon	<0.1	<0.1	<0.1
Northwest Territories and Nunavut	<0.1	<0.1	<0.1

Table A. 12. Data for Figure 16. Total carbon monoxide emissions by source, Canada, 1990 to 2020

Year	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
1990	5494.3	2581.7	2258.3	812.1	335.9	11 482.4
1991	5289.2	2511.4	2358.6	817.1	326.0	11 302.3
1992	5288.5	2572.2	2186.2	859.4	341.3	11 247.6
1993	5272.4	2640.0	2381.0	863.0	363.3	11 519.7
1994	5250.1	2672.0	2329.8	838.6	400.3	11 490.9
1995	5034.4	2720.3	2367.3	817.5	408.0	11 347.5
1996	4935.5	2698.4	2112.9	835.2	420.4	11 002.4
1997	4938.1	2606.6	1847.1	825.8	470.0	10 687.6
1998	4969.0	2532.2	1760.9	661.9	488.1	10 412.2
1999	4860.1	2525.4	1692.5	643.1	499.9	10 221.0
2000	4934.8	2352.2	1619.6	652.0	445.2	10 003.7
2001	4684.5	1956.4	1508.9	561.8	469.2	9 180.9
2002	4355.6	2016.4	1443.2	542.9	501.0	8 859.2
2003	4131.5	2023.7	1518.2	512.6	530.6	8 716.7
2004	3806.0	2151.0	1223.4	544.2	502.9	8 227.5
2005	3125.4	1970.4	1198.4	560.7	495.2	7 350.0
2006	2823.8	1981.8	1003.6	549.7	504.4	6 863.2
2007	2702.7	1970.5	947.3	645.0	524.4	6 789.9
2008	2557.2	1878.6	954.4	645.0	541.9	6 577.1
2009	2365.5	1805.9	906.0	651.7	526.2	6 255.3
2010	2257.0	1792.4	887.7	577.5	522.1	6 036.7
2011	2056.9	1545.5	899.5	614.0	531.7	5 647.5
2012	1954.0	1392.5	909.9	582.5	533.5	5 372.4
2013	1911.0	1373.5	845.3	643.8	564.3	5 337.9
2014	1755.9	1389.2	901.7	656.9	550.0	5 253.8
2015	1729.8	1344.4	876.9	643.9	557.0	5 152.0
2016	1804.2	1204.6	905.7	608.2	537.3	5 060.0
2017	1824.1	1258.0	876.5	609.7	550.9	5 119.3
2018	1849.0	1291.7	787.8	618.6	566.5	5 113.6
2019	1871.7	1281.0	781.6	586.7	539.8	5 060.8
2020	1637.3	1243.2	733.0	539.7	501.9	4 655.1

Table A. 13. Data for Figure 17. Carbon monoxide emissions by province and territory, Canada, 1990, 2005 and 2020

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2020 (emissions in kilotonnes)
Newfoundland and Labrador	185.5	105.6	84.0
Prince Edward Island	54.9	37.8	20.3
Nova Scotia	308.5	190.5	116.1
New Brunswick	316.1	214.1	110.1
Quebec	2255.2	1564.4	1195.9
Ontario	3269.3	2082.6	1128.2
Manitoba	385.8	258.6	168.3
Saskatchewan	522.6	406.7	278.1
Alberta	1810.4	1278.7	890.2
British Columbia	2340.3	1184.2	645.2
Yukon	16.4	9.6	5.8
Northwest Territories and Nunavut	17.4	17.4	12.9

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 14. Data for Figure 19. Total fine particulate matter emissions by source, Canada, 1990 to 2020

Year	Dust and fires (emissions in kilotonnes)	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
1990	529.6	674.0	338.4	139.7	1 681.7
1991	510.5	666.9	313.4	139.6	1 630.4
1992	492.2	652.2	305.2	145.8	1 595.4
1993	488.2	638.0	302.0	145.6	1 573.8
1994	543.6	623.9	302.7	140.6	1 610.8
1995	506.4	609.8	301.8	136.2	1 554.2
1996	535.7	596.2	293.0	138.4	1 563.4
1997	594.1	582.4	288.2	135.3	1 600.0
1998	462.2	568.8	278.4	107.6	1 417.0
1999	493.1	555.3	276.0	103.5	1 427.9
2000	467.6	541.9	272.8	103.8	1 386.2
2001	494.3	528.6	244.9	88.6	1 356.4
2002	466.8	509.0	220.0	84.7	1 280.4
2003	499.7	489.5	213.3	78.9	1 281.4
2004	488.5	469.4	207.0	82.7	1 247.6
2005	507.4	450.2	202.3	84.2	1 244.1
2006	562.6	430.8	176.3	81.6	1 251.3
2007	646.2	417.4	172.1	95.1	1 330.7

Year	Dust and fires (emissions in kilotonnes)	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
2008	731.8	403.7	164.0	94.5	1 394.0
2009	644.7	390.5	148.3	94.8	1 278.3
2010	735.2	377.5	151.4	83.5	1 347.6
2011	792.9	364.2	141.4	88.1	1 386.6
2012	904.2	367.5	137.0	82.9	1 491.6
2013	913.8	370.4	132.2	89.5	1 505.9
2014	909.3	373.3	129.7	88.9	1 501.2
2015	926.1	376.4	122.1	84.8	1 509.5
2016	927.6	379.3	116.1	78.5	1 501.5
2017	932.0	370.5	123.3	77.2	1 502.9
2018	939.3	362.0	124.2	85.2	1 510.6
2019	944.8	354.1	122.8	86.5	1 508.2
2020	883.6	348.9	119.9	79.7	1 432.0

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. The numbers have been rounded off and their sum may not correspond to the total.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 15. Additional information for Figure 19. Total fine particulate matter emissions by source, Canada, 1990 to 2020

Year	Ore and mineral industries (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Miscellaneous (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Building heating and energy generation (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Incineration and waste (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)
1990	53.1	34.8	114.4	14.0	53.7	12.2	4.6	48.4	3.1	<0.1
1991	50.7	31.9	103.5	12.1	51.4	12.7	4.6	43.4	3.1	<0.1
1992	48.7	31.0	100.2	12.1	51.6	13.1	4.7	40.6	3.1	<0.1
1993	48.6	30.6	101.0	12.4	55.6	13.2	4.9	32.5	3.2	<0.1
1994	50.5	31.0	100.8	12.9	60.3	14.2	4.9	24.9	3.3	<0.1
1995	50.2	29.9	102.0	13.3	63.1	14.5	4.9	20.7	3.3	<0.1
1996	51.7	30.1	93.7	13.4	62.2	14.5	5.2	18.9	3.2	<0.1
1997	52.0	31.5	85.9	13.8	61.9	14.9	5.0	20.1	3.1	<0.1
1998	49.8	32.4	80.9	14.6	56.9	16.6	4.6	19.7	3.1	<0.1
1999	49.4	33.2	80.6	15.2	54.2	14.1	4.8	21.4	3.1	<0.1
2000	50.2	33.9	75.6	15.6	52.2	13.9	5.3	23.0	3.2	<0.1
2001	46.8	33.1	64.7	15.9	43.2	13.8	5.0	19.2	3.2	<0.1
2002	37.4	31.7	55.5	16.4	41.3	14.3	5.2	15.0	3.1	<0.1
2003	37.3	31.4	53.5	16.5	41.8	12.8	5.6	10.9	3.3	<0.1
2004	35.7	31.3	50.9	16.9	41.4	12.1	5.3	10.2	3.2	<0.1
2005	40.8	33.2	45.2	17.2	35.9	12.5	5.2	8.9	3.3	<0.1
2006	39.7	31.4	29.0	17.4	32.9	11.9	4.9	6.0	3.2	<0.1
2007	38.0	30.0	27.2	17.4	32.5	11.7	5.2	7.0	3.1	<0.1
2008	36.4	28.8	24.4	17.8	31.3	10.2	5.1	6.8	3.0	<0.1
2009	30.8	26.3	20.2	17.9	29.6	9.4	5.0	6.1	2.9	<0.1
2010	34.6	25.6	20.0	17.6	30.9	9.3	4.7	5.7	2.8	<0.1
2011	33.3	24.3	20.5	16.8	24.6	9.8	5.0	4.3	2.7	<0.1
2012	35.3	22.9	19.7	16.9	21.2	10.4	4.6	3.2	2.6	<0.1
2013	32.0	21.8	19.9	16.8	19.9	11.2	4.8	3.2	2.6	<0.1

Year	Ore and mineral industries (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Miscellaneous (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Oil and gas industry (emissions in kilotonnes)	Building heating and energy generation (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Incineration and waste (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)
2014	32.1	20.2	18.7	16.1	18.3	13.1	4.9	3.6	2.5	<0.1
2015	30.6	17.1	18.7	15.3	17.6	12.1	4.7	3.5	2.6	<0.1
2016	31.1	16.8	17.2	15.3	14.0	11.1	4.7	3.4	2.6	<0.1
2017	34.7	17.5	17.3	15.4	15.1	12.4	5.0	3.3	2.6	<0.1
2018	33.6	18.3	17.3	15.4	15.9	12.4	5.4	3.2	2.7	<0.1
2019	33.7	18.3	16.4	15.5	15.7	12.2	5.4	2.8	2.7	<0.1
2020	34.4	16.6	16.4	15.6	14.2	12.4	5.1	2.4	2.7	<0.1

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation. 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 in the Data sources and methods for a complete list of the air pollutant emissions sources included under each category. The numbers have been rounded off and their sum may not correspond to the total.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 16. Data for Figure 20. Fine particulate matter emissions by province and territory, Canada, 1990, 2005 and 2020

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2020 (emissions in kilotonnes)	1990, excluding open sources [A] (emissions in kilotonnes)	2005, excluding open sources [A] (emissions in kilotonnes)	2020, excluding open sources [A] (emissions in kilotonnes)
Newfoundland and Labrador	18.2	12.7	13.6	12.2	8.3	5.8
Prince Edward Island	4.7	3.9	3.5	2.1	1.8	1.3
Nova Scotia	27.8	19.6	13.9	19.0	12.7	7.2
New Brunswick	26.9	17.8	10.8	18.7	13.1	5.7
Quebec	144.4	112.5	117.6	99.8	72.5	57.6
Ontario	211.0	163.2	171.7	113.6	72.6	47.3
Manitoba	108.6	89.8	99.0	14.4	10.0	6.6
Saskatchewan	542.7	400.8	433.5	23.0	18.3	12.1
Alberta	432.8	347.2	500.6	71.9	33.6	26.4
British Columbia	155.3	68.7	60.7	101.3	41.9	28.6
Yukon	4.1	2.7	2.1	0.5	0.2	<0.1
Northwest Territories and Nunavut	5.2	5.1	4.9	1.7	1.4	1.1

Note: [A] Open sources include emissions associated with dust and fires and agriculture (livestock, crop production and fertilizer). The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires and from vegetation.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 17. Data for Figure 22. Total black carbon emissions by source, Canada, 2013 to 2020

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)	Oil and gas industry (emissions in kilotonnes)	Building heating and energy generation (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
2013	11.4	12.6	8.0	2.7	1.0	1.4	37.1
2014	10.7	11.4	8.0	3.1	1.1	1.3	35.6
2015	8.8	10.9	7.7	2.9	1.0	1.3	32.6
2016	8.5	8.4	7.2	2.5	1.1	1.2	28.9
2017	9.0	9.1	7.2	2.6	1.2	1.2	30.3
2018	9.4	9.7	7.6	2.7	1.2	1.1	31.8
2019	9.5	9.6	7.4	2.6	1.3	1.2	31.6
2020	8.8	8.6	6.8	2.5	1.2	1.1	29.0

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires. "Other sources" includes emissions from ore and mineral industries, manufacturing, electric utilities and agriculture. Consult Table 2 in the Data sources and methods for more details.
Source: Environment and Climate Change Canada (2022) Canada's Black Carbon Emissions Inventory.

Table A. 18. Data for In 2020, 3 provinces, Alberta, Ontario and Quebec, accounted for 62% (18 kt) of total national black carbon emissions

- Between 2013 and 2020,
    - all provinces and territories, with the exception of Prince Edward Island, experienced reductions in black carbon emissions between 4% to 56%
    - Ontario and Quebec experienced the largest reductions in emissions of 2.1 kt and 1.6 kt, respectively. For both provinces, the reductions were mainly attributable to lower emissions from off-road vehicles and mobile equipment

Figure 23. Black carbon emissions by province and territory, Canada, 2013 and 2020

Province or territory	2013 (emissions in kilotonnes)	2020 (emissions in kilotonnes)
Newfoundland and Labrador	0.9	0.9
Prince Edward Island	0.2	0.2
Nova Scotia	1.3	0.9
New Brunswick	1.4	0.6
Quebec	7.5	5.9
Ontario	8.2	6.1
Manitoba	1.4	1.2
Saskatchewan	4.1	3.4
Alberta	7.3	5.8
British Columbia	4.3	3.6
Yukon	<0.1	<0.1
Northwest Territories	0.4	0.3
Nunavut	0.1	0.1

Note: The indicator reports air pollutant emissions from human activities only. It does not include emissions from natural sources such as forest fires.
Source: Environment and Climate Change Canada (2022) Canada's Black Carbon Emissions Inventory.

Table A.19. Data for Figure 24. Contribution of the oil and gas industry to total air pollutant emissions by activity type, Canada, 2020

Activity type	Sulphur oxides (percentage of national emissions)	Volatile organic compounds (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	32.3	35.0	29.9	10.5	0.8	0.5
Downstream oil and gas	5.3	1.5	1.1	0.3	0.1	<0.1

Note: In the oil and gas industry, upstream activities include exploration, drilling, production and field processing and downstream activities include refining, storage and distribution.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Additional information for Figure 24. Contribution of the oil and gas industry to total air pollutant emissions by activity type, Canada, 2020

Activity type	Sulphur oxides (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)	Carbon monoxide (emissions in kilotonnes)	Fine particulate matter (emissions in kilotonnes)	Ammonia (emissions in kilotonnes)
Upstream oil and gas	210.4	512.0	432.9	488.6	10.9	2.4
Downstream oil and gas	34.7	21.8	16.0	13.3	1.5	<0.1

Note: In the oil and gas industry, upstream activities include exploration, drilling, production and field processing and downstream activities include refining, storage and distribution.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 20. Data for Figure 25. Changes in emissions of key air pollutants from the oil and gas industry, Canada, 1990 to 2020

Year	Carbon monoxide (percentage change from 1990 level)	Nitrogen oxides (percentage change from 1990 level)	Volatile organic compounds (percentage change from 1990 level)	Sulphur oxides (percentage change from 1990 level)
1990	0	0	0	0
1991	-3	-2	-1	1
1992	2	3	1	9
1993	8	10	6	14
1994	19	19	9	13
1995	21	24	11	12
1996	25	28	15	12
1997	40	40	13	4
1998	45	44	15	-2
1999	49	49	8	-3
2000	33	33	10	-4
2001	40	31	11	-7
2002	49	31	13	-12
2003	58	43	12	-11
2004	50	24	8	-12
2005	47	25	7	-14
2006	50	24	4	-21
2007	56	31	3	-25
2008	61	34	4	-29
2009	57	33	-3	-30
2010	55	31	-6	-36
2011	58	34	-8	-37
2012	59	33	0	-37
2013	68	34	8	-39
2014	64	38	14	-44

Year	Carbon monoxide (percentage change from 1990 level)	Nitrogen oxides (percentage change from 1990 level)	Volatile organic compounds (percentage change from 1990 level)	Sulphur oxides (percentage change from 1990 level)
2015	66	38	9	-49
2016	60	36	-1	-52
2017	64	39	2	-50
2018	69	41	5	-49
2019	61	39	2	-49
2020	49	30	-12	-54

Note: Fine particulate matter and ammonia are not shown in the table due to their low share (≤ 1%) of total emissions in 2020.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Additional information for Figure 25. Changes in emissions of key air pollutants from the oil and gas industry, Canada, 1990 to 2020

Year	Carbon monoxide (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)	Sulphur oxides (emissions in kilotonnes)
1990	336	346	604	537
1991	326	340	598	542
1992	341	356	613	583
1993	363	381	641	610
1994	400	413	657	607
1995	408	430	669	601
1996	420	442	697	600
1997	470	486	685	556
1998	488	497	697	527
1999	500	514	650	519
2000	445	459	665	516
2001	469	454	669	499
2002	501	454	680	470
2003	531	496	673	477
2004	503	431	653	471
2005	495	431	649	464
2006	504	430	627	426
2007	524	454	622	405
2008	542	464	631	380
2009	526	460	586	375
2010	522	452	566	344
2011	532	465	555	336
2012	534	461	605	339
2013	564	465	653	326
2014	550	477	686	299
2015	557	478	659	274
2016	537	471	598	259
2017	551	481	618	266
2018	567	486	636	276
2019	540	482	617	271

Year	Carbon monoxide (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)	Sulphur oxides (emissions in kilotonnes)
2020	502	449	534	245

Note: Fine particulate matter and ammonia are not shown in the table due to their low share (≤ 1%) of total emissions in 2020.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A. 21. Data for Figure 26. Contribution of transportation, off-road vehicles and mobile equipment to total air pollutant emissions by transportation mode, Canada, 2020

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	8.8	2.1	2.6	<0.1	<0.1	0.5
Passenger light trucks	15.8	4.4	3.9	<0.1	<0.1	0.6
Large trucks and buses	9.5	17.9	1.9	0.7	<0.1	0.2
Air, marine and rail travel	1.0	10.7	0.7	0.2	0.3	<0.1
Off-road vehicles and equipment, tire wear and brake lining	26.7	12.0	8.4	1.1	<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 (2022) Air Pollutant Emissions Inventory.

Additional information for Figure 26. Contribution of transportation, off-road vehicles and mobile equipment to total air pollutant emissions by transportation mode, Canada, 2020

Transportation mode	Carbon monoxide (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)	Fine particulate matter (emissions in kilotonnes)	Sulphur oxides (emissions in kilotonnes)	Ammonia (emissions in kilotonnes)
Passenger cars and motorcycles	410.0	31.0	38.5	0.9	0.2	2.3
Passenger light trucks	735.8	63.0	56.7	1.3	0.3	3.0
Large trucks and buses	444.3	259.0	27.6	9.5	0.2	1.0

Transportation mode	Carbon monoxide (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)	Fine particulate matter (emissions in kilotonnes)	Sulphur oxides (emissions in kilotonnes)	Ammonia (emissions in kilotonnes)
Air, marine and rail travel	47.2	155.1	9.6	3.5	2.2	0.2
Off-road vehicles and equipment, tire wear and brake lining	1 243.2	173.4	123.2	15.6	0.2	0.3

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 (2022) Air Pollutant Emissions Inventory.

Table A. 22. Data for Figure 27. Changes in emissions of key air pollutants from transportation, off-road vehicles and mobile equipment, Canada, 1990 to 2020

Year	Nitrogen oxides (percentage change from 1990 level)	Carbon monoxide (percentage change from 1990 level)	Volatile organic compounds (percentage change from 1990 level)
1990	0	0	0
1991	-5	-3	-4
1992	-3	-3	-3
1993	0	-2	-2
1994	6	-2	-1
1995	9	-4	-2
1996	11	-5	-4
1997	17	-7	-8
1998	19	-7	-11
1999	23	-9	-13
2000	23	-10	-20
2001	16	-18	-33
2002	9	-21	-36
2003	5	-24	-39
2004	1	-26	-39
2005	-3	-37	-48
2006	-9	-40	-51
2007	-10	-42	-52
2008	-14	-45	-53
2009	-21	-48	-57
2010	-21	-50	-58
2011	-24	-55	-68
2012	-29	-59	-71
2013	-33	-59	-73
2014	-38	-61	-74
2015	-42	-62	-75

Year	Nitrogen oxides (percentage change from 1990 level)	Carbon monoxide (percentage change from 1990 level)	Volatile organic compounds (percentage change from 1990 level)
2016	-45	-63	-77
2017	-42	-62	-76
2018	-40	-61	-76
2019	-40	-61	-76
2020	-47	-64	-79

Note: Fine particulate matter, sulphur oxides and ammonia are not shown in the table due to their low share (≤ 5%) of total emissions in 2020.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Additional information for Figure 27. Changes in emissions of key air pollutants from transportation, off-road vehicles and mobile equipment, Canada, 1990 to 2020

Year	Nitrogen oxides (emissions in kilotonnes)	Carbon monoxide (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)
1990	1 288	8 076	1 205
1991	1 230	7 801	1 161
1992	1 247	7 861	1 169
1993	1 286	7 912	1 187
1994	1 365	7 922	1 193
1995	1 400	7 755	1 181
1996	1 435	7 634	1 153
1997	1 512	7 545	1 114
1998	1 535	7 501	1 074
1999	1 580	7 386	1 052
2000	1 582	7 287	968
2001	1 489	6 641	802
2002	1 403	6 372	774
2003	1 346	6 155	733
2004	1 303	5 957	733
2005	1 249	5 096	629
2006	1 176	4 806	594
2007	1 153	4 673	583
2008	1 106	4 436	568
2009	1 022	4 171	518
2010	1 021	4 050	503
2011	980	3 602	386
2012	910	3 347	350
2013	868	3 285	330
2014	803	3 145	310
2015	752	3 074	299
2016	708	3 009	277
2017	742	3 082	285

Year	Nitrogen oxides (emissions in kilotonnes)	Carbon monoxide (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)
2018	770	3 141	292
2019	774	3 153	289
2020	682	2 881	256

Note: Fine particulate matter, sulphur oxides and ammonia are not shown in the table due to their low share (≤ 5%) of total emissions in 2020.
Source: Environment and Climate Change Canada (2022) Air Pollutant Emissions Inventory.

Table A.23. Data for Figure 28. Contribution of electric utilities to total air pollutant emissions by fuel source, Canada, 2020

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	24.7	4.6	0.2	0.1	<0.1	<0.1
Natural gas	0.1	1.2	0.2	<0.1	<0.1	<0.1
Diesel	<0.1	0.6	<0.1	<0.1	<0.1	n/a
Other sources	1.0	0.6	0.1	<0.1	<0.1	<0.1

Note: n/a = not available. 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 (2022) Air Pollutant Emissions Inventory.

Additional information for Figure 28. Contribution of electric utilities to total air pollutant emissions by fuel source, Canada, 2020

Fuel source	Sulphur oxides (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)	Carbon monoxide (emissions in kilotonnes)	Fine particulate matter (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)	Ammonia (emissions in kilotonnes)
Coal	160.8	66.3	8.8	1.5	0.2	<0.1
Natural gas	0.8	17.7	9.9	0.3	0.8	0.1
Diesel	<0.1	9.1	1.5	0.2	<0.1	n/a
Other sources	6.6	8.1	6.1	0.4	0.2	<0.1

Note: n/a = not available. 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 (2022) Air Pollutant Emissions Inventory.

Table A. 24. Data for Figure 29. Changes in emissions of key air pollutants from electric utilities, Canada, 1990 to 2020

Year	Sulphur oxides (percentage change from 1990 level)	Nitrogen oxides (percentage change from 1990 level)
1990	0	0

Year	Sulphur oxides (percentage change from 1990 level)	Nitrogen oxides (percentage change from 1990 level)
1991	-4	-2
1992	-1	2
1993	-12	-5
1994	-9	-7
1995	-14	-3
1996	-12	5
1997	-4	12
1998	-2	21
1999	-3	19
2000	0	27
2001	1	22
2002	1	23
2003	2	14
2004	-6	4
2005	-16	-1
2006	-26	-13
2007	-20	-7
2008	-31	-12
2009	-38	-15
2010	-46	-9
2011	-53	-22
2012	-54	-35
2013	-55	-37
2014	-56	-35
2015	-59	-41
2016	-59	-41
2017	-60	-44
2018	-64	-50
2019	-67	-51
2020	-73	-61

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown in the table due to their low share (≤ 1%) of total emissions in 2020. The indicator 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 (2022) Air Pollutant Emissions Inventory.

Additional information for Figure 29. Changes in emissions of key air pollutants from electric utilities, Canada, 1990 to 2020

Year	Sulphur oxides (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)
1990	618	257
1991	592	251
1992	611	263
1993	547	243
1994	560	240
1995	533	248
1996	542	269
1997	591	288
1998	604	310
1999	601	306
2000	619	327
2001	624	313
2002	624	315
2003	630	293
2004	582	268
2005	522	254
2006	459	224
2007	492	239
2008	428	225
2009	384	218
2010	334	234
2011	293	200
2012	284	166
2013	278	162
2014	269	167
2015	252	152
2016	253	152
2017	246	145
2018	220	129
2019	206	125
2020	168	101

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown in the table due to their low share (≤ 1%) of total emissions in 2020. The indicator 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 (2022) Air Pollutant Emissions Inventory.

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